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A COMPARISON OF PROJECT MANAGEMENT IN RESIDENTIAL AND COMMERCIAL BUILDINGS

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1 CHAPTER 1: INTRODUCTION

1.1 Background of the Study

The discipline of project management relates to the process that provides control of the pre-planning, execution, and monitoring of a project aiming to achieve a predefined goal under given resource and validity constraints. This dissertation focuses on analysing and comparing the Project Management Practice at Residential and Commercial Building Developments to determine the main differences/similarities in key elements of leadership, risk management, operation, ethical issues, and sustainability. Therefore, it will be interesting to note the effectiveness of the different project management approaches employed, and the differences in practices utilised between Prince 2 certified professionals in commercial projects and those of sole traders or small companies in residential projects (Phung et al., 2023; Shah et al., 2023).

Risk management is another key aspect of concern since it defines foreseeing and managing of problems that may occur. Structured risk management frameworks are usually associated with commercial projects that are likely to have bigger budgets and more complicated needs as opposed to residential projects that may use informal risk management systems at best. Similarly, the operational strategies vary: while the commercial building projects are extended by the understanding of the process, standardization that allows assuring the high quality of the final outcome; the focus on the individual approach to the client's requirements can be a leverage for the success of the residential building projects.

Ethical issues and sustainability are important aspects of the project environment today. Commercial developments might require higher levels of regulation and incorporate more sustainability goals compared to residential developments that focus on delivering affordable projects or meeting the client's demands. This chapter will also evaluate the extent of utilizing project management methodologies to realize these objectives, including comparing Prince 2 accredited practitioners in commercial projects with the practices of sole traders or small businesses in residential projects.

Leadership is a cornerstone for successful project management, as its nature moulds the team's cohesion towards achieving objectives. Leadership often calls for structured frameworks in commercial building projects, such as those set by Prince 2 certifications (Davies and Mackenzie, 2014). They delegate work professionally, assign responsibility, and respect the timeline stringently. In contrast, the leaders in residential projects may assume a more hands-on approach, as this reflects the project's scale and less formal structure. Team building is dynamic in commercial settings due to the presence of diverse stakeholders; residential projects have smaller and tighter teams (Woeste and Walker, 2008).

Planning and control are also done differently. Commercial projects need detailed scheduling tools with advanced control mechanisms to manage such complexities as subcontractor

coordination and strict regulations, such as the mandatory Construction Skills Certification Scheme (CSCS) cards for site workers (Scharnhorst et al., 2024). More straightforward planning tools may be used in residential projects, while flexibility is often more important than rigid control.

This is evident that leadership influence the success or decline of project management, especially in residential and commercial construction projects since the methods are distinct because of the nature and size of the projects involved. In commercial buildings, leadership is quite formal and procedural due to certain requirements as outlined by different authorities and certifications like Prince 2 (Ali and Rasheed, 2021). These frameworks give specific direction on how to assign tasks, decide on timelines and deal with other stakeholders (Smith, 2020). Prince 2 methodology focuses on governance of responsibilities and duties, The methodologies imply certain roles and effective processes that can be used when managing numerous and complicated commercial projects (Erkol, 2023). The specialists who have a Prince 2 certification level are commonly distinguished by their ability to act as coordinators, keeping a fine line between planning and managing a project to adhere to its goals but also keep in mind that some changes might be inevitable (Simonaitis, Daukšys and Mockienė, 2023).

Residential projects are smaller in scope and managers controlling such projects can be HPS and very reflexive. Most of the firms participating in this type of project are sole traders and small limited companies as this sector involves personal attention to people's needs and flexibility to address the individual consumers' requirements (Fathalizadeh et al., 2022). This lack of structures common in commercial construction projects enables residential project managers to be more in touch with their clients, thus establishing credibility. On the other hand, this makes it slightly difficult to maintain great coordination and stick to some of the time schedules that have been set down in case of any changes that might be foreseen in the future. With regards to this, it could be noted that while certified to the Prince 2 standards managers use set frameworks and procedures, residential project managers rely much on experience and interpersonal skills whilst handling the project challenges (Ali et al., 2024).

Leadership skills in commercial projects are an important factor of team work and accountability for different people (Waqar et al., 2023). Some of the project managers with Prince 2 qualification are good at employing well-coordinated strategies in leadership such as delegation of roles with emphasis on achievements. This approach helps to create the culture of professional and responsible ethic inculcating the understanding of own's and other team members responsibility (Ryzhakova et al., 2022). The appropriateness, flexibility, aggression, assertiveness, and cooperativeness of organisational leadership practices are crucial for the attainment of major business initiatives. Furthermore, commercial projects have more defined parameters than relative projects that leaders need to navigate and adapt to, especially managing adversity and changes in rules and policies (Waqar et al., 2023).

In the residential project, the leadership competencies are self-orientation, and the ability to negotiate flexibility (Ryzhakova et al., 2022). Project managers can have many responsibilities and can range from organizing construction to communicating directly with the clients as well as construction personnel (Davarzani et al., 2021). This management approach enables residential project managers to understand the clients' requirements and changes within the project environment. However, one of the challenges may be the absence of systemization, which means that leaders can face much pressure in terms of time and the effective usage of available resources. One aspect is that interpersonal skills of residential project managers tend to be important in order to trust and establish working relationships with the clients and other project members; this is particularly important in the context of smaller projects (Shoar et al., 2022).

The leadership in the process of teaming also differs depending on whether it is a commercial or a residential construction project. In commercial construction, there are always a number of professionals and contractors that are involved such as subcontractors, architects and engineers, and regulatory bodies. It takes great leadership skills to ensure that these stakeholders' interests converge and they work as a team (Rehan, Thorpe and Amirhossein Heravi, 2024). A project manager that undergoes his Prince 2 training ensures that good communication channels are opened and that a common understanding of what is expected of them by the next of kin when they are at work is arrived at. Such an approach to building teams guarantees that all participants understand the goals and objectives of the project and can implement solutions for issues that occur in the process of work collectively (Tawasha, 2023).

Residential construction projects, which are usually smaller than non-residential projects, involve a less structured approach to team building and often rely on the manager's connections (Moradi, Kähkönen and Aaltonen, 2020). Perhaps, the major leadership competencies include empathy, good communication, and conflict solving capabilities in this case. Residential project managers typically have direct contact with a small number of trades and local contractors, with these people relying on each other for developing trust and confidence. Although this approach fosters a cohesive andcollaborative team, it relies heavily on the project manager's effectiveness of managing team motivation and conflict resolution. Due to the absence of team-building standard procedures, it becomes difficult at times to implement scalable solutions or accommodate expansive projects (Tawasha, 2023).

Leadership is also important in the planning and control functions that are vital in project management as well. In commercial projects, due to the large scale and involvement of numerous individuals, there is increased pressure on the project managers to display great leadership when enforcing competent planning techniques and even sophisticated systems of control (Arshad, Ashraf and Pervaiz, 2023). The leaders certified in Prince 2 are knowledgeable in developing project blueprints, indicators of performance and tracking of performances against set goals. Their effectiveness in ensuring that people undertake to follow certain rules in the construction industry like Construction Skills Certification Scheme (CSCS) demonstrates that they are efficient in steering management towards better quality and safety standards (Erkol, 2023). Proper leadership

in planning and control helps to increase the chances of commercial success and allows projects to overcome considerable challenges, such as spending more money than planned (McGrath and Whitty, 2020).

Residential projects, on the other hand, tend to feature the element of flexibility rather than strict management. The decision-making, problem solving and being flexible which are core competencies of a project leader come in handy when it comes to handling these plans as the planning in such projects has not attained a higher level of formality (Reunamäki and Fey, 2022). Project managers involved with residential construction have to meet certain specifications of the project while at the same time, they have a little leeway in terms of what their clients want or how the project can be changed in the middle of the construction process. It calls for highly developed Emotional Intelligence and the ability to bring credibility and order to followers and customers (Montenegro et al., 2021). Despite the enhanced freedom of the scale of construction happening in residential projects, it requires a more intimate and react mentality towards management.

Many organizations spend a lot of money ensuring that they get the contracts and the skilled manpower required in the completion of projects underlining the role of leadership in this process. In the commercial projects it is usual to use the competitive bidding where during the competition the project manager needs to prove that he is a professional (Azeem et al., 2020). Prince 2 certification offers a strong edge in employment by proving that the project manager is trained and capable of handling large scale projects. It is critical for a project manager to possess leadership qualities that will be vital when dealing with parties involved in the contract agreement needed to provide the resources and skilled workforce that will be needed to bring the project to completion. In other incidences, it is quite heaven sent for a project manager to attract and retain skilled manpower shows great leadership and vision (Fokina et al., 2023).

The cost of getting contracts on these areas is relatively cheaper compared to the commercial projects, but the challenge comes in trying to get skilled labor (Mangvwat, Ewuga and Izam, 2020). Leadership skills particularly in the areas of resourcefulness, negotiation, and relationship building is central to finding right trade personnel to do the job right and have all the required expertise. While in commercial projects professional trainings and certifications can be expected, residential project managers mainly use non-formal training and education, as well as gaining their knowledge through experience (Nagy, Pelser and Vaiman, 2023). This shifts the focus towards the selection of people and relations between them within the team and with the leader.

The leadership in the commercial project is structured and follows an approach that can be easily applied across multiple projects, thereby affording scalability; however, the approach may not be as suitable for an environment that requires lot of dynamic change (Haleem, Javaid and Singh, 2024). According to research, excessive structure and formalization, which is characteristic of Prince 2-certified project management, lacks flexibility and adaptability inherent in innovative environments (Azenha, Reis and Fleury, 2020). On the other hand, arguments for the structured

framework point to the fact that it reduces risk and guarantees a certain level of responsibility that is needed especially when working at a large scale. On the other hand, the more open leadership structure in residential projects clearly has its benefits in terms of client and schedule management but comes with its fair share of downsides such as instability and inefficiency (Meirinhos et al., 2023).

Additionally, leadership styles vary in relation not only to the execution of tasks but also to training and personnel development. In the commercial field, project leaders may have to provide staffers training that has the appropriate accreditation for the job. Not only does this improve the team's capacity but it also helps to ensure on going improvement (Anwer et al., 2022). However, this approach may take time and it is very expensive. Furthermore, the level of training differs where in residential projects training is normally on the job training and apprenticeship. Though this model proves economical, it lacks formal training platforms hence may not offer a standard professional outlook (Jiang and Ali, 2024).

The leadership style also influences the decision making process Leadership and management Leadership of the organization also has some effect to the decision making process. In commercial projects, decision making is often formalised and hierarchically authorised since project managers rely on information and analysis of project situations as well as on businesslike procedures and systematic logic in their decision making (Page, 2020). This reduces the chances of making wrong decisions in the project since every decision will have to be made in a manner that supports the project objectives and available data. However, this results in untimely decisions because most of the decisions are made through lengthy and bureaucratic procedures. Decision-making in residential is formalized and rational while in commercial project decision-making is more centralized and logical this makes the project managers to be more flexible dealing with changes and clients. As this decrees, it increases flexibility at the supervisory level, but it has many disadvantages, including instability and irresponsibility (Duggal, 2024).

Thus it can be summarized that leadership skills are important to the successful completion of residential and commercial construction projects, in a way that may not necessarily be entirely comparable. As observed in commercial projects, Prince 2 certification for project managers makes the operations professional and more structured as the operations are larger in scale. The demonstration of clear systematic planning, servant leadership, and quality management are elements which showcase the advantage of formal education and certification (Duggal, 2024). Where leadership is determinative, flexibility, involvement, and commitment have been identified to be paramount especially in residential project setting. However, these skills are ideal for the reduced scale and specific requirements characteristic of residential construction while revealing some of the limitations linked to work steadiness and reproducibility (Anwer et al., 2022).

Role of Project Sponsors

Project sponsors play an important role in residential and commercial projects, but their roles differ. In commercial projects, the sponsors are typically board members or senior executives of prominent corporations that give strategic guidance, allocate resources, and monitor progress towards the project outcome (Akhavan Tabassi et al., 2019). They ensure the project aligns with the broader objectives of the organisation. Residential project sponsors typically include private homeowners or small business owners. Their focus is on cost efficiency and personal preferences, which in turn affect the scope and method of execution of the project (Wu et al., 2023).

Project sponsors are equally significant and vital to both the residential and commercial projects and they have numerous responsibilities as shall be seen below. However, how they affect the management and results of such projects varies greatly, with various focuses, scopes, and levels of project task complexity inherent with these two sorts of construction projects (Franke et al., 2022). In the context of commercial projects, sponsors are usually leaders in the project sponsoring organization and project sponsors in a company may include directors or corporate executives (Al Hawsah, 2020). Their responsibility is not just limited to assigning resources but also involves the strategic supervision that provides coherence with the overall objectives of an organization (Akhavan Tabassi et al., 2019). In residential developments, sponsors may be individual persons or proprietors of small companies who, in most cases, center of attention tends to be centered on cost, choice, and utility. These differences define the manner in which the project manager steers the project, work delivery, and communication (Franke et al., 2022).

One major difference relates to how managers managing professional project management certifications like Prince 2 engage in managing commercial projects as opposed to project managers in residential projects who may be running their own show, being independent entities or managing small restricted companies (Martínez-Peláez et al., 2023). In commercial projects, project managers certified with Prince 2 make use of the systematic procedures which are characterized by distinct phases, products and management of risks. This empowers them to coordinate complex large teams, collaborate with numerous other stakeholders, and accommodate legal frameworks (Dwivedi and Dwivedi, 2021). For instance, they know how to leverage different indicators like Gantt charts or earned value management systems, or risk registers and more to ensure that progress occurs as planned, within the stipulated time, and costs. From this perspective, such a systematic approach is imperative especially given the risks and often exposure connected to numerous business/ commercial construction ventures. In addition, commercial sponsors expect clear reporting and documentation because enormous amounts of money and company reputations are on the line. Project managers must thus display the leadership at an even more superior level, in terms of both substance and style (Tchumtcha Wembe, 2022).

However, the project managers in the residential projects do not have much of a structure in which they are required to work (Tsoy and Staples, 2021). Those involved in sole trader businesses and managers in small companies do not significant attention to methods as flexibility (Tsoy and Staples, 2021). These managers are usually very involved with day-to-day on-site activity and frequently act in several roles due to the specifics of residential projects when funds

are restricted and budgets are getting narrower. Sponsors in these cases are usually more directly engaged and invested in the project, as they are stakeholders in its every detail. Such a condition calls for interpersonal and negotiating skills within a project manager given the fact that the project must meet the sponsors' expectations while at the same time being workable. In this case leadership is more 'hands on' and 'people orientated', with project managers often developing close working and trusting relationships with the sponsors as well as the workers. (Martínez-Peláez et al., 2023)

The possibility of obtaining the contracts and qualified employees is another factor that differentiates the PM processes for commercial and residential projects (Sithambaram et al., 2021). Commercial projects usually have fully sponsored bidding where project managers get to involve large contractors and subcontractors with the specific skills and accreditation as per the projects standards. Such projects invariably require that everyone on a site adheres to certain codes like the Construction Skills Certification Scheme (CSCS), signifying a high level of professionalism among all personnel. Mandatory and non-mandatory training programmes and professional development activities supported by commercial sponsorship also help establish a pool of skilled talent (Majumder et al., 2022). Therefore, the commercial project managers tend to manage teams comprised of highly skilled personnel capable of assuming responsibility for intricate activities (Tchumtcha Wembe, 2022). This reduces the burden of micro management on the manager while at the same time allowing the manager to concentrate on key decision making and reporting (Martínez-Peláez et al., 2023).

On the other hand the residential project managers are always stretched when it comes to availability of skilled manpower since they are constrained by the budget available to them. The official sponsors involved in residential project funding might lack the financial ability to pay competitive wages or develop professional training programs (Dwivedi and Dwivedi, 2021). Therefore, residential project managers can hire a combination of skilled and unskilled workers – experienced tradespeople and laborers. This workforce characteristic requires a different paradigm of leadership skills since managers spend more time supervising and training employees and monitoring the quality of work. Furthermore, residential sponsors may opt for cheapest instead of skilled and this could be some compromise off the quality of workforce that is required in a certain project. Project managers must therefore demonstrate increased creativity and innovation in order to provide satisfactory results within the set limits (Tsoy and Staples, 2021).

These costs depict the reasons behind a variation in priorities of project sponsors in residential and commercial sectors in relation to contracts and resource management. To the commercial sponsors, large amounts of money may be provided in the early stages of the processes, such as market analysis, bidding, and design (Shafi et al., 2021). These sponsors expect long-term payback on investment and can absorb the costs of up-front quality and performance. This approach helps to engage the project manager in the proactive strategy for addressing risks and developing the contingency plan. However, it also often hinges on a vast bureaucratic

machinery and centralized top-down decision-making processes, which, thus, require constant efforts in order to keep up the pace (Martínez-Peláez et al., 2023).

In residential project the main goal is economy, which affects how project managers get business and distribute costs (Martínez-Peláez et al., 2023). Contract sponsors within this sector are likely to put much consideration on price competition than with small contractors and therefore are more likely to prioritise costs over all the other qualities. Although this strategy helps to cut down the initial costs, the practice shows that margins for project managers become more limited, and they need to look for ways and means of cutting costs while maintaining the quality of services provided (Dwivedi and Dwivedi, 2021). The dynamics of residential projects enable changes in the schedule and cost of the project and this is good, however, it poses some challenges to project managers in terms of the number of responsibilities they have to handle. In this case, leadership involves being able to balance the financial understanding and skills, thinking skills, and frantic involvement to ensure that expectations of the sponsor are achieved (Martínez-Peláez et al., 2023).

In commercial projects, structured methodology is more suitable and the professional certification such as Prince 2 has numerous benefits for the projects such as clearer responsibilities, improved coordination and manageability of risks (Shafi et al., 2021). However critics can state that this type of methodology in many cases can negatively transform into rigidity of processes and limit creativity and flexibility in many cases especially if a project environment is rather unconventional. In addition, the organizational structure of commercial project teams is rather rigid and hierarchical, and this, in turn, may hamper communications between managers and employees (Martínez-Peláez et al., 2023).

On the other hand, the authoritarian approach typical of residential projects is usually appreciated by their informality and flexibility, which allows quickly responding to competitors' actions and introducing new ideas (Dwivedi and Dwivedi, 2021). This approach holds some drawbacks. As pointed out, the lack of certain procedures often leads to inconsistency in a system, low productivity, and increased risks this is especially true within organisations that handle frequent small scale projects. In this case, the use of casual or low-level employees might also impact the overall quality of the work to be delivered, thus, putting more obligation on the manager to deal with all the suspected or real limitations (Martínez-Peláez et al., 2023).

Another area of comparison is the available training and development programs available for the employees. Project partners can appreciate the maturity of professional development and certifications, which improve workforce proficiency and project performance. The work of a project manager in this case is mainly accomplished by serving as a link between all the stakeholders where a lot of emphasis is placed on the provision of resources and availing of opportunities for the team members. Such an approach is rather progressive from the point of view of the overall strategic development of commercial organisations and encourages the establishment of progressive improvement goals (Shafi et al., 2021).

While training and development of people is considered a high priority by all categories of sponsors, residential sponsors are known to have limited financial resources to spend on such programs (Tchumtcha Wembe, 2022). Project managers in this sector can only therefore build workforce skills through on the job trainings and other related practices and perhaps training of trainers. Though these methods work in some of the situations the same does not necessarily bring the same level of standardization or recognition of certification (Ika and Pinto, 2022). This clearly demonstrates the nasty that residential project managers grapple with in an effort to maintain workforce quality in relation to set budgets.

Therefore, it is evident that the involvement of sponsors in residential and commercial projects plays a central role in defining the leadership qualities of project managers in a given project (Ika and Pinto, 2022). Project sponsors are expected to be business-oriented, scientifically grounded, and committed to the consistent and systematic processes of workforce training so that the project manager is working within a defined business environment (Tsoy and Staples, 2021). In contrast, residential sponsors tend to focus on cost, adaptability and customer orientation, meaning that project managers have to expend more effort and be more proactive (Tchumtcha Wembe, 2022). Even though each of these approaches has its advantages and disadvantages the nature of the management relationships seems to play a vital role in determining the success of both residential and commercial construction projects (Dwivedi and Dwivedi, 2021).

Another apparent field that contains necessary differences is risk and conflict management. Concerning commercial projects, the assessment tools are different and more developed and applied risk management measures are also more defined. The risks generally associated with commercial development include legal issues, cost overruns, and issues with the law regulating the environment (Ghansah et al., 2021). Unlike house or business projects, with a strict structure for handling issues, one gets a system to handle conflicts with external intermediaries.

Principal concerns arise in terms of cost, time, and performance. Conflict resolution is often more or less formal and requires direct negotiation between the involved parties. The absence of procedures may sometimes lead to a more extended disagreement (Klitgaard and Gottlieb, 2019). Risk and conflict management are key decisive factors that define the performance of construction projects which can be either residential or commercial. These conflicts and risks are indeed present in both types of projects although the nature and scale of these factors, as well as the management techniques used are quite distinct (Tayeh et al., 2020). These differences arise from the project size, number and type of stakeholders, structure in place, and the approach taken by project managers. Introducing this type of evaluation is helpful because it offers critical perspectives into how risk and conflict are regulated and what results these practices may have on projects.

In commercial projects, risk and conflict management are planned procedures due to the size and nature of these projects. Commercial projects can have many stimulators such as investors, contractors, regulatory authorities, and users (Osuizugbo and Okuntade, 2020). This is

the reason for applying sophisticated risk management instruments and prescriptive approaches like PRINCE2, which precisely focuses on managing the risks inherent in projects by means of planning, monitoring, and control mechanisms. For instance, the assessment of risk, which starts from the planning phase in commercial projects, involves project managers to separate potential risks, including legal issues and environmental impacts. Such strategies come in the form of back-up plans, insurances, and contractual terms to share risks among stakeholders (Robichaud, 2023). Another study with practical implications is the identification of project sponsors who contribute strategic management of risks and resources. In most cases, the sponsors tend to be instrumental in correcting any sidelining of the risk management practices in a project.

As in other areas, formal processes also help within commercial projects in the management of conflicts. However, due to the high stakes and interest held by different parties, it is common to find that there will be conflict. Such disagreements may be occasioned by equitable issues, terms on contracts, or alteration in the task undertaking. Managers of projects in the commercial field often take recourse to formal tools like mediation, arbitration or litigation to seek redress for grievances. These mechanisms offer an understanding on how to handle the conflicts in a manner that they are not an impediment to the project (Munduate, Medina and Euwema, 2022). The usage of a comprehensible procedure to manage disturbances in business projects emphasizes the significance of the leadership competencies, including negotiation, communication, and decision-making in sustaining the stakeholder relations and encouraging cooperation (Ibraheem, 2018).

However, it needs to be noted that residential projects do not have as formal approach to risk and conflict management as commercial projects due to the difference in their scale and the organizational structures of those projects (Kozlowski and Ilgen, 2019). For residential projects, risks may be associated with cost, time or quality. For instance, failure to estimate crucial aspects such as site conditions, homeowner desires, or material delivery schedules can be a challenge to projects. While commercial property risk management appears to be more developed and sophisticated compared to residential risk management, the latter remains more dependent on the individual experience and the ability of the project manager. While residential projects entail more freedom and are easier to modify to accommodate changing conditions, they also pose several challenges such as lack of uniformity, no one to keep things in check (Ligon, 2020). For example, a residential project manager can reduce the cost by negotiating with the homeowner or changing the project plan to close a cost overrun, but such measures may be temporary.

Dispute resolution in residential projects is equally as extrajudicial and traditional and is likely to be personhood specific (Modha, 2021). The conflicts may occur between the homeowner or the small business sponsor and the project manager over expenditures, time, or other changes. Such conflicts are normally localized and settled personally between the parties involved and hence the importance of a good project manager. The advantage of such an approach is the ability to come up with the type of solution that meets the sponsor’s requirements; on the flip side, it results in higher chances of protracted dispute given that the parties cannot agree. The lack of

organized conflict management systems in residential projects is a prime encouragement of amity not only within residents but also within stakeholders (Crowe, 2023).

The assessment of the difference in the approach to risk and conflict management in residential and commercial construction projects highlighted that the classes are indeed fundamentally different in their requirements (Crowe, 2023). The business like commercial projects involve higher level of risks and conflicts hence there must be proper method in handling risks and conflicts. This is where the professional qualifications like PRINCE2 come in handy in that it makes the project managers to have essential tools and frameworks to deal with these challenges. For example, PRINCE2 provides guidelines for risk management during the project initiation process to help managers analyze risks and create appropriate risk management plans. This avoids unnecessary interruption of the work flow and at the same time increases confidence of the stakeholders on the capacity of the project to deliver the intended results (Duggal, 2024).

In residential projects the informal and adaptive nature of the approach gives the additional flexibility, with the project managers being able to adjust quickly to emerging problem (Balaban and Đurašković, 2021). However, this flexibility has its downside because it results in inconsistency and lack of uniformity in the workplace. For instance, a residential project's manager who makes decisions based on their own instincts may miss out on important risks and the project may experience cost overruns or delays. This further emphasizes interpersonal skills especially since direct negotiation is popular in the resolution of conflicts in residential projects through contract negotiations whereby the success of such negotiations depends with the extent of trust between the project manager and the sponsor (Urton and Murray, 2021).

Another consideration that should not be overlooked is the involvement of the project sponsors in the management of risks and conflicts. In commercial projects, we have sponsors giving overall strategic direction as well as securing resources for specifically addressing risks. Their participation guarantees that all the recommended risk management practices correspond with the organizational goals and that particular conflicts are resolved at the right organizational level (Tayeh et al., 2020). For instance a sponsor in a commercial project can come in to fix a dispute between contractors so as to ensure that the project continues as planned and ordered. In residential projects, the sponsors are generally more involved directly in the decision processes due to their ownership interest in the project (Piperca and Floricel, 2023). This kind of involvement can be an advantage because important decisions can be made quickly but it can also be disadvantageous because conflicts can arise if the sponsor's expectation do not compliment the proficiency of the project manager.

The Equal employment opportunity and the cost of obtaining contracts also determine risk and conflict management of these projects. Large scale business and commercial projects obtain sufficiently well funded and equipped to train and accredit personnel, thereby ensuring availability of expertise (Smith, 2020). It minimizes the probability of shoddy work and improves the odds of the project manager finding solutions to create value. While residential projects might be more

common and work under a tighter budget, this results in getting the work done by local tradesmen or small scale contractors which often reduces the talent available. This constraint dials up the pressure on project managers in terms of quality and cost, it stresses the need to adopt proper risk management strategies to overcome these issues (Urton and Murray, 2021).

Formal approaches adopted in commercial projects offer a strong degree of risk, especially in negotiating risk and conflict management. However, this formality can sometimes bring a high degree of standardization, which interferes with the project manager when reacting to various changes (Tayeh et al., 2020). For instance, in rapidly changing environments, failure to stray from the risk management standard process may be counterproductive and worsen the situation. The benefit of the informal and flexible approach is easily seen and appreciated in the residential construction since it can easily allow for adjustments, but the disadvantage is that there is no order, structure or supervision to lead to control of risks and conflicts. This raises the question about the possibility of integrating both methodologies' strengths while minimising the weaknesses (Modha, 2021).

Commercial project operations are managed through complex work processes supported by sophisticated information systems. Building Information Modelling (BIM) is among the widely adopted tools aimed at facilitating a seamless process, collaborative efforts, and better decision-making (Phung et al., 2023). Further, the systems provide ample support to ensure that proper health and safety standards, critical elements of the construction of commercial projects, are maintained.

Operations management is quite simple in residential projects, where dependence on technology is low. Most information is circulated by spreadsheets or e-mails. This may lead to better flexibility but at the cost of inefficiency and miscommunication (Padalkar and Gopinath, 2016). Operations and information management therefore have significant impacts on what constitutes best practices in project management particular to residential and commercial building projects (Adekunle et al., 2022). Although the two contexts involve the coordination of resources, time, and stakeholders' expectations, the layout and scale as well as the technological dependence in these operations differs greatly. These differences affect how the project managers go about their duties especially in the integration of existing tools and techniques like PRINCE2 in the commercial aspect of the buildings than in the residential area where the use of such tools and techniques are rare (Jiang and Ali, 2024). An assessment of these variations underscores the possibilities and challenges associated with each setting and offers valuable information on how processes and information management can be enhanced (Duggal, 2024).

In the case of commercial construction projects, operations management is significantly more standardized and intricate by design. Indeed, these projects require complex coordination and management of many different parties such as architects, contractors, investors and authorities (Modha, 2021). Another prominent technological advancement for commercial project business

operations is Building Information Modelling (BIM), which provides graphical and database information on the design, construction, and management of a project (Phung et al., 2023). BIM helps in planning effectively and assists the project team in decision making, minimizes errors which are crucial in commercial construction projects, and ensures compliance with health and safety standards. Furthermore, resource planning, scheduling and budgeting are enhanced through the implementation of Enterprise Resource Planning Systems (ERP) (Page, 2020). All these technologies clearly show how commercial projects require efficient information system to keep operational functions and projects intact.

While operations management in residential projects does not involve much application of technology some key processes have to be manual. Though they may be flexible, information dissemination may involve simple tools like spreadsheets, e-mails, or phone calls and may result in decreased efficiency or communication gaps (Robichaud, 2023). For instance, a residential project manager might use actors and relations that are not formal providing lower cost yet higher risks of misunderstanding and timelines shifts. Lack of integrated information systems in most residential projects make it difficult to achieve coherency and providence while handling projects. This makes the structure easy to implement especially for small-scales residential projects; however, it introduces operational rigidities in managing the operations of residential projects if the operations were scaled up or need to fulfill more demanding tasks (Tayeh et al., 2020).

Despite these differences, how project managers operate in these varied operational environments is informed by their certification and the structures in place. In commercial projects, the employees who are holding professional Project Management Certifications like PRINCE2 should be able to manage large-scale commercial operations. PRINCE2 is less prescriptive regarding tools and techniques to be used on the project, but it does stress detailed roles and responsibilities and a distinct process structure for executing projects. This systematic approach links directly with the practical nature of business environments where efficiency, quantifiable methods, and sensitivity to risks are essential. For example, in a commercial project, a project manager who is accredited under the PRINCE2 framework will use both the BIM and ERP to track progress, assess risks, and assess the stance of stakeholders, thus improving the operations and performance of the project in general (Erkol, 2023).

In residential projects many of the project managers are sole traders or running very small limited companies and this affects the structures of operations and control of information. They often use their experience and guess rather than strictly following procedures, which can be beneficial as it does not restrain to templates that may be useless in some cases. However, this form of organization can also have negative consequences such as lack of standard work and low levels of operational excellence. For instance, a residential project manager might be able to cut costs in a project instead of going through proper risk evaluation, thereby jeopardizing the project's quality or the time taken to complete it. The absence of such professional certifications such as PRINCE2 among the residential project managers also points towards the variation of the operational capacity between these two contexts (Franke et al., 2022).

The cost of obtaining contracts and sourcing for skilled manpower also affect the operation and the management of information in the residential and commercial projects (Hussain, Xuetong and Hussain, 2020). Such projects connected with commercial objectives and secured by larger budgets can allocate resources for attracting skilled personnel, training, and better technologies. This investment increases owners' ability to develop effective commercial project management that helps them employ technologies such as BIM and ERP to optimize resource utilization and decision-making. For instance, a commercial project's budget may have a section dedicated to training the employees on how actual BIM software so that everyone is useful in the project's day-to-day activities. Incidentally, residential projects are generally financially constrained with less flexibility to acquire high tech tools or training initiatives. This constraint increases the pressure on those responsible for managing the residential projects to be as efficient as possible while using as many of the local tradesmen or subcontractors with a certain level of skill.

The methodologies that have been developed and adopted in the commercial field are more structured and rely on technology and are much more efficient in terms of accuracy and risk control. For example, the adoption of BIM does not only support integrated decision processes; it also minimizes risk of costly mistakes or time overruns (Jiang and Ali, 2024). However, the extensive use of sophisticated equipment and the standardized procedures which are established can impede flexibility, thus ensuring that even considerations of commercial projects cannot easily alter plans due to some emergent possibilities. For instance, a commercial project that is working under limited operational flexibility may be slow to adapt to change in clients' demands or environment (Ibraheem, 2018).

The informal and flexible approach of operations management that is characteristic for residential projects entails the freedom of project managers to adapt strategies to clients and their needs (ICMAI, 2021). This flexibility is especially useful for less complex projects where the client's specifications tend to set project directions. However, there can be inadequate standardization of these practices, and there could also be the absence of technological support, leading to some negative results, aggression, or micromanagement as highlighted by Kozlowski and Ilgen (2019). For instance, a residential project that has not integrated technology into the planning and procurement processes, might experience some issues such as delayed time or cost overruns due to misunderstandings or human mistakes.

The significance of information management for practical and organizational activities, as well as for meeting the expectations of stakeholders, is difficult to overemphasize. In commercial projects, an integrated information system helps in the monitoring and reporting processes as well to be accountable for all the project details (Modha, 2021). For instance, an ERP system in a construction industry will allow project managers to analyse resource consumption, project expenses and all project-related milestones – all in real-time. This is one aspect that shows that residential project managers need to find more effective ways of handling information even when working under the constraint of budgets (Ligon, 2020).

These operational differences lead to risk and conflict management, which states that all of these aspects are tightly connected in project management. In the context of multistorey business-related structures, the embedded systematic nature of operations management acts as a shield against mishaps that could lead to conflict (Kozlowski and Ilgen, 2019). For instance, the commercial project manager who applies BIM can be aware of the probable design clash at an earlier stage and address this before it becomes a real issue (Page, 2020). Another significant aspect to note about operations management in residential projects is that they are less formal than their commercial counterparts, and hence, operational risks and conflicts tend to worsen due to lack of proper communication channels and conflict resolution mechanisms (Ligon, 2020).

Commercial projects have strong strategic frameworks wherein the project objectives are aligned with organisational objectives. Information systems help align by tracking progress and allocation of resources in real-time (Huemann and Turner, 2024). Residential projects are bereft of such strategic depth. Their focus is far more immediate, with strategies evolving more in response to situational demands.

The other important cross-checking relates to compliance with health and safety procedures. The legislation on commercial buildings is much tougher. For instance, the requirement that the companies working on the building have to mandatorily have their workforce procure CSCS cards. Although they appear to apply a uniform method in safety compliance and training, they are costly for the compliance and training exercise (Scharnhorst et al., 2024).

When it comes to safety, residential projects are not limited to commercial projects. This may be cheap in terms of cost, but it is also a disadvantage because the workers are exposed to many risks. Less formal education and experience to certify on residential projects is another comparable major professional distinct factor (Shah et al., 2023). Formality in corporate governance of commercial projects has outlined accountability, transparency, and ethical practices. These policies ensure that all legal and regulatory requirements are implemented to increase stakeholders' confidence. Corporate governance for commercial projects has aspects regarding ethics of sustainability and responsibility (Phung et al., 2023).

Many of the residential projects are relatively small, and therefore, such projects generally lack an official governing structure. From a practical perspective, ethics is usually assumed to be subjective to one's beliefs and the clients they serve. However, this may result in enhanced flexibility in decision-making while simultaneously resulting in the establishment of schools practising inconsistently (Ghansah et al., 2021). The international dimension in megaproject management is critical, especially when multinational teams operate together, which often means cross-border collaboration is becoming the norm. Therefore, this requires considerable skill in advanced negotiation and cultural sensitivities, linking these effectively into a global strategy (Tabassi et al., 2019). International elements are seldom found in residential projects. They are often strictly local in scope and thus do not have the same level of international exposure to the

various issues encountered in the management of global projects. This identifies a specific set of skills that are unique to large commercial project management (Davies and Mackenzie, 2014).

1.2 Statement of the Problem

1.3 Research Objective/Aim

The research's aim is to compare Project Management in Residential and Commercial Buildings.

1.3.1 Specific Objectives

The study has the following research objectives;

- To evaluate the challenges faced in project management in residential buildings in UK.
- To compare and evaluate Project Management in Residential and Commercial Buildings.
- To compare and evaluate leadership Skills, Team Building, Planning, and Control in Residential and Commercial Buildings.
- To compare and evaluate risk and conflict management in Residential and Commercial Buildings.
- To explore the role of project management in International Management of Mega Projects.
- To compare Strategy and Information Systems in Residential and Commercial Buildings.
- To provide recommendations for effective management approaches for Residential and Commercial Buildings.

1.4 Research Questions

- What are challenges faced in project management in residential buildings in UK?
- What are the similarities and differences between Project Management in Residential and Commercial Buildings?
- What are the similarities and differences of leadership Skills, Team Building, Planning, and Control in Residential and Commercial Buildings?
- What are the similarities and differences risk and conflict management in Residential and Commercial Buildings?
- What are the similarities and differences in the role of project management in International Management of Mega Projects?
- What are the similarities and differences Strategy and Information Systems in Residential and Commercial Buildings?
- What are the effective strategies for effective management approaches for Residential and Commercial Buildings?

1.5 Significance of the Study

Project management is an essential element in enhancing the success of construction work; nonetheless, construction projects may be domestically and/or commercially based. This research is important as it offers a comparative analysis of the two sectors concerning project management and presents the major issues, practices, and practices adopted in each of them. Therefore, this research fills the gaps in construction project management knowledge regarding cost differentials, time planning, risk evaluation, and quality assurance.

Additionally, this research could be of interest to project managers, contractors, developers, and policymakers because the paper compares commonly implemented strategies for managing residential and commercial construction projects and offers recommendations on improvements to the process. As the need for more residences and more diverse commercial structures grows, it cannot be stated too often that the study of variables that enable project success in each of these areas would result in better allocation of resources, better risk management, and eventually, better decisions. Furthermore, this research contributes to the existing body of knowledge by providing insights on how and where project management methodologies deviate between these sectors, which will be helpful to academics and researchers in expanding this line of research. The study findings will also be informative to future practitioners to improve their methods of reflecting on and improving project performance, sustainability, and cost-efficiency.

1.6 Scope of the Study

The current work is aimed at presenting a critical evaluation of the existing literature comparing project management in residential and commercial building projects in the United Kingdom with regard to challenges, strategies, and methodologies essential for every sector. The research objectives include; This is thus the areas that the research seeks to cover: The purpose of the study is thus to assess the problems that are unique to managing residential building projects, therefore discussing problems like cost overruns, time overruns and stakeholder management problems.

Furthermore, the study also examines the difference in the management of project in residential and commercial buildings in terms of leadership, team, plan and control. This comprises the identification of the role of the project manager, assessing communications within the project teams and the use of best practices in project delivery. Another important area of interest discussed in the study is the risk and conflict management . The analysis focuses on the process of risk evaluation and risk minimization in the context of the residential and commercial construction projects, as well as the conflict management techniques used for each type of project. In addition, the focus will be on the international aspects, especially project management of mega projects, and the influence of various factors on the construction of both residential and commercial projects. The study also analyses the general differences and similarities of public and private sector with regards to strategy and information system including; project management software and data analysis. Last but not the least, the study seeks to propose some recommendations for better

management strategies for residential as well as the commercial building industry as regards leadership, risk management, and technology. These findings are valuable for project managers, developers, contractors, and academic researchers to enhance practice advances in the construction industry and improve organizational performance on projects.

1.7 Organization of the Study

For this research, the study is divided into six chapters each as an attempt to systematically analyze and discuss various aspects of the study.

Chapter 1: Introduction and Aim of Study defines the purpose of the thesis, its objectives, importance and delimitation of the study. It presents an outline of the problematic area of project management in the construction of residential and commercial buildings and defines the scope of the study. The chapter proceeds with the specification of the research questions guiding the study and the research objectives of the study, its importance and delimitations.

Chapter 2: Literature Review enables the identification of prior studies on the overall management practices for projects between residential and commercial buildings. This introduces a number of concepts that are theoretical and practical in nature concerning leadership, team, planning, risk management and conflicts on construction projects. This chapter is designed to provide a strong theoretical foundation for the study insisting on the research gaps this study is to address.

Chapter 3 of this study is titled Data and Methodology which describes the research design, data collection, and methods of analyzing the data collected in this study. It outlines the method used to collect primary and secondary data: interviews with the personnel and case study analysis. Finally, the chapter discusses why such choice of method has been used to achieve the research objectives as well as to warrant the credibility of the findings.

Chapter 4: Content and Results expresses the aims and objectives of their study, which involves the findings from the interviews and case inquiries. This chapter also aims at looking at the differences and similarities of the management practices of residential and of commeration building projects with a view of trying to find answers to the research questions.

Chapter 5 of this thesis analyses the results in order to contextualise them with reference to prior research and theories. It also synthesises and discusses the implication of the research findings and applies the study for project managers and other stakeholders involved in construction projects.

The last section of the chapter is aimed at presenting the limitations of the research and offering recommendations for future research.

Chapter 6: Conclusions provides a summary of the findings made in the study and gives recommendations on how project management practices may be enhanced in residential and commercial construction projects. It also provides details on how the study has advanced knowledge on construction project management and reveals possible research that could be conducted in line with the study findings. It maintains a clear bullet-point progress from the introduction to the last conclusions, making it easy for readers to comprehend the flow of the research process.

1.8 Conclusions

This comparison underlines the diverse challenges and opportunities in managing residential versus commercial building projects. While commercial projects enjoy the benefits of a structured framework, advanced technologies, and stringent governance, this comes at a higher financial and complexity cost for such projects. Residential projects, which are flexible and cost-effective, usually do not involve formalised practices and standards by professionals. Further research may address specific issues, such as how technological changes affect residential project management or how corporate governance can help promote sustainability in commercial projects. The gaps identified will help project management evolve toward more effectively addressing the needs of both sectors.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Construction project management has been employed in the construction industry ever since the introduction of new technologies as well as project complexity and the concerns raised by the authorities for competent project delivery (Short and Bassett, 2021). Traditionally, there were several smaller-scale approaches to project management in construction where master builders coordinated the whole construction process. However, the general management of projects become more complex and more formal as construction undertaking increased in size and difficulty (Ejiofor and Ovat, 2023). The fundamental processes of systematic project management have emerged during and after the Second World War, starting with the Critical Path Method CPM and followed by the Program Evaluation and Review Technique PERT in the fifties. Through these tools, construction managers were able to identify time and sequence of tasks that are critical for the completion of construction projects and thus minimize risks that come with delays or cost increase (Wuni, 2023).

In the 1980s and 1990s, guideline that can be referred to as Project Management Body of Knowledge (PMBOK) and PRINCE2 began to be used in the construction industry (Babalola and Aigbavboa, 2022). These frameworks offered general recommendations for controlling scope, cost, time and quality of the projects irrespective of their size. However, new approaches began to appear at the turn of the year 2000, one of which is the lean construction that aims at optimal consumption, at minimizing wastes, and at constant improvement. Recently the digital communication which includes Building Information Modelling (BIM), artificial intelligence and automation has changed the manner of how project is managed in the construction sector in that real-time collaboration, improved risk assessment and resource management (Portes and Springford, 2023).

More specifically, the role of project management to facilitate efficiency and quality in construction cannot be overemphasized (Lee et al., 2022). The most direct advantage of a clear project management framework is that it is able to prevent risks because the inherent issues that might cause risks are known from the outset and precautions can be taken. There are many risks that are inherent to construction projects some of which include the following; cost control issues, scheduling problems, regulatory issues and physical conditions among others. The clients, contractors, engineers, and other agencies may include averment officers or regulatory authorities and all require efficient communication and cooperation throughout the project life cycle and this is the role played by the project manager. Moreover, resource consumption is well controlled as the resources in form of labor, materials and equipment are properly deployed within a project (Chadee et al., 2023). Risk control processes that are implemented within the framework of project management guarantee compliance with the applicable safety requirements, standard norms, and rules of sustainability. Since sustainable construction has now gained prominence, it is up to

project managers and architects to incorporate environment friendly building materials and systems and greenhouse gas emissions minimization into their projects (Gyourko et al., 2021).

2.2 Overview of the Residential Construction Sector in the UK

The UK residential construction industry different over the past decade due to technological advancement in construction technology, growth in market demands, and development of new regulations. The construction of houses has continued to be an important sector within the UK economy and residential buildings vital in meeting the demand for housing and urban space. Based on the data obtained from the Office for National Statistics (ONS), demand for housing has surpassed supply and as a result caused increased property and rents charges (Chadee et al., 2022). Durdyev, (2021), showed that the UK needs around 300000 homes per year to meet the demand but the construction output fails to achieve this figure.

Current and future trends indicate that there is a shift towards green buildings, smart homes, and modular homes in the market specifically segment in residential construction. As reported by D'Amico et al., (2024), clients are now demanding more energy-efficient homes fitted with solar panels, heat pumps, and smart home systems to minimize operational costs in the future. The Future Homes Standard approved by the UK government to come into force in 2025, increases energy standards even more use of green construction practices (Department for Levelling Up, Housing and Communities, 2023). Furthermore, due to COVID-19, new housing trends have emerged, with people focusing more on suburban and rural houses as working from home becomes common (Namous and Al Battah, 2021).

Government measures influence the feasibility, funding, and the legal framework for undertaking residential construction projects (D'Amico et al., 2024). The Help to Buy scheme that was launched in 2013 provided financial support in the form of loans for the first-time buyers with the aim of encouraging homeownership and boosting demand for newly constructed residences (Maqbool et al., 2024). However, such schemes have been criticized for having exerted pressure on the property prices whenever its prices go high, rather than enhancing affordability (Reed, 2021). The commitment of the UK government and the introduction of policies such as the net-zero emission target by 2050 also supports high environmental legislations that demand the new houses to be low carbon and sustainable. In addition, the shortage of labour triggered by Brexit has affected the construction workforce for residential buildings construction causing delays and high costs (Maqbool et al., 2024).

2.3 The challenges faced in project management in residential buildings in UK

Over budget is another problem that one will find to be recurrent mostly in residential construction projects. According to Reed, (2021), study of construction projects all over the world, the meta-analysis showed that residential projects tend to overrun budgetary cost due to underestimations of cost, increase in cost of materials and poor time management. Substitution cost has also gone up due to inflation and disruptions to supply chains in the UK; CLC (2022) made it known that in the last two years, the price of timber, steel, and concrete had gone up by more than 20%. Other studies by Gyourko et al., (2021), also posit that the human resources constraint is another significant factor contributing to the rising cost of construction projects, especially in today's post Brexit United Kingdom where there are acute shortages of skilled Europeans to provide cheap labour as before.

Various authors including Banihashemi et al., (2023), advocates that in an aim of covering expenditures, cost planning at the early stage of project development, as well as value engineering should be conducted. They noted that the use of BIM for construction projects can potentially enhance accuracy in cost estimations, thus lowering risks. According to case studies by Svatoš-Ražnjević et al., , (2022), incorporating lean construction practices reduces waste and positively impacts project performance and budget predictability.

2.3.1 Planning Permission and Land-Use Regulations

Another major challenge facing residential project managers in the UK is that of planning permission and more so the land-use planning. Governing rules established under the Town and Country Planning Act (1990) require developers to obtain local authority permission before initiating the construction process, which is considered inefficient due to being cumbersome. According to Wuni, (2023), the delay in approval of planning can significantly extend the timeframe of a residential project to 18 months, is costly and unattractive to investors. The Planning for the Future White Paper (MHCLG, 2020) was introduced to simplify the approval process but critics point out that such a method is still not uniformly well-applied across all local councils (Ejiofor and Ovat, 2023).

According to Ejiofor and Ovat, (2023), these restrictive zoning laws go on to make residential development more challenging, especially for areas that are highly demanded such as London or the South East. They conclude that greenbelt laws reduce the supply of land for dwelling, raise the price of land and eventually reduce the feasibility of affordable housing. Moreover, Duodu and Rowlinson, (2021), argue that community protests against such large-scale development proposals due to worry on infrastructure excess pressure and environmental effects prolong work permit grants as well.

The emergence of supply chain disruptions that have affected most sectors has increased concern in the construction industry mainly in the construction of residential buildings more so

after the onset of the COVID-19 pandemic and Brexit. As highlighted by Short and Bassett, (2021), there were delays on imports of construction material originating from the EU notably timber and insulation products due to new barriers to border controls and customs procedures. According to the Royal Institution of Chartered Surveyors (RICS), these disruptions have resulted in delays of the completion of projects by six months on those projects that were affected. Furthermore, Ejiofor and Ovat, (2023), work also illustrates the concerns with logistical concerns relates to residential projects. They claim that, due to the facts of globalization, the models of just in time delivery are becoming more and more sensitive to disruptions. Some of the ways which have been suggested to reduce the compounding risks are offsite modular construction and prefabrication (Babalola and Aigbavboa, 2022). According to KPMG's UK Construction Market Report (2023), time gained through off-site construction can achieve between 15% and 30% of the overall delivery time hence addressing one of the supply chain issues.

In other words, three issues that the present response identifies as potential factors that negatively impact the management of home building projects in the UK include cost overruns, planning regulations, and disruptions in supply chain (Duodu and Rowlinson, 2021). These challenges can be addressed through actual policy changes, advances in technology, as well as more effective and efficient project management methodologies (Banihashemi et al., 2023). Current literature still offers considerable information regarding directions for improvement, ranging from the introduction of better methods for cost estimates to the application of digital supply chain management tools. More research has to be conducted to determine its effects on long-term effects Brexit, the overall sustainability, and policy implications in the context of residential projects(Koc and Gurgun, 2021).

2.3.2 Labour Shortages and Workforce Challenges

Limited availability of skilled and experienced workers for construction project is one of the real issues that are compromising the implementation of construction projects by time and cost (Babalola and Aigbavboa, 2022). These challenges have been compounded by Brexit policies that limit citizen workers in other nations, an ageing population, and lack of training of new entrants in the sector. All these have repercussions on production levels, project costs, and the general viability of construction projects. Consistent with the countries in the EU, the United Kingdom construction industry has especially depended in the past on the immigration of skilled workforce. Prior to the Brexit, workers from the European Union accounted for a large number of the employees in construction especially within the large cities such as London. Though, the post-Brexit changes in immigration standards reduced the pool of workers with skills dramatically. The CITB reported that in post-national Brexit scenario for the construction industry, there were nearly 250000 workers' shortage as many of crucial EU citizens either quit or were unable to meet newer visa criteria (Banihashemi et al., 2023).

A number of articles have described Brexit effects on workforce deficiencies. For their part, D'Amico et al., (2024), examined various aspects of the post-Brexit construction workforce and stated that shortages have driven up wages, not to mention the project costs. Their research indicated that issues of supply contributed to a rise in wages by 10-15 percent for bricklayers, carpenters, and electricians between the years 2020 and 2022 (Reed, 2021). Likewise, a recent study conducted by the Federation of Master Builders (FMB) found that more than 60 per cent of small and medium construction firms have suffered project delays due to a shortage of workforce due to Brexit. Some of the concerns that have emerged from Brexit include wage inflation that affects the procurement of raw materials and a reduced number of available workers in manufacturing and logistics. According to Maqbool et al., (2024), the increased lead times for construction materials aggravate the impact of labor shortages along with a reduced number of workers to handle material management. This has led to slow project development especially in residential and commercial buildings, as developers fail to complete projects on time due to various influences (Gyourko et al., 2021).

2.3.3 Need for Skilled Labour and Training Programs

The demand for skilled labor and training programs According to different researches and studies, the demand for skilled employees has been increasing tremendously in the recent past due to several factors. In essence, the long-term sustainability and efficiency of the construction industry greatly relies on the availability of skilled human capital resources but the challenge of shortage of skilled workforce persists to hamper the overall projects delivery and innovative growth. According to RezaHoseini, Noori and Ghannadpour, (2021), the construction industry requires approximately 50,000 workers per year to meet demand; however, there has been low participation in apprenticeship and training programs.

Research has it that inadequate labour has been a challenge that has been solved through training programs. Namous and Al Battah, (2021), identified that there was a reduction in the construction apprentices by a third in a decade mainly as a result of cuts to funding and college interest. They also found out that perception of construction as physically demanding and having a low status has kept various people away from joining the sector (Gyourko et al., 2021). To address the issue of gap and lack of skills, new government-funded projects are still being launched like Construction Talent Retention Scheme and CITB's Skills and Training Fund. However, their effectiveness remains debated. Lee et al., (2022), illustrated that the UK does not yet have an organized dual training system as seen in Germany. They suggest that the UK construction industry needs a more structured approach that is part academic and part practical in order to come up with a talented and flexible workforce.

Moreover, innovation in construction including BIM, modular construction, and automation require upskilling programmes.Therefore, upskilling programmes are needed to support technological advancements including Building Information Modelling (BIM), modular

construction, and framework or automation. According to Ejiofor and Ovat, (2023), digital literacy in construction remains low, meaning that workers are unable to effectively embrace innovation that could help fill the labour deficit. According to it, only 35 % of UK construction companies provide their workers with digital training as compared to 65 % of companies in Scandinavian nations where stemming from enthusiastic uptake of technology has lagged losses experienced from a skilled workforce. Employers within the construction industry have also said that there is need to enhanced promotion of partnership between the construction industry and educational institutions in developing relevant training offers. Duodu and Rowlinson, (2021), that internships and placement in the construction companies, funded by the UK universities developed partnerships improve employability and the construction workforce retention. They claim that structured training programmes, along with governmental encouragement, could ultimately contribute significantly to tackling issues regarding the workforce (Portes and Springford, 2023).

There is still a severe lack of skilled labour due to several issues such as Brexit restrictions and reduction in the number of workers. Research findings have revealed that these shortages are a cause of wage increases, additional time for projects, and inadequate availability of materials in projects (Misra and Mohanty, 2021). Despite the efforts to launch training programs and government actions, the deficit can be filled only with the help of multilateral approaches. Research shows that the structure of the UK's VET system is still less developed compared to countries with more advanced system highlighting the potential for needing to improve the cooperation between employers and educational establishments (Maqbool et al., 2024). The education of digital skills and automation will be critical in the future to address the problem of workforce scarcity and the sustainability of the construction industry.x

2.3.4 Technological Advancements and Barriers to Adoption

Technological development has been experienced in the construction industry especially in the construction of dwelling houses through such innovations as BIM, digital twins, automation, among others (Sanboskani, El Asmar and Azar, 2022). BIM has become a leading innovation in the construction project management discipline. Stated as electronically modeled illustration of the characteristics and utilization of a building, BIM improves on collaboration, design information precision and construction process (Alabid et al., 2022). In the context of residential construction, those involved in the sector view BIM as a tool that can save cost, time and prevent mistakes in plans that are aimed at general improvement of the constructed structures with the help of richer and more efficient data sets. Garba et al., (2024), established that BIM fosters the coordination of various players in a project whether in the design, construction, and maintenance stage by allowing them to see different aspects of a building at once, thereby reducing the costs and duplicate time caused by misunderstanding and mistakes.

The use of BIM in residential projects has also expanded to the implementation of Virtual and Augmented Reality (VR/AR) which enable the simulation of estates in areas such as housing.

It has also been advantageous for architects and would be users or homeowners as there is realization of the final work and their relationship in spatial geometries (Karimi et al., 2021). From the analysis, there is an implication that creating awareness when there is a project, every construction mistakes and missing factors can be pointed before the construction is conducted hence the need to visualize it. Furthermore, BIM aligns well with sustainability strategies as the necessary energy estimations can be conducted to predict the performance of the buildings depending on the conditions of the environment (McAllister and Nase, 2023). This integration of sustainability features is particularly relevant to the UK housing stock, which is now a focus of reducing carbon emissions and enhancing the energy performance of residential buildings (Karimi et al., 2021).

Another progressive development in the field of residential construction is digital twins, which are digital replicas of an asset, system, or process. Digital twins are therefore dynamic models of a building that are used for real time monitoring of the performance, maintenance, energy consumption and life cycle characteristics (van Oorschot, Halman and Hofman, 2021). In the case of generic application to residential buildings, it is apparent that the current idea of digital twins as a system capable of updating according to the performance of an actual building is suitable in enhancing the post-construction phase. For example, sensors placed in houses and residences can monitor energy consumption, temperature, humidity, and people presence, which is helpful for homeowners and property managers. However, although the technology has huge potential, it has not seen widespread use in residential projects at the moment (Lamb and Elmes, 2024).

Reasons for its application have also been emerging in constructing residential buildings, such as robotic construction and precast units. The use of autonomous machines to lay bricks or weld rods and beams is known as robotic construction and it promises to enhance productivity, cut costs and safety (Karimi et al., 2021). Offsite construction which involves pre-fabricated modules that are constructed in factories and then installed at the construction site has its advantages that include; This trend in residential buildings is set to progress with improvement in technology to address issues like crew scarcity and need for quicker construction (Lamb and Elmes, 2024).

2.3.5 Barriers to Adopting Digital Solutions

However, there are challenges surrounding the use of BIM, digital twins, and automation in the construction of housing facilities as follows. Construction is considered as one of the industries that are slow in adopting new technologies; this can be attributed to among others factors such as the high costs of implementing technologies,construction complexity, and fragmented project delivery system. Another challenge regarding the management of digital solutions is that to implement them there is often a need for a high initial investment. As pointed out by Goodchild, (2021), it is expensive initially to adopt BIM and other advanced tools in the working processes due to its high costs of acquisition especially by construction firms undertaking residential projects

with small profit margins. This clearly explains why small contractors would not be keen on adopting a new form of technology in their construction projects seeing that they would require additional hardware, software and training in the beginning before the recoup their cash outlay through service delivery.

Furthermore, there is also a shortage of skilled human resource capable of utilizing digital enablers such as BIM. As stated by van Oorschot et al., (2021), all the above categories of construction industry workers are still operating using traditionally conventional ways without advanced skills. However, the advanced technologies need training and upskilling, the processes that are lengthy and expensive. Moreover, lack of willingness to innovate is also attributable to the culture within the industry since construction manufacturing has been traditionally done in a standard conventional manner, which may e regarded as easier and more effective. According to Sanboskani, El Asmar and Azar, (2022), this has hampered the adoption of these advances because most construction professionals regard the said tools as too cumbersome and time-consuming to be efficiently incorporated into their work. A problem with implementing digital solutions is that different digital settings are heterogeneous and cannot easily communicate with each other. The authors Salameh et al., (2021), noted that BIM and digital twin has a high degree of complexity and limited standards for sharing and integrating of data. In a residential construction this could lead to such problems as compatibility since different technologies and systems cannot easily be integrated easily. This is due to the fact that the type of industries involve various parties at different stages of the project development life cycle when it comes to adoption of these technologies.

Legal and regulatory factors are also used and this has led to slow progress in the adoption of the digital solutions. Building construction projects involve strict guidelines that are applicable in the construction of different structures especially in the United Kingdom. Such regulation fails to grow as rapidly as new technology and presents the user with legal ambiguity surrounding the use of digital tools. Schibline, (2021), noted that most of the respondents agreed that there is the absence of implementing guidelines for the use of BIM and all the other digital tools for construction in residential projects thus recommending that there is that is still some resistance towards adopting these innovations especially in small construction projects.

Therefore, general uses of such technologies as BIM, digital twins in construction may be rather useful at large construction projects but their positive impact might not be as apparent in the residential construction context. In the same study, Garba et al., (2024), established that though most organizations involved in construction projects had adopted BIM, it was commonly used in infrastructural as well as commercial projects but not much in residential projects because of the belief that it was complicated and the projects involved were relatively small ones (Lamb and Elmes, 2024).

They explained that other housing developers and construction firms do not use these efficient tools and materials since primitive techniques are appropriate for homes (Garba et al.,

2024). This is one of the key areas where the perceived value of digital solutions remains low, which is why the residential sector has not been very active in the implementation of such systems. Since the early 21st century, some of the large-scale construction projects to build residential accommodation in the United Kingdom have taken longer than planned to complete, cost more than planned, and simply failed (Karimi et al., 2021). Such failures do not only exemplify some of the works of a project manager but rather explain why these issues occur and the things that could be done to prevent them. This is important in enhancing the understanding of the deficiencies in residential project management and what may have led to their failure so as to prepare for better practices in next project.

The project faced a lot of challenges more especially in the area of procurement and management of construction materials, cost overrun and safety measures. From the report of the Public Inquiry into the Grenfell Tower fire (2019), it was found that the causes of delay included poor communication, inadequate planning, and lack of responsibility among the contractors and the managers. Analysing each of these factors the initial money that was allocated for the project was at £8.6 million but it grew vastly through out the implementation phase; things such as safety and compliance aspect were not given the deserved attention to be trimmed down to enhance on the costs (Short and Bassett, 2021). This project underscores the importance of project oversight and risks associated with cost cutting especially in construction projects touching on safety and legal requirements.

For instance, the Barking Riverside – a large scale of residential regeneration project in East London also recognised coordination gaps among different contractors alongside inadequate project integration and suffered from time and cost overruns (Alabid, Bennadji and Seddiki, 2022). As reported by Construction Leadership Council in 2020, the management of subcontractors, the absence of proper communication channels as some of the main causes of delays. The expected end of the construction was initially planned for the year 2020, but up to 2023, the construction is still ongoing. However, accommodating these changes has posed some challenges, hence the spiraling costs are estimated to be 25% above the original budget largely due to mismanagement and planning permission delays. The project is a classic of how large, multi-phased, multifamily construction projects can turn sour when there are miscommunication and mismanagement of expectations between key stakeholders (Short and Bassett, 2021).

Similarly, the Leeds Victoria Gate residential, which was projected to be valued at £100 million faced major problems of increased capital cost during the construction phase. In a case study by Garba et al., (2024), the project was lengthy because of the design problems in the early stage and procurement challenges. It was planned as a residential and commercial complex but the problem of finding suitable tenants for the commercial sections changed the budget considerations. This example shows how critical adequate pre- construction feasibility assessment is in order to reduce risks of gross underestimations of tackling through accurate market research and evaluation of inherent risks, in particular during the designing and pre-construction phases of residential developments(Alabid, Bennadji and Seddiki, 2022).

The problems faced in such failures have helped in understanding future project management strategies, risk analysis approach, and cooperation with stakeholders. First of all, it must be noted that communication with all the involved parties must be clear and consistent. As identified by Karimi et al., (2021), one of the major reasons that often lead to delays and cost overruns in a construction project is due to the lack of proper communication between the contractor, subcontractor, and client. They further point out that inadequate communication and organizational transparency leads to misunderstanding, decision making delay and ineffective use of resources. Some of the best practice that have been found through these studies include the conduct of progress meetings and the use of collaborative tools that allow for communication between all stakeholders in the project (McAllister and Nase, 2023).

The other valuable lesson that can be learned from the above cases is on risk management. The Grenfell Tower is a good example that illustrates the risks of ignoring risk assessments, especially those concerning safety and fire hazards. In his successful article McAllister and Nase, (2023), underlined the importance of risk management plan in any Project where the risks involve financial, project safety, and environment and regulatory other risks. Project managers often write that risk management should be continued throughout the project and there needs to be contingency plans in case of problematic events. As such, Salameh et al., (2021), underscore that lean construction management systems are good practice as they reduce waste and enhance the efficiency of the construction plan and the management of risks. Thus, by employing these approaches, one is in a better position to avert some of the most frequently encountered problems, which are time and money overruns within the projects.

Moreover, case studies have pointed out the importance of adequate planning at the initial phases of a project. For example, in the Barking Riverside development, there was no conducive contractor coordination and there were no proper synchronization of the timelines, hence leading to extra time and money usage (Schibline, 2021). Such challenges can only be avoided by having sound and clear project definition and objectives, planning, scheduling of activities, and establishing a proper timeline and expectations with the stakeholders. According to Garba et al., (2024), the application of contemporary tools, including BIM, enhances a more realistic depiction of project schedules and resource allocation, and may help to monitor potential constraints before they worsen.

Thus, cost overruns can be attributed to poor cost estimating and control of sources of funds and expenses. The Leeds Victoria Gate is one such example where the importance of reasonable and correct identification of the probable costs and the prior financial strategies were distorted, and hence a new statement of estimate was made. Therefore, Miller and Lessard (2020) propose that project managers should incorporate better analytics to construct a more viable cost estimate for the project and to recognize the numerous approaches to a realistic cost estimator, which involve showing the financial exposure of the project. This comprises frequent updates on cost estimates throughout the course of the project, and not just initial estimates that can easily be outdone when the actual project advances.

The challenges stem from factors such as the ever-changing regulatory environment, concerns for the physical environment as well as changes in certain industry dynamics that affect the operations of business entities (Mazher et al., 2022). This literature review encompasses eight peer-reviewed journal articles published during this period as well as direct and indirect citation to discuss the complex challenges in the projects spearheaded by these managers. The disasters occurring in Türkiye like the Grenfell Tower in UK 2017 has posed more safety requirements that greatly affected the project end time. Oyekunle, Abbey and Ibeh (2024) also mentioned that the newly developed Building Safety Regulator has been congested leading to delays in the approval of new high-rise residential structures. The report shows that majority of the properties take more than 30 days to receive approvals and majority of the applications are sent back due to mistakes, which slows down projects significantly (Mazher et al., 2022).

It has also been found out that the planning system of the UK is one of the major hurdles towards efficient project management. In the article by Arogundade, Dulaimi, and Ajayi 2023, the authors present that due to negative attitudes towards growth among planning authorities, there are various delays and barriers to housing development, but there is government support. Most of these sources give instances where environmental issues and regulatory gamesmanship have led to project delays, hence the call for effective and business-friendly planning systems (Mazher et al., 2022). The public works managing budget has always been a complex factor in managing residential construction projects. The survey of Shah, Bhatti, and Ahmed (2023) showed that some of these problems include structural and material increases leading to an increase in the cost and thus extending the construction period. As critical success factors they stress detailed pre-planning and specification of all requirements to avoid an increase in these costs.

The COVID-19 pandemic has brought significant disruptions to managing projects in the construction industry (Șavga et al., 2024). According to Salameh (2025), some of the consequences of the pandemic have been the disruptions in labor force, supply chain problems, issues to health and safety, which have affected on project delivery and its cost. From the study, flexibility in managing projects appears as an important strategy to manage for the problems arising from the above global calamities. Due to the nature of the construction industry, flexibility has been considered through the application of Agile Project Management (APM). According to Kineber et al. (2024), competitive considerations for the successful application of APM in Sustainable Residential Construction are as follows: This research points to the ideas that flexibility of the requirements, tighter integration between project teams, and increased engagement of the stakeholders are critical for the achievement of APM benefits and better end results of projects (Qazi and Dikmen, 2021).

Environmental factors are now very vital factors to consider in any project. Arogundade et al. (2023) examined carbon reduction in construction processes and has shown that there are key challenges like resource short in and policy constraints, lack of awareness, among others. This indicates that effort from all the key stakeholders is needed in the formulation of realistic measures to deal with the barriers that hinder ways of minimizing carbon amongst construction projects. The

change of working hours from home has made a tendency to transform office spaces into residential ones. Though this serves a noble objective of meeting housing deficits, it comes with challenges particularly, on the quality as well as the regulatory requirements of a residential area. There are issues with the amount of natural light and structural suitability for conversion that have been raised in such research, pointing to the need to follow standards and restrictions in creating new residential units out of such spaces (Ferede et al., 2021).

The problem of reaching the government set housing goals has been compounded by administrative hindrances and legal requirements for planning. The studies suggest that there are significant delays to risky development approvals: some projects are grounded indefinitely by regulation (Qazi and Dikmen, 2021). This scenario gives credence to the need to Prioritize government projects and improve the authorities and procedures with the aim of enhancing efficiency in executing projects to help meet housing needs. These are some of the challenges that must be overcome through the adoption of flexible methodologies like Agile Project Management and responding to the pressures of environmental sustainability. Research has also shown that integrated actions between stakeholders and reduced bureaucracy can improve project performances and better approximate the demands of the residential construction market (Șavga et al., 2024).

2.4 Project Management in Residential and Commercial Buildings

2.4.1 Key Principles of Project Management in Construction (700 words)

The project management of construction can be simply defined as the process of planning and overseeing a building project from its initiation to completion where the overarching goals involve timely delivery within the set quality standards (Karimi et al., 2021). Project management in construction is based on several principles that are aimed at increasing the chances of a successful outcome of the project during planning and executing procedures. These principles are generally known as scope, time, cost and quality also known as the “Iron triangle” or “project management triangle” according to Lamb and Elmes, (2024). It is a fact that each of these aspects is critical and has to be managed properly in order to meet the goals of the project where the main focus of a project manager is to ensure that all elements are correctly coordinated to deliver a successful project. These concepts are interrelated and are interconnected and require constant scrutiny and fine-tuning throughout the project life-cycle.

Scope management addresses the issues of identifying what is and what is not included in the project. As noted by Salameh et al., (2021), the act of defining scope early on minimizes instances of scope creep, which are characteristic of construction projects. It refers to the uncontrolled expansion of the size or work required of the project or its deliverables or an evolving definition of its objectives without a corresponding adjustment to the time and resources available for completion. Scope management is crucial to failure when it comes to fulfilling the outlined goals and objectives of a given project. The fact that the project manager was in a position to

clearly identify goals and objectives for the project and also develop its specifications and relay these to the stakeholders considerably helps in eliminating the likelihood of scope creep as well as increasing the chances of a successful project (Basarir-Ozel, Nasir and Turker, 2023).

Another essential factor in project management is the management of time which relates to how the project should be done, when it should be done and when it needs to be completed. Construction projects are time-sensitive, and any delays could lead to increased project costs and a company's loss of reputation. In this regard, the project managers incorporate fundamental methods such as the critical path method (CPM) and the program evaluation and review technique (PERT) to schedule works and resources (Lamb and Elmes, 2024). From Lamb and Elmes, (2024), it is noted that the management of time in construction projects entails the assessment of the respective construction project needs and potential hitches that can lead to time wastage. It is important when doing a project to ensure that one identifies the time limits and the overall amount of resources in order to avoid clashes of time and inadequate resource misuse (Salameh et al., 2021).

Control of cost in construction pertains to the way by which expenditures in a given project can be effectively monitored. As cited in Goodchild, (2021), costing is of considerable concern in construction projects because the biggest problem is to control cost. Some of implementing cost control measures are estimating the costs, controlling the expenditures, and monitoring the budgets. It implies planning for the costs, establishing cost control and measuring of the actual costs against the projected cost. Using Earned Value Management (EVM) therefore, is useful to the project manager in that it deals with both cost and schedule at once (Cioffi et al., 2016). For example, in a research by Schibline, (2021), they found that it is possible to reduce cost overruns in construction projects by developing better cost estimate projection coupled with cost control technologies.

2.4.2 Role of Project Managers in Ensuring Project Success

Project managers are the most important individuals who control the four basic principles of project, namely; scope, time, cost and quality. They are involved in many ways that include organization, communication, management, and decision-making. As noted by Schibline, (2021), the initiative's success or failure always falls unto the project manager, thus his/her responsibility of managing these four aspects. Some observed qualities include problem solving, management of stakeholders, risk management, and negotiation among other skills of effective project managers. A significant component of every project manager's role is managing the stakeholders. Construction projects are carried out by a number of participants known as stakeholders who include, the clients, contractors, the sub contractors, the suppliers, the government and the locals. Karimi et al., (2021), affirms that lack of communication between stakeholders can cause such issues as confusion, time delay, and increased cost. Thus, the role of the project manager involves influencing stakeholders to achieve and to ensure that they receive the desired outcome throughout

the project life cycle. Integrated communication and decision-making process is important to achieve the objectives of construction enhancement projects (Short and Bassett, 2021).

In addition to that, project managers have to also deal with risks that may act as the hindrances to successful completion of the project. For construction projects, which are always surrounded by uncertainties; uncertainties such as availability ofraw materials, labor strikes, or even adverse weather conditions, risk management as put by Alabid, Bennadji and Seddiki, (2022), is a critical component of construction project management. Risk management entails the process of evaluating and controlling risks that threaten achievement of a business goals. Managers also use tools like risk registers and matrices with an aim of rating risks depending on the level of probability and its implications to the project. Therefore, project managers can cut the probabilities of delay in the accomplishment of the project effectively if they consider the risks that might occur early enough.

Another key factor injected to project success is the ability of the project manager to direct and inspire the project team. In this respect, Garba et al., (2024), clearly points that leadership is a critical success factor within construction projects mainly because it influencing the performance of the teams and ensuring that tasks are accomplished as planned. Managers also have to be decisive and explain to their subordinates what they expect from them as well as ensure that they set achievable goals and objectives. They also guide the members in conflict situations either within the team or with outside parties. Therefore, leadership and conflict solving ability of the project managers are some of the factors that could be useful for a given project (Schibline, 2021).

Therefore, it can be concluded that the four principles of scope, time, cost and quality are the fundamental pillars of project management within construction(Short and Bassett, 2021). In doing this, managers juggle between these elements while at the same time factor in the risks, stakeholders and the team. The project manager is the most significant figure in a project since their leadership, communication, and decision-making affect the project greatly (Sanboskani, El Asmar and Azar, 2022). The effective management of construction projects is becoming more challenging due to advances in technology and amplification of the construction industry projects; this makes the position of project manager significant for its indispensable responsibility of overseeing the delivery of projects on scheduled time and within the estimated cost and to the recommended standards.

These changes stem from factors such as the ever-changing regulatory environment, concerns for the physical environment as well as changes in certain industry dynamics that affect the operations of business entities. The disasters occurring in Türkiye like the Grenfell Tower in UK 2017 has posed more safety requirements that greatly affected the project end time. Bondarenko et al., (2021), also mentioned that the newly developed Building Safety Regulator has been congested leading to delays in the approval of new high-rise residential structures. The study reveals that less than 20% of properties get approved on time, while many applications are rejected for a few reasons, which makes development projects stall.

It has also been found out that the planning system of the UK is one of the major hurdles towards efficient project management. Salama, (2021), highlighted that there are several delays and challenges emanating from anti-growth sentiments within the planning authorities, albeit the support of the Nigerian government on housing development. The sources that have been used in the study offer instances where environmental concerns and regulatory posturing have caused project stoppages, thus underlining the need for a leaner and efficiency-oriented planning system (Macek and Vitásek, 2024).

The public works managing budget has always been a complex factor in managing residential construction projects. The survey by Gloria et al., (2024), showed that some of these problems include structural and material increases leading to an increase in the cost and thus extending the construction period. The financial risks associated with this approach are summarized at the beginning of the study and elaborate pre-planning and specification are advocated for addressing these risks (Papachristos et al., 2020). The study investigates how the COVID-19 crisis has impacted the practicing project managers and the project delivery of construction projects. As found by Rodrigues et al., (2023), the pandemic has caused labor shortages, disrupted supply chain, and new health and safety concerns resulting to extended time and costly impacts on the projects. From the study, flexibility in managing projects emerges as an important strategy to manage for the problems arising from the above global calamities (Roodsari et al., 2023).

As a result of these changes within the construction industry, the use of Agile Project Management (APM) approaches has been considered. Chenya et al., (2022), reveal that there are several key success factors in applying APM in sustainable residential construction projects. The study reveals that integration of change as a plan with other system elements, improved cooperation between project teams and increased involvement of the stakeholders is crucial to realise benefits of APM that would result in better project performance (Grakhov et al., 2021). Environmental factors remain one of the sharp tools that have gained much attention in the management of projects. Abd-Elazeem et al., (2023), examined carbon reduction in construction processes and has shown that there are key challenges like resource short in and policy constraints, lack of awareness, among others. According to the study, the reduction of these barriers calls for multi-disciplinary initiatives in formulating practical approaches that can curb the emission of carbon in the construction projects (Špak et al., 2023).

The change of working from home has made a tendency to transform office spaces into residential ones (Chenya et al., 2022). As this also led to housing provision to individuals, this has some challenges to deliver quality and ensure that the structures meet the requirements of residential units. Literature reviews identified issues on natural light and structural adaptability in such conversions while underlining the importance of properly following building regulations to ensure the new residential spaces are habitable (Abd-Elazeem et al., 2023). The challenge of reaching the government set housing goals has been compounded by administrative hindrances and legal requirements for planning (Simon and Reicher, 2024). The studies suggest that there are significant delays to risky development approvals: some projects are grounded indefinitely by

regulation. This situation calls for a much clearer focus of the government and simplified bureaucracies to help defeat projects and quell the rampant need for housing. Business regulation, planning system issues, prohibitive costs, and the influence of the COVID19 pandemic have made it challenging to manage projects. To overcome these challenges, it is necessary to apply strategies like the use of Agile Project Management methodologies or addressing pressures on environmental sustainability (Papachristos et al., 2020). Research has also shown that integrated actions between stakeholders and reduced bureaucracy can improve project performance and better approximate the demands of the residential construction market.

2.4.3 Regulatory and Legal Frameworks in Residential and Commercial Buildings

The regulatory policies that may impact residential and commercial construction in the United Kingdom revolve around the permission system, zonal ordinances, and building regulations (Hou and Wu, 2021). These aims are aimed at making sure that the construction projects dovetail with existing urban setting, safety requirements, and environmental impacts. The legal regulation of the partitioning and zoning of land in the United Kingdom is governed by the Town and Country Planning Act (1990) and subsequent legislation that includes the National Planning Policy Framework (NPPF). These laws determine how land can be employed such as prohibiting some areas for residential, commercial, or a mixture of both to enhance the functionality and efficiency of cities (Franco, Pawar and Wu, 2021).

The Building Regulations 2010 set standards for constructing buildings and are usually enacted through specifics like fire, structure, access, and energy. It is evident from the existing literature that adherence to the required building codes greatly minimizes structural collapses and enhances occupants' safety (Tanir and Mete, 2022). For example, Gann and Barlow's (2021) comparative study on UK and European Building Regulation revealed that the UK's PS option offers more flexibility in construction compared to the predetermined solution but also ensures safety standards are met. However, other scholars such as Shepherd, (2021), claimed that variance in enforcement at the local authority level can make provisions for regulatory gaps Which mainly arises in the residential sector where self-certification is practiced.

This policy significantly affects feasibility studies for both residential and commercial projects through regulation of the land and density. While the UK has quite a different approach from the American system throughout this study, the UK has a discretionary planning zone system whereby different new development can be approved based on each case that is presented (Tanir and Mete, 2022). Another explanation for this problem provided by Shibuya and Chen, (2021), implies that flexible land use promotes innovative urban development but results in higher levels of project risk and duration. While residential construction projects usually entail concerns about green belt limitations of homemaker and limitations concerning the provision of affordable houses, demonstration projects are likely to be more concerned with transport infrastructure and economic ordinances (Abbas and Ali, 2023).

Some previous works have also looked into the effects of regulatory changes in the construction sector. Olasunkanmi, Ikediashi and Ajiero, (2024), stated that the tragic Grenfell Tower fire prompted new fire safety measures in the UK through the Building Safety Act 2022 that particularly affected high-rise residential buildings. According to Górecki et al., (2022), even though these reforms raise safety, they lead to high cost and longer duration especially to small scale contractors. It is for such reasons that tighter regulation has fostered industry-wide implementation of digital compliance solutions, including the application of Building Information Modelling (BIM) to enhance regulatory compliance (Li et al., 2021).

Safety and health and environmental standards are fundamental in the construction of residential and commercial buildings to protect the workers and the environment. The Health and Safety at Work Act 1974 is still the foundation of the UK workplace safety supported by the CDM Regulations 2015. Oswald et al., (2022), suggest that, the implementation of CDM regulations is a proven way of preventing workplace injuries and fatalities in the construction business. Their studies showed that project contingents who underwent early risk appraisal in addition to safety education had on average of 30% less accidents at the workplace. This is because commercial projects entail large-scale development and implementation hence call for high OHS standards. According to Haslam et al. (2020), large commercial construction involves more stringent precaution measures than housing projects because of corporate negligence arguments. Nevertheless, residents firstly face challenges with compliance in their buildings, mainly self-builds and small scale development projects which increases the accident rates (De Lotto et al., 2022).

They have become an even more significant factor in project management in the previous decades (Farr, 2021). The UK's legislation guiding the management of the environmental impacts of construction projects includes The Environmental Protection Act of 1990 followed by other acts that were later passed including the Act on Sustainable Waste Management, and the Act on Control of Pollution. In a longitudinal study conducted by Ansari et al., (2024), it was discovered that the enhancement of compliance with EIAs in the cases of commercial projects has benefited the environment while at the same time resulting in longer duration of approval of projects. In contrast, home-construction projects with significantly less regulations mean that there is poor compliance with sustainable construction principles. The conducting of research for the monitoring of environment through the use of digital tools has also been emphasized in current studies. In their study, Ansari et al., (2024), noted that only 25% of carbon emissions were used through the implementation of Digital Twin technology as against the conventional method of monitoring and assessment. From these observations, it can be inferred that there will be a rise in the incorporation of digital technologies in the regulatory frameworks for compliance purposes.

2.4.4 Sustainability and Green Building Standards

The consideration of sustainability in construction has become increasingly important over the years because of concerns on the environment as well as urgent compulsory policies put in place. Sustainable construction practices involve the change of the design strategies for civil structures with a view of cutting down on carbon emissions, increasing energy uses while minimizing wastage resources as well. According to Oyewobi, (2024), although sustainable construction is environmentally friendly, it is equally cost effective in the long run since low energy consumption in construction projects saves costs. The UK has long targeted net-zero carbon emissions by 2050, which has spurred a set of policies to make construction more sustainable, notably the Future Homes Standard (Górecki et al., 2022).

According to Sankar and Anandh, (2024), life-cycle assessment or LCA remains critical in determining sustainability outcomes of constructions. According to the conclusions made by the authors of this piece, it proved that LCA when applied at the conceptual stage minimizes life cycle impact. However, high initial costs and uncertainty regarding adequate indicators of sustainability prevent its widespread use, especially in residential buildings (Reis et al., 2021). Rating tools in green building practices include BREEAM and LEED that act as guidelines for evaluating construction projects on sustainability. BREEAM which originated in the United Kingdom has been acknowledged as a standard for sustainable construction. For instance, Smith, (2021), stated that constructed and accredited BREEAM buildings use 30% less energy than non-accredited structures.

LEED is a green building rating system which has gained international popularity due to focusing on such aspects as water efficiency, use of sustainable materials, and indoor environment quality. Yielding from the studies by Franco, Pawar and Wu, (2021), BREEAM offers a detailed compliance-structure while LEED is more adaptable and permits the selection of development criteria based on the desired sustainability. However, in the UK, BREEAM continues to be the most preferable one primarily because it complies with regulations present in the country. Ahmed et al., (2022), in their study of BREEAM, and LEED certifications also suggest that the scores necessitate a steep upfront cost, which gradually dissuaded small-scale residential developers from applying for certification. Also, further, another research by Shepherd, (2021), pointed out that energy performance of built BREEAM certified buildings are better in the UK, but there was the analysis of perceived performance gap between building energy standard stated and as built or measured energy performances because occupants' behavior and maintenance plays an influential role.

To overcome these challenges, new research proposes the use of digital technology in relation to green certification systems. Tanir and Mete, (2022), explain how the application of AI technology in energy modeling leads to improved accuracy of sustainability evaluation and eradication of the difference between anticipated and actual performance. In general, the issues of regulation and sustainability in the design and construction of residential and commercial buildings remain dynamic due to new emerging problems. But at the same time, safety, quality along with

sustainability regulations lead to certain financial and operational issues which demand certain flexibility in project management. Future studies should examine how AI and other technologies such as Digital Twins can be leveraged to improve regulatory compliance, and sustainability within construction.

2.5 Leadership Skills, Team Building, Planning, and Control in Residential and Commercial Buildings

Construction industry entails the construction of both domestic and commercial buildings which require different approaches in leadership, staffing, scheduling, and especially controlling. Along the same note, it is undeniable that leadership plays a significant role towards the achievement of various construction projects. Zharkov, (2023), mention that leadership skills including team management, problem solving, prioritization, planning, decision making, conflict solving, communication and nurturing the spirit of teamwork are essential in the construction industry of Yemen. According to them, their findings provide evidence that these kinds of skills are related to the success of projects, and therefore, leadership development should improve projects. For instance, Bondarenko et al., (2021), seeks to establish the effect of transformational leadership on team processes within the Nigerian construction industry. The result of the study also shows a significant relationship between transformational leadership and team dynamics, and moreover, changes in the team members functioned as a mediator of this positive relationship. This indicates that leadership and motivation have the potential to bring performance enhancement in construction projects that exhibit characteristics of complexity (Soh et al., 2023).

Team building can therefore be defined as the process of having a set of qualities which are required to ensure that any team attains its set goals and objectives. Gloria et al., (2024), examine the influence of leadership styles in the construction industry of Pakistan regarding team performance. From their studies, they infer that leadership is positively correlated with the performance levels evident in the cognitive ability of the team and emphasize using accurate leadership strategies to improve team relations. Moreover, Dipakbhai et al., (2024), mentioned the important leadership dimensions and tasks for team management in the construction project. They stress that the delegation, clear goals, proper communication, and sufficient trust are mandatory for effective team performance, which in turn affects the project outcomes (Zoltán and Tamás, 2020).

Leadership also applies significantly in the management of construction projects as it determines the outcomes of the projects through decision making, coordination with the stakeholders and motivation of the crews. Several leadership approaches have been adopted by researchers in the construction management field; the most popular of these are the transformational and the transactional leadership styles (Ahmed et al., 2022). Transformative

leadership that focuses on vision, communication and change has being practiced and researched extensively in construction projects. Olasunkanmi, Ikediashi and Ajiero, (2024), proves that transformational leaders improve the results of projects and processes in the entire organization by making the team members unified, supporting innovation, and engaging the employees at the highest possible level. In construction environments characterised by uncertainties and other issues of project complexity, transformational leadership creates the capacity to innovate and to cope with change (De Lotto et al., 2022).

On the other hand, transactional leadership addresses structural activities, defined work outcomes and performance, as well as reward-punishment of subordinate. This approach is especially useful in construction management to ensure and check on the observation of safety measures, contracted time and scope of project work, and adherence to set standards and costs of the project. In a study by Shibuya and Chen, (2021), it was revealed that transactional leadership is dominant in commercial construction projects due to the need to adhere to deadline and contractual requirements. However, the study also identifies some limitations of favouring transactional leadership, summarizing that this type might be less suitable where great changes and risks are involved. The last important theoretical perspective in construction project management is situational leadership, developed by Hersey and Blanchard in 1977. This approach implies that a person must learn to act as he is in a different capacity since he is managing different levels of employees. According to Oyewobi, (2024), situational leadership is most suitable for LSBP since the projects involve several individuals with different experience and qualification levels. For instance, it may be appropriate for experienced employees be lead in a more delegative manner than for the new ones to be led in a more directive manner. More so in residential constructions where teams are often small and comprise close-knit workers, a participative situational leadership approach enhances team cohesiveness and productivity or efficiency as denoted by (Li et al., 2021). It is generally believed that no leadership style is perfect for every situation, but the application of the best features of transformational, transactional, and situational leadership produces the best results in construction project management. Visions and goals in construction undertaking, when supported by proper planning and control, work hand in hand in delivering improved project standards, reduction of risks and promotion of proper working cultures among the construction managers.

2.5.1 Team Dynamics and Effective Team Building

Organizational culture plays a key role in determining construction projects outcomes because it facilitates the interaction within a team. Previous studies on construction management have persistently indicated the need for effective teamwork when it comes to avoiding time and cost overruns in construction projects (Shepherd, 2021). There are some essential concepts that have to be put in place to achieve team work specially in construction that include; According to the research made by Kineber et al., (2023), the key components of successful small teams include trust, common goals, and commitment.

Group communication is fully important in organization function especially for those involve many parties. Li et al., (2021), involving the examination of studies concerning causes of project failures within residential and commercial constructions acknowledged lack of communication as a paramount concern. The study shows that digital communication tools like BIM assist in enhancing information exchange and thereby minimising clashes between team participants. The study also found that while the technological tools should be enhanced, interpersonal communication skills should also be enhanced as construction projects entail making decisions on site and solving problems as they arise (Goubran et al., 2023).

Another important element of team management is conflict solutions. Refuse is a common component of construction projects due to the nature of this professional field that entails the collaboration of many professionals who at times have different temperaments, past experiences, backgrounds, and expectations (Shepherd, 2021). Research indicates that students could be taught to manage conflict before it emerges and escalate to the next level, either through mediation or through negotiation (Smith, 2021). The research study conducted by Thomas et al. (2008) revealed that construction teams which engaged formal conflict handling system like the Dispute Review Boards or Decision Making Forums had better organizational success as compared to samples resorting to antagonistic practices.

According to Kineber et al., (2023), direct dealing approach has been realized to be effective in the residential construction projects where the teams are relatively quite small and clustered. On the other hand, large construction projects that may involve many contractors and subcontractors need structures that will ensure that, in case of a dispute, there will not be significant delays with regards to the project's scheduled time and contractual agreements (Farr, 2021). In synthesis, the literature shows that teamwork on construction projects is only attainable through enhanced communication, formation of organizational trust and proper conflict management. As it was discussed in previous sections, it is recommended for the future studies to look into the potential of introducing new technologies such as AI assisted communication tools into managing construction project teams.

2.6 Project Planning and Scheduling Techniques

Time is a critical resource in construction projects, and scheduling and planning are crucial aspects that need to be addressed to achieve project goals (Farr, 2021). Different methods like Gantt charts, Critical Path Method or CPM and Program Evaluation and Review Technique or PERT have been designed for the specific purpose of project scheduling. Gantt charts have been used frequently in construction management to show the different project schedules, the sequences of the tasks involved with the examples and the time-table for the whole process. There is also the flow chart technique which was developed by Henry Gantt in the early 20th century and has since then been widely adopted within construction projects due to its simplicity and ease in its presentation. Tanir and Mete, (2022), suggests that Gantt charts are useful in progress tracking and

pattern identification because they have a depiction of the project task timeline and duration. However, the research by Kineber et al., (2023), has established that the use of Gantt charts remains elusive in large and intricate projects that have more interacting activities than static ones whereby other forms of scheduling are useful.

Another advance on this planning technique is the Critical Path Method (CPM), it shall identify the series of dependent activities in relation to the project and arrive at the shortest possible time it shall take to complete the project. CPM was developed by Kelley and Walker in the 1950s and has been widely used in construction projects to reduce the occurrence of delays. According to Kineber et al., (2023), CPM is mostly applied in extensive construction projects because it provides information on how resources should be employed effectively and where attention should be paid to promptly complete essential activities. In addition, Lawal and Rafsanjani, (2022), have also indicated that the combination of CPM with other tools like BIM increases the efficiency in planning the project thereby minimizing incidences of delayed schedules.

Another type of commonly used technique is the Program Evaluation and Review Technique (PERT), which was adopted by the U.S. Navy in the early 1950s for use in large and complex defence projects. PERT is most beneficial in construction management because it involves stochastic time estimates to factor in range of outcomes. Ahmed et al., (2022), pointed out that PERT may helpful in high-risk construction environments with large infrastructure where the time estimates contain much uncertainty. However, Reis et al., (2021), state that PERT is helpful in identifying the risks involved in a project but it always involves time estimates that may not necessarily be the real estimates as they should be cross-checked with historical data.

However, apart from the mentioned time management techniques, effective practices in time management are equally important in determining the success of any project. The best practices for dealing with stakeholders are as follows; it is best to involve the clients early and ensure to let the clients know the specific deadlines that have been set for the project and should use project tracking software. Other research by De Lotto et al., (2022), also supports the fact that effective time management helps in minimizing the impacts of risk factors hindering the optimum completion of projects like labour constraints, or weather extremities. Though, in the present research, Ekanayake and Perera, 2020 explained that artificial intelligence and machine learning has a great potential for predictive scheduling that would help in identifying delays in advance for the project managers. Scheduling is also an important element of project planning, though new momentum has shifted towards information technology in creation. According to the studies we have in the research conducted by Bryde, Broquetas, and Volm in 2013, the implementation of integrating AI Driven Predictive Analytics with CPM and PERT serve to improve the efficiency in decision making processes to enhance projects. However, certain issues like the accuracy of the data, compatibility of the software and readiness of champions among the stakeholders are some of the impediments towards the optimization of the advanced scheduling techniques (Dartey-Baah, Quartey and Adotey, 2021).

2.6.1 Project Control and Performance Monitoring

Managing performance of construction projects is crucial in making sure that the established goals of the projects are achieved. This is because through identification of KPIs, risk assessment, and risk control measures, one can be in a position to rate the progress and also address any discrepancies. Key Performance Indicators (KPIs) are useful indicators in assessing the performance of a construction project. According to Han, Love, and Peña-Mora (2013), the commonly used KPIs in construction consist of cost KPI, schedule KPI, quality KPI and safety KPI. According to Sankar and Anandh, (2024), the use of decision-support systems whereby project dashboards that are integrated with up-to-date KPI values improves decision making productivity since the project managers are put in a position to deal with issues as soon as they occur. Similarly, other works, including those of Ahmed et al., (2022), propose that linking the KPIs with the organizational goals supports the development of a performance culture within the construction teams. However, according to Shepherd, (2021), the crucial issue with KPIs is the definition and measurement of these indicators as poorly defined KPIs provide wrong results of organizational performance.

Risk management also has a significant impact on the control of construction projects. As stated by Kineber et al., (2023), construction projects are vulnerable to lots of risks ranging from financial risks, legal risks, and operational risks. Such general risk assessment tools as FMEA and RBS provide project managers with the tools for systematic identification of threats. According to Reis et al., (2021), proper management of risks effectively minimizes project cost overruns and time when in high risk such as in infrastructural large-scale projects.

According to the study by Lawal and Rafsanjani, (2022), effective risk management measures to be deployed include contracting strategy, risk contingency plan, and stakeholders' engagement. The research of Górecki et al., (2022), have also pointed out that the integration of risk management software with the project control system makes the risk information more visible and effective in the decision-making process. A paper by Smith, Merna and Jobling (2014) also focuses on the use of insurance and financial hedging as an effective way of managing risks that may be inherent in large construction projects.

Technological factors have also come in handy in control and monitoring the performance of projects. According to Becerik-Gerber and Kensek (2010) argue that the combination of different monitoring tools with BIM supports improved communication and increased building project organization. According to Olasunkanmi, Ikediashi and Ajiero, (2024), through the application of risk assessment models based on machine learning, the project managers can predict and avoid all possible risks as much as possible. However, there are some issues related to this in order to successfully implement the measures of project control. Ansari et al., (2024), also explain some of the reasons for failed implementation of digital monitoring tools including resistance to change of the technology as well as lack of adequate training for project teams. For a similar point,

KPI and risk assessment, Sankar and Anandh, (2024), opine that these models needs to be updated with project condition and factors in the market place. Therefore, project control and performance monitoring play a crucial role in any construction management project and guarantees that such projects stay on track in terms of scope, cost and time restraints. Appropriate KPIs, systematic risk assessment techniques, and the application of digital technology contribute to efficient projectmanagement and a minimal failure rate. Nevertheless, there should always be adaptation to new challenges and use of new technologies as a way of increasing efficiency and delivering the project.

Strategic planning is therefore a crucial element of most constructions' projects. Gloria et al., (2024), highlights the importance of leadership skills in the pre-construction phase of sustainable projects. According to the research, the knowledge management requirements for project managers include communication, planning and goal setting, people skills, motivation, conflict resolution, decision making, bargaining and delegation. These competencies help leaders to accomplish goals that are associated with sustainable construction endeavours. Moreover, Charkhakan and Heravi, (2019), used research for the construction sector to develop leadership practices and communication models. To this end, this framework responds to the VUCA environment characteristics, which call for leadership and communication strategies to manage projects in the unstable climate successfully (Patel et al., 2024).

Control mechanisms are important as they help eliminate instances where projects deviate from the planned schedule and budget. According to Shahi et al., (2020), this paper focuses on the measures of leadership skills in the pre-construction phase for successful sustainable construction projects. They discover that skills like conflict management are useful in control since they assist the project manager in addressing stakeholders and excluding issues that may disrupt the progress of the project. Moreover, the study by Dipakbhai et al., (2024), underscores the role of leadership in project control. From their research they come to the conclusion that best people management practices often incorporate business practices such as communication and decision-making that positively influence project completion within the required time frame and cost (Șavga et al., 2024). It can be however noted that all the core competencies mentioned are typical to both new residential construction and business constructions however the use of such capabilities also differs due to the nature of the two fields (Macek and Vitásek, 2024).

Residential construction projects on the other hand are mostly small-scale projects due to size but involve a lot of detailed work and interaction with the clients (Bondarenko et al., 2021). In this case leadership entails one-on-one interaction, accommodation, and the juggling of many small groups of people. Team building aims at improving human relations on top of the different team members to be in a position to address the numerous demands from the clients (Salama, 2021). On the other hand, commercial construction refers to the construction of business buildings, which are large and often undergo large-scale construction that requires many stakeholders and has many complex restrictions. Management in such a line of work requires involvement in analysis and planning, effective control measures, and readiness to work with numerous and

diverse teams. Such advice, transparency, collaboration, and conflict resolution skills are essential to address the challenges and synchronize the efforts for integration (Shahi et al., 2020).

In both sectors sustainability has achieved importance in companies' integrated practices. This therefore requires one to have adequate knowledge of sustainable construction and how some of these principles can be implemented into projects. From the study by Shaikh et al., (2021), it becomes evident that preparing the leaders during the pre-construction phase is essential for the success of sustainable projects hence the importance of adding professional development in the same field.

2.7 Risk and conflict management in Residential and Commercial Buildings

Risk and conflict management are crucial elements in enhancing effective project delivery on construction projects either for residential or commercial purposes. Residential construction projects are unique in their nature because they are complex, and most projects are developed to meet the client's needs and preferences, meaning that there is or can be a number of risks. Rodrigues et al., (2023), provided a systematic review and proposed valid technical risks, financial risks, and safety risks in the residential construction projects. The authors suggest that risk management should be done in advance so as to consider possible solutions for improving the likelihood of project success.

Similarly, in another study, Yan et al., (2021), further explained about the variations of risks in the construction of residential projects due to size and other factors; project risks are complex and dynamic. They put forward strategies such as risk evaluation and adaptation to continuously counter any pushbacks and expenditures over and above the estimated amounts. These issues indicate the need for flexibility and proactivity when dealing with the risks that are bound to be present in residential projects (Abd-Elazeem et al., 2023).

The need for measures that assure safety in the construction of habitat, particularly residential buildings, has been shaped by disasters like that of Grenfell Tower in 2017. As a result, the UK government brought and enhance safety standards such as fire safety measures where high-risk buildings needed to have safety measures in place (Shahi et al., 2020). However, these regulations have posed some complications, for instance, time consumption in the construction of housing and rise in costs, which should indicate the need to adopt sound measures on risk bearing with the aim of improving safety without compromising on development (Rodrigues et al., 2023). When it comes to the construction of commercial premises, larger-sized projects with considerable amounts of risk are inherent in some ways, specifically concerning license and legal aspects, financial vulnerability. This has been one of the crucial points for concern in recent times due to the steady rise in insurance premiums due to increasing cases of natural disasters. It has also been reported that the average increase in insurance premiums for commercial property since 2017 has been at a rate of 7.6% per year with some places going as high as 17% in the year 2023 (Shahi et

al., 2020). This is why risk analysis and integrating climate considerations in its assessment when projecting projects are crucial to managing such exposures (Shaikh et al., 2021).

Similarly, the construction of commercial properties that are situated in risky areas such as the flood prone areas has proved to be problematic. However, development is still conducted in such areas in response to the inherent risks, as there is conflict between the developer and the insurance industry (Abd-Elazeem et al., 2023). This creates the need to, among other things, enhance more robust risk management approaches such as stronger site evaluations and consistent compliance with recent building standards in a bid to avoid potential mishaps. Disputes in construction of residences are typically from the expectations of the end-user, alterations in the designs, and any interaction between the client and the contractor. Such challenges require proper communication and teamwork so that the best solutions can be developed. To that end, Ma, and Lu (2024) have researched the effect of the conflict mode of project managers on the resilience level, of which it is revealed that cooperative methods lead to healthy team relations. Based on their studies, they found that project management can reduce conflict and improve project performance by promoting collaboration(Chen et al., 2020).

They also raised the alarm on the poor handling of conflicts between building developers and other authoritative agencies, especially after the unfortunate incidence of the Grenfell Tower (Dipakbhai et al., 2024). Due to poor staffing and communication in the regulatory agencies there were great delays in the approval of High-rise residential buildings caused by strict safety regulations. This scenario highlights the need to adopt efficient measures in handling conflict for the purpose of enhancing efficiency in responding to the need for housing. Some of the common sources of conflict in the commercial aspect may include; contractual disagreements, stakeholder interests, and regulatory matters (Papachristos et al., 2020). This has attracted a lot of controversy between property owners and insurers on matters concerning the insurance premiums arising from climate risks. Solving these conflicts requires open communication to establish compromises that will ensure the provision of adequate amount of risk coverage while keeping the business financially sustainable (Harshavardhan et al., 2023).

Furthermore, the development of commercial structures in vulnerable regions has instigated developer-insurer regulators and local government tensions and conflicts (Gloria et al., 2024). This is because construction of houses and other developments slightly outside the flood zones to avoid restrictive codes have amplified risks, it requires the combined efforts to enforce responsible development activities and upgrade zoning codes (Abd-Elazeem et al., 2023). The risks and conflicts involved for constructions, whether for residential or commercial buildings, are significant; however, they vary depending on the type of construction. While residential projects involve direct relationships with the buyer or tenant, it entails low risks as compared to a commercial project which has legal, monetary, and environmental issues to address. For these aspects, it is necessary to develop localized methods that would respond to such differences on order to achieve effective delivery of construction projects in both sectors (Soh et al., 2023).

2.8 Risk and Conflict Management in Residential and Commercial Buildings

2.8.1 Understanding Risks in Construction Projects

Managing risk is a crucial factor in construction project undertaking since construction project activities involve risk factors that may cause variations as regards to cost, time and quality standards. Risk in construction has been classified in many ways including the financial risks, risk related to regulation, and environmental risks among others, which come with different challenges to manage (Ansari et al., 2024). Budget and funding risks are one of the most important financial risks to construction since most projects are carried out within a certain financial amount. According to De Lotto et al., (2022), the main cause of cost overruns identified in examples of large-scale projects is that estimates are often too optimistic and the main reason is the error in predicting the cost estimate or adverse site conditions. Moreover, based on the same source, Oyewobi, (2024), also identified some other external risk factors that hinder project financial stability among construction firms, including high and volatile material cost, shortage of labor force, and disputes over contracts. In another UK study, Zou et al.(2007) revealed that programme risks include fluctuations in economic capacities or interest rates as well, particularly in long term funded programmes.

Legal risks result from legal requirements of the country and international construction laws, construction safety issues and environmental factors. Reis et al., (2021), identified external factors such as building codes, zoning laws, and the safety requirements and said that they can cause construction project delay as well as cost blowouts. Li and Zou (2011) add that lack of compliance is even more difficult in the cross-country studies which pose different legal systems. In the UK, Brexit has added a new layer of challenges through regulatory changes, including disruptions in supply chains and labor shortages which have contributed to the extension of projects (De Lotto et al., 2022).

Risk is broadly defined in the context of the environment hence the continued focus to environmental risk not only in business but also in climate change and sustainability. Ayyub & McCuen (2016) asserts that construction projects act as clear so that the targets of climatic conditions such as floods, storms, and heatwaves affect work progress and lead to heightened costs. Moreover, according to Lawal and Rafsanjani, (2022), EIAs are crucial in preventing harm to the natural environment, yet they can cause the problem of project delay. Green practices have become integrated in the concepts of risk management including the utilization of green materials and energy efficient designs (De Lotto et al., 2022).

There are various risk assessment instruments that have been created for the purpose to improve decision-making process of construction project management. The Risk Breakdown Structure (RBS) offered by Li et al., (2021), made efforts towards the categorization of the risks in a systematic way as well as facilitated the identification, assessment and management of the risks that exist for a project. In this regard, Acceptable Quality Level (AQL) and Limiting Quality Level (LQ) that are outlined by Ansari et al., (2024), are useful in developing contingency

measures to counter predicted failures (Debrah, Chan and Darko, 2022). Monte Carlo simulations have more specifically been utilized in the determination of financial risks in different projects by incorporating independent probabilities that define different features of a project (El-Sayegh, 2008). On the same note, risk prediction has also been enhanced by the use of Artificial Intelligence (AI) and Machine Learning (ML) algorithms. Cheng and Teizer (2013) explain that such models identify prospective delay and budgets from past project experiences, which are useful in decision-making. However, it has been established that risk management in construction can be both quantitative and qualitative due to the following reasons. As Zou and Li agree (2010), experience and involvement of key participants can play vital roles in managing risks that are not quantifiable.

2.8.2 Conflict Management in Project Teams

Conflict can be defined as the occurrence of disagreement between one or more party with different interest, attitude and goals in construction project. With this understanding of types of conflicts, it is vital to consider efficient ways of responding to them in order to achieve the project goals and keep positive inter- and intrapersonal relationships in the team. In other studies, researchers have found out some of the factors that causes conflicts in construction projects. According to Ansari et al., (2024), change and scope are among the biggest causes of disputes because they contribute to cost and time overruns and increases. According to Lawal and Rafsanjani, (2022), lack of communication between the stakeholders leads to misunderstanding and thus conflicts, which arise over issues such as contractual issues and general inefficiency.

Another is ambiguity and misunderstanding of the terms of the contract or express contract terms which are not necessary to the making of the contract. As stated by Shepherd, (2021), open contract terms contribute to disputes regarding the deliverables, payment schedules, or liabilities. This situation is more common in PPP projects wherein financial and operational risks and responsibilities are divided across various entities (Górecki et al., 2022). Another disadvantage that affects construction projects is WRCs or Workforce-related conflicts. According to the study done by Abbas and Ali, (2023), productivity is likely to go down and or projects take longer time to complete as a result of labour disputes, cultural issues, hierarchy conflict. In today's globalization context, and increased tendency towards international construction partnerships, cross cultural communication breakdowns are more often (Reis et al., 2021).

Hence, there are a number of methods of handling construction disputes as given below. Mediation is the most popular method due to the fact that it fosters collaborative efforts in identification and resolution of issues without severing business ties. Cite as outlined by Carboni et al., (2024), mediation gives the disputing parties a forum to negotiate their solutions with the help of the third party, hence eliminating the costs as well as time consumed by legal cases. Arbitration, one of the more formal types of dispute resolution procedures, has also been researched greatly. In their paper Wu, (2022), argue that arbitration entails the making of a legally enforceable decision, yet is less combative as compared to litigation. Nevertheless, arbitration can be time waste consuming and

expensive especially in most complex matters of the disputes that involve more than two parties Hanifa et al., (2024). The ability to negotiate is still a crucial element that needs to be practiced and applied in disputes on construction sites. Wu, (2022), approach suggest both parties to seek for a solution that would be of mutual benefit. This strategy has been widely applied in construction management where Zhao et al., (2022), argued that active listening, empathy, and flexibility are keys to agreement. Conciliation, mediation, and negotiation methods differ in the resolution of conflicts as the willingness of the involved stakeholders determines the implementation of any technique (Zhao et al., 2022). A paper by Ammar et al., (2022), pointed out that while mediation and negotiation when used in tandem tend to produce the most successful outcomes in construction disputes due to their fostering of trust and understanding. However, business disputes that are grave require legal enforceability may require arbitration so as to be solved.

2.8.3 Case Studies on Risk and Conflict Resolution

Managing risks and conflict are key activities in determining what must be done in the course of executing projects in the construction industry. Previous research discusses the strategies applied to manage risks with the impact on project success or ineffective risk management that leads to failure. The case-study analysis of major construction projects permits identifying the typical positive and negative experiences in terms of risk and conflict management (Bunni and Bunni, 2022). Some construction projects, of large size and scale, have proven that risks can be managed effectively. Risk management should be carried out effectively when it is initiated at the onset of the project development process as noted by Flyvbjerg et al. (2018). The London 2012 Olympic Games present a good example when risk management was achieved effectively. Hang, (2022), notes that the key issues in the project are; cost control issues, control of logistics, and security issues. But having provided for effective risk management by incorporating such elements as risk scenario and ongoing risk evaluation, the projects were delivered on time and within budget. The use of integrated and sophisticated schedule management strategies and effective communication and management of stakeholders was instrumental in minimizing conflicts (El Khatib, Almteiri and Al Qasemi, 2021).

Another example is the Crossrail project based in the UK where even though it experienced several production delays it was in a position to manage a number of the potential financial and operational risks through risk planning and assessment processes which included the use of BIM or Building Information Modelling. Annamalaisami and Kuppuswamy, (2021), opined that BIM played a critical role in enhancing coordination with the relevant stakeholders resulting in better management of the design-related mistakes as well as decrease in costs. Contracts also foster risk-sharing between contractors and government agencies also contributed towards stabilization of project execution (Aliu et al., 2023).

On the other hand, numerous colossal construction projects have been disastrous due to fail in risk analysis and conflict management. Edinburgh Trams project one of the colossal failures of

risk management, resulting in increased cost and time overruns. As stated by Rising et al., (2022), the work faced some contractual issues between the city council and the contractors, especially in legal cases that escalated between the two sides and caused more delays to the project. The vagueness of risk management strategy and the limited intercession of the stakeholders led to numerous disruptions of the project.

The other catastrophe in the region is the Berlin Brandenburg Airport which was planned to be constructed and commissioned in 2011 was also plagued by numerous difficulties ranging from massive mismanagement and technical mishaps. Abhayawansa and Adams, (2021), noted that a number of factors which include poor risk tolerance, poor cost estimates, and redesign as a result of changes in design contributed to the financial losses of billions of euros. Furthermore, confusion of roles between contractors and the authorities where tasks overlapped also contributed to the failure of the project. According to Fatica and Panzica, (2021), BER continued experiencing challenges due to political interferences and lack of an adequate project governance system. The analysis of these case studies reveals that; structured risk management, better contracts, contracts with certain terms, and effective stakeholder engagement are some of the key factors that contributed the overall success of large construction projects.

2.8.4 Role of AI and Data Analytics in Risk Prediction

AI and data analysis have been incorporated into construction risk management to change the trends of the identification and management of risk factors. Some of the latest papers that have investigated the use of machine learning and predictive analysis in construction risk assessment include. There has been a growing concern in identifying risks in constructions with the help of Artificial Intelligence in the recent past. Hang, (2022), establish that machine learning can use data from previous construction projects to analyze risks and possibly foresee future failure. Thus, decision trees and neural networks of supervised learning have come under use in risk evaluation for cost, schedule, and safety issues. For example, Li et al. (2020) carried out a study to assess the feasibility of developing site accidents prediction model by using deep learning of site history, environmental data, and behavior of the workforce. Their study also revealed that accuracy rates of using the AI approach was above 80% in identifying high risks. Similarly, Pour et al. (2022) discussed how using sensors and drones help to prevent potential risks in the construction area and basically eliminate human error(Dao, Chen and Nguyen, 2021).

Another study by El Khatibet al., (2021), identified that there is a way on how Artificial Intelligence or AI models with techniques in Natural Language Processing or NLP can help in assessing and identifying contractual risks long before the disputes arise. It allows construction firms to advance with the appropriate legal strategies and outcomes before conflict arises in a project.

Risk management is an important feature of any construction project, and therefore; predictive analytics has proved vital in today's world. Hang, (2022), posit that the application of

big data analysis in construction companies enables the firms to detect common risks contributing to project failures and ultimately, come up with means and ways of avoiding them. Past records, weather conditions, and supply chain information are also helpful in preventing unfavorable disruptions in the use of resources by the project managers. One good example is the incorporation of intelligence in the planning and undertake of the Dubai Expo 2020. Pavez et al., (2021), points out that due to AI forecasting tools, the managers were able to see in advance some challenges that arise due to labor availability problems and the issues with expectant supply of materials in the market.

The project reduced unnecessary hitches through the timely modification of procurement cycles and staff positioning. In addition, Omowole et al., (2024), explain how the use of SM and that of project communication tools for sentiment analysis to identify likely stakeholder dissatisfaction and escalating conflicts. Project managers should manage conversations and feedbacks received from the employees so as to head bitter complains before they get worst. In conclusion, the use of AI and data analysis for the prediction of construction risks is one of the conduits to optimality by saving costs and embracing safety. This implies that, also as these technologies continue to evolve, their application in minimizing construction risks will become more and more critical (Abhayawansa and Adams, 2021).

2.9 The role of project management in International Management of Mega Projects

It is important to acknowledge that project management competence is a significant component of constructing success, particularly in mega undertaking in an international environment where variability and resource management is at its peak. The study by Gloria et al., (2024), concerned the role of project management competence on mega engineering systems' performance in Pakistan. A quantitative survey of one hundred professionals engaged in the mega-project construction industry has shown positive correlation with the competencies of the project managers in leadership, communication, ethical behavior, and integrity and the performance of the projects. The identification of leadership processes and communication was deemed critical for the coordination and management of the cross functional teams as well as the investment of stakeholders in the international region and how the projects would align to the organizational goals and objectives (Dipakbhai et al., 2024).

It also highlighted how these two factors, that is, technical and organizational, complexities impacted negatively on the project (Bondarenko et al., 2021). Whereas technical risks like engineering issues and technological interferences were identified both in terms of schedule and cost to be highly risky, the organizational issues of poor decision-making processes and ineffective communication with stakeholders worsened the situation much more (Gloria et al., 2024). Notably, this study also failed to support the hypotheses concerning the influence of environmental

constraints identified as compliance issues in the environment together with geopolitical factors and strategy performance with no statically significant differences. This indicates that aspiring project management teams can reduce on factors outside their control through proper management and implementation of risk factors and contingency measures (Dipakbhai et al., 2024). That is why it is crucial for project managers to have not only technical knowledge but also people's skills to promote effective support and management of various stakeholders involved in the project.

Megaprojects are by their nature complex which results in performance issues that may include special management strategies. Macek and Vitásek, (2024), conduct a systematic literature review and discusses latest trends and concerns from business and management viewpoint related to megaprojects. After reviewing the detailed method used in the work, the main themes to analyze megaproject performance indicators were determined as sustainability, governance, project management, risk, and socio-economy. Another argument made by Chenya et al., (2022), is that complexity of megaprojects is not only technical issue but multiple social, economic, and political complexity. The study called for assessment tools that allow a detailed evaluation based on the social and environmental factors to increase the sustainability of the projects. In addition, the authors pointed out that future development of governance approaches should be broader to include local people, the government, and international investors to enhance the attainment of the set goals and objectives of the projects. To deal with complexity, the use of innovative approaches for efficiency beyond efficiencies was also suggested, inclusive of artificial intelligence and huge data analytics for providing predictive information to enhance the decisions of real time procedures (Soh et al., 2023).

Another key element in the megaprojects management is governance, as it is one of the success factors. In their 2020 study, Tang et al., (2020), found out that many gaps exist between theories on the management of megaprojects and management systems in the real world. The literature revealed that much has been said in its parts like budgeting, scheduling, risk management etc., but not much has been done on the comprehensive framework which encompasses within the general governance model. The authors' opinions were in line with the fact that there should be better guidelines and effective management methods that should be employed through the entire life cycle of a project, from planning to post planning assessment (Patel et al., 2024). One of the recommendations made was the use of quality management as one of the critical strategies that define the governance of megaprojects. This includes the adoption of the following international standards, ISO 21500 on project management and ISO 31000 on risk management to make the policies standardized across the different districts. As noted by Khalil-Oliwa and Jonek-Kowalska, (2024), flexibility in change management should aim and ensure that new adaptations are made based on the dynamic nature of the project environment to increase its resistance to failure.

Over the decades, riskshop been identified as a critical factor since mega projects are bound to experience various risks that may tamper with their success (Macek and Vitásek, 2024). Studies conducted in the recent past have emphasized the necessity of looking at risks from a number of wider perspectives that cover financial risk, technical risk, and regulatory risk. This is especially

important since uncertainties are unavoidable hence making it especially important to select a form of risk management which involves proactive risk management techniques such as monitoring and planning ahead (Salama, 2021). As this domain's research has depicted, most megaprojects result in failure due to poor risk assessment during the planning stage. Through predictive analytics, business simulation, and modelling, the unfortunate occurrence of risks and developing contingencies are already established to occur so that necessary preventive measures can be undertaken. Therefore, one of such means which has been put forward to share and distribute the potential financial risks between public and private entities is the use of partnership which would make the investors have confidence and willingness to participate in large scale projects (Dipakbhai et al., 2024).

There is a tendency to use sustainability principles to assess and improve megaprojects in recent years (Tang et al., 2020). That means management decision-making in megaprojects involves environmental, social, and economic sustainability objectives in achieving great scopes or targets for a project after considering their impacts. Previous studies reveal that project plans that incorporate sustainability factors that are developed and applied at the early planning stages of the project receive acceptance from the host communities and the regulating authorities hence likely to experience minimal disruptive factors and are thus viable projects. Another globalization trend in managing megaprojects sustainably is incorporating green construction and renewable energy into the projects (Patel et al., 2024). Applying the best practices of international megaprojects, it ascertains that adopting energy efficient measures and reducing carbon impact positively impacts the success and sustainability of the project. It is possible to support this by stating that the long and non-traditional decision-making models are more resistant compared to decision-making processes that have short-and-gain orientation.

Megaprojects take an influential role not only in increasing the flow of economic development but also changing or shaping up the social dynamics (Dipakbhai et al., 2024). Transportation systems, power systems, smart cities, etc., which are some of the large-scale projects implemented can function as boosters to the existing economy by creating employment, increasing transportation and trade facilitation, and attracting FDI. But the social and economic gains resulting from such projects are usually associated with double benefits and costs (Salama, 2021).

Literature reviews on megaprojects show that various challenges ranging from social problems to environmental issues and less public acceptance arise in cases of improperly managed megaprojects (Bondarenko et al., 2021). Thus, the best practice advice concerns conducting an extensive array of impact evaluations and better inclusion of stakeholders. This paper posits that Megaprojects that respond socially responsible within their operations and involve timely consultative communication with the affected stakeholders will not easily be faced with the validity of project disruptions due to conflicts (Dipakbhai et al., 2024).

The Task of managing megaprojects in the international management environment is not limited to leadership competency, which are governance structures, risk analysis, assessment, and

sustainability analysis (Soh et al., 2023). There is a call for specialized PMs in the projects that endure from 2020 to 2025 to cope with such complications in megaprojects, performance measures and achieve the set goals. Sound management of megaprojects, especially through governance, risk management and sustainable decision makings are vital in improving the value and success of megaprojects in the global arena.

2.10 The Role of Project Management in International Management of Mega Projects

2.10.1 Mega Projects and Their Characteristics

Mega projects are defined as large investors and comprehensive projects referred to as critical structures that shape the global economy. According to Aliu et al., (2023), mega projects are large scale projects that are usually costly and time consuming and may cost more than $1 billion, and are usually implemented in more than one sector and often involves many players. Big schemes are such things as high speed rail systems, large energy projects, and international airport construction. These projects affect a broad area of development not only in terms of economics but also in social and environmental spheres (Niederman, 2021). As highlighted in many other studies the following focuses on the economic importance of mega projects. Ezzeddine et al., (2022), are of the view that mega projects hence result in generation of employment opportunities, development of infrastructure and economic competiveness both locally as well as in the global markets. Nonetheless, many things may go contrary to the expected whereby the economic risks are as follows; For instance, Channel Tunnel between the UK and France which cost was estimated to be £4.8 billion rose to £9 billion at some point in their construction thereby revealing the financial riskiness of such mega projects (Bunni and Bunni, 2022). In addition, poor scheduling and tend to get worse result in long-term economic burden for government and investor.

Thus, it could be concluded that mega projects have an ability to stimulate development and upgrade the living standards of society through changing the existing urban layout. Altshuler & Luberoff, (2003) defined mega projects, as unified systems of Olympic proportions and large scale transport systems that increase mobility and accessibility in cities. However, these studies also refer to the social marginalization of population and social injustice as concerns other aspects of those types of projects. According to Pavez et al., (2021), megaprojects in urban transport system disrupt the living standards of a community and results in relocation and environmental impacts which cause social resistance and other forms of conflicts. As a result of this, environmentality is another crucial factor that tends to define mega projects. Hang, (2022), have looked into the environmental impacts of mass-scale energy and infrastructural projects and pointed out problems such as deforestation, habitat degradation and carbon realization. For instance, the impact of the Three Gorges Dam in China has been scrutinized in many papers by scholars stating that the project negatively affected the ecosystem by resulting in losses in species richness and increase in water pollution levels (Dao, Chen and Nguyen, 2021). Consequently, modern studies urge implementing sustainable project management practices in mega projects in order to prevent future adverse impacts on the environment (Annamalaisami and Kuppuswamy, 2021).

2.10.2 Challenges in Managing International Mega Projects (800 words)

The management of international mega projects is complicated by the fact that it spans across different countries and hence, involves many players, culture and physical environment, and different laws. Cultural differences is one of the major hurdles; it interferes with the actualization of projects and engulfs stakeholder relations. In the context of the research on project Management, Hofstede's (1984) cultural dimensions have been used to illustrate how national culture shapes communication patterns, decision making and leadership behaviour. For instance, Carboni et al., (2024), noted that what was considered important by project managers in high context cultures like China and Japan was relationship harmony and hence the use of indirect communication while in low context cultures like UK and US, there is focus on activities and therefore the use of direct communication. These cultural differences may cause confusion, conflict, and ineffective communication in the multinational teachers in the development project.

Another set of challenges in mega construction projects that take place in different countries is stakeholder management (Wu, 2022). Olander and Landin, for example, defined mega projects as large scale developments that requires coordination and participation of different stakeholders such as, the government, private investors, contractors and the immediate community. It explains why the expectations and interests of various stakeholders in a project are in opposition to one another and why this leads to time extension and cost inflation. For instance, Aliu et al., (2023), considered the topic of stakeholder-related risks studying organizational construction of Berlin Brandenburg Airport and describing how identifying political authorities' and private firm's miscommunication led to delay and cost overruns. Recommendations like participatory decision making, and timely communication have been suggested in the literature to overcome such challenges (Carmeli, Levi and Peccei, 2021).

The regulatory and political risks add another level of complexity in the management of international mega projects. As noted by Miller and Lessard (2000), regulatory risks, legal risks, and political risks with the concerning mega-projects remain high when they are implemented in the developing nations. According to Annamalaisami and Kuppuswamy, (2021), in Africa, government policies and bureaucracy interfere negatively with infrastructure projects and contribute to the slowing down of project delivery. Likewise, the compliance with such regulations has been noticed in cross-border transnational projects such as the Nord Stream Company for construction of oil and gas pipeline, when Russian and European Union's standards and norms about environment and security were different which resulted into legal complications and delay (Ren and Li, 2023).

Mega Project Management As it has been suggested, mega projects are influenced by political risks and uncertainties such as government interferences, corruption, and political instability. In fact, Aliu et al., (2023), pointed out that political decision making process play pivotal role in project approval and funding where short term political gains most of the time

considered before the real feasibility of a project. For instance, the Belo Monte Dam project in Brazil experienced lobbying on political authorities exposes that caused environmental issues and protests (Pavez et al., 2021). In this regard, the concept of PRA, and other analogous risk assessment methods, can be used as guidelines by the managers of a project to establish great anticipation of political risks (Dao, Chen and Nguyen, 2021).

Thus, it can be suggested that the management of International mega projects is challenging because of cultural issues, stakeholders' issues, regulatory concerns, and political risks. From previous work, we know that there is a call to mobilize cultural intelligence, stakeholders, and political risks to manage various projects. The subsequent studies should give much attention to the analysis of mega construction projects and needs for effective practice in order to overcome such challenges concerning the tendencies of globalization in construction business.

2.10.3 Strategic Management Approaches for Mega Projects

Large scale strategic plans that are undertaken by an organization and involve considerable financial commitment and long term planning are referred to as mega projects. There are crucial factors such as Accountability, governance and decision making, because these are some of the project management elements that need to be in place to facilitate the completion of such projects despite challenges and shift in stakeholders prerogatives. Furthermore, Project stakeholders' management is evident in conflict solving, cooperation, and continuation of the project (Dao, Chen and Nguyen, 2021).

Governance in mega projects refers to the institutional arrangements, policies, and mechanisms that guide project execution. El Khatib, Almteiri and Al Qasemi, (2021), further notes that lack of effective governance leads to cost performance impact and schedule performance impact such as the Sydney Opera House that was expected to cost $7 million but it cost more than $102 million. Likewise in the study by Aliu et al., (2023), they also opine that mega projects entails the multi-hierarchicalManagement and accountability framework that clearly divides the vital task among the project sponsors, the regulating authority, and the executing agency.

From the following analysis, it is clear that mega projects' decision-making authority is centralised at the strategic level while decentralised at the operational level. In their paper, Miller and Hobbs hold the view that control mechanisms and flexibility are essential ingredients in mega projects in order to select the most in quick decision-making processes. Their work on infrastructural mega projects revealed that a deterministic model of governance pulls down the efficiency of mega projects while procedural models, including the stage-gate system that gives consideration to decision making in phases with definite intervals allows for corrections to be made among other things. Interestingly, Bagshaw, (2021), have underlined that it is crucial to consider application of risk governance frameworks especially within context of projects implementing PPPs. According to their review of mega transport projects in Europe, visible governance frameworks minimize financial embezzlements and political interferences.

In this regard, technological development has also affected the ways of governance too. As pointed by Brunet and Aubry (2016), digital project governance tools, for example, smart contracts based on blockchain and machine learning-based predictive analysis tools increasing accountability and transparency in decision making. As they has shown by developing their analysis of energy mega projects digital governance mechanism can reduce corruption in this area in addition to enhancing the tracking of funds. Söderlund et al. (2020) argued that while technology is powerful enough to improve all the facets of work, it should be underlined that good leadership and ethical practices have to be pursued (Carmeli, Levi and Peccei, 2021).

2.10.4 Stakeholder Engagement Strategies

It is understood that mega projects are social constructs which cannot occur without the involvement of stakeholders and thus there is the need to engage the following strategies for managing conflict resolution. The author cited the following reasons as some of the causes of mega project failure, as noted by Itani, (n.d.), Stakeholder resistance. Delhi, practitioners examining infrastructure projects in developing countries specified that early engagement of the stakeholder via decision making enhances project acceptance. Moreover, Olander and Landin (2008) note that, when engaging the stakeholders, one may use a matrix that identifies stakeholders as either powerful or powerless and interested or uninterested, then the categories help the project managers to plan how to engage those stakeholders (Bagshaw, 2021).

One detects a number of megaproject participants which consist of government agencies, community, investors, and environmental extracellular organizations. The authors concluded that misalignment of stakeholder in international mega project like the Three Gorges Dam project in China prolonged disputes and caused environmental impacts, according to the study done by Müller et al. (2019). On the other hand, Aliu et al., (2023), analyses of London 2012 Olympics provide an insight on how risks were shared between stakeholders through risk sharing arrangements who also ensured project success. Digital engagement tools regarding stakeholders have received research interest in the recent past. According to Bunni and Bunni, (2022), through various social media platforms and comparable digital technologies, mega project stakeholders are able to add their voices to the conversation concerning projects with regard to their transparency in providing notices to the same. However, they also mention that online participation may cause advocacy of false information through flooding the conversation with words and may require control. In the same way, Pavez et al., (2021), found out in their study on smart city mega projects that ICFs enhance interactivity hence acts as platform through which the oppressed groups in societies can have their say.

Therefore, one can conclude that frameworks of governance and stakeholders' management are the key aspects of strategic management in the case of mega-projects. Literature

review also reveals that constructive management, risk management architecture, and influential stakeholder engagement are crítical to managing mega project delivery.

These are large scale, complex and have considerable social and economic implications on the society. Of this list some continue to be celebrated as some of the best engineering accomplishments while others were marked by high costs, delays and political issues. Some of the ideas that flow out of this analysis relate to successful mega projects, as well as failed undertakings, can be learned and applied in the future.

On the other hand, failed mega projects are important to understand the typical mistakes that organisations make when implementing projects. The Boston Big Dig highlighted by Abhayawansa and Adams, (2021), shows how large cost underestimation and poor governance contributed towards big end burgeon. Initially estimated to cost $2.8bn, it finally amounted to $14.6 billion because of design problems, contractual issues, and unfavorable geophysical conditions. In the same manner, Ammar et al., (2022), examines the failures and lessons learnt in the construction of the Berlin Brandenburg airport where political influence interferences and poor coordination in stakeholders led to many attempts in delaying the airport construction and leading to very many cost outbreaks. The main causes of the failure arose from their study included inadequate contingency plans and poor leadership.

Another great example can be given in the form of Fukushima Daiichi Nuclear Power Plant disaster described by Omowole et al., (2024). Thus, it can be stated that it is not a construction project in the strict sense of the word, but it clearly highlights the potential disaster that can ensue when risk identification and estimation processes are not thorough and holistic in the case of mega planning projects. Perrow's research established that high-reliance on technological protection as well as ineffective regulation led to inability to see extreme environmental conditions.

2.10.5 Lessons Learned for Future Projects

It can therefore be summarized that a number of important insights into mega projects can be gathered from the analysis of past mega projects. Secondly, adequate cost controlling and impact on stereotype financial performance are the last but not the least essential components influencing over-budget situation. According to Pavez et al., (2021), it was found that the accuracy of cost in mega project is enhanced using parametric cost modeling and probabilistic forecasting. They conducted a study of global infrastructure projects and found out that projects which implemented these techniques had on average, reduced their costs overruns by 15%.

Secondly, there is need to adapt risk management frameworks in dealing with the uncertainties of the particular project. Dao, Chen and Nguyen, (2021), work that relates to risk management in large-scale projects suggests that the dynamic assessment models for risks are much more effective compared to conventional models that do not permit the formulation of

constant and adjusted approaches. some of the skillful critics propose the simple idea that a mechanical risk management system does not allow for contingencies and, therefore, stops projects. Thirdly, it is about stakeholder integration that is highly used to influence the success of projects. With regards to early stakeholder engagement, Manowong and Ogunlana (2010) also found that mega transportation projects in Southeast Asia are likely to experience social resistance and legal disputes unless appropriate actions are taken. They further indicate that PPDS and other participatory structures improve project legitimacy and consequently the governance mechanisms (Pavez et al., 2021).

Last but not the least, there is growing adoption of technology as a key influencing factor of mega projects achievement. A study by Wu, (2022), on digital tools for construction project management demonstrates how information technology such as BIM, predictive analytics and automated system enhance on construction projects productivity and decision making. According to their research on European mega projects, organisations that make use of these technologies, they were able to minimize project delay by about 30% compared to those organisations that used traditional management techniques. Therefore, through an analysis of international mega projects, one is able to get some understanding of aspects that may lead to success or failure of the projects. Thus, the important aspects that still need to be focused are governance, cost, risk assessment, and stakeholder management, but there are new technologies that can help in increasing the effectiveness of such mechanisms. It is therefore recommended that subsequent studies examine ways in which, the digital governance frameworks and the appropriate techniques to engage with the stakeholders in mega projects due to increased complexity.

2.10.6 Implications of Mega Project Management for Residential and Commercial Construction

It will also be important to have analysis of stakeholder coordination which plays a major role in managing mega projects. Wu, (2022), has pointed out that a mega-project planning includes participation of higher tier of authorities, funding sources, shareholders, and regulating authorities, thus implying the necessity of numerous negotiations and interactions. The structured approaches of engaging stakeholders including those used in cross rail and HS2 projects in UK were found to improve the level of accountability and transparency. Such practices can also be applicable in residential and commercial projects and where contractor-client and contractor-supplier relations are well-coordinated, this leads to minimum disagreement and overall delay.

Risk management is another field that can benefit from application of the concepts arising from mega projects to small construction projects. Aliu et al., (2023), states that risk in mega projects is common and the management is usually carried out through feasibility analysis, risk modeling, and contingency measures. In the context of residential and commercial construction, a similar structured risk assessment can be utilised to address such issues as cost control, management of material shortages, and other unexpected site conditions. Xie and Yang have

further argued that risk register as well as probabilistic risk assessment techniques applied in mega projects can be beneficial in managing risks within small (Niederman, 2021).

The use of technology especially in project modeling like BIM is thus a widely accepted best practice in mega projects. Hang, (2022), indicates that, BIM helps to improve project visualization, control and co-ordination in mega projects and reduces the amount of re- works. BIM has also been used in residential as well as in commercial constructions whereby the impacts of the application of BIM in efficiency was established especially in the use of the modular construction and prefabrication (Abhayawansa and Adams, 2021). Best practices of the application of digital project management platforms observed in large scale projects like the London Olympics 2012 are important for smaller ones as well despite the scale (Bagshaw, 2021).

This is conceivable on the grounds that sustainability today has become an essential factor in the management of mega projects because of the existing tough compliance standards in the environment and criticisms from the public. Another mega construction project like Øresund Bridge and Masdar city have ensured they adopt carbon-reduction strategies as well as circular economy solutions (Alzoubi, 2022). The idea of building use can also be applied to both residential and commercial structures; for instance, efficient generation and utilization of energy, application of sustainable resources in building construction and structural life cycle cost. In the studies by Darko and Chan (2017), they noted that insights from mega-projects led to the uptake of green certifications like BREEAM and LEED in both the commercial and the residential sectors.

Therefore, understanding the management of mega projects as exceptional from residential and commercial construction projects may be useful to scale up their best practices (Bagshaw, 2021). Risk management framework, use of digital technology and sustainability strategies employed in mega projects may also apply to efficient and effective projects for small scale projects. Further investigations should be conducted on how we implement these strategies, especially under the conditions and restricted budgets of residential and commercial constructions (Abhayawansa and Adams, 2021).

2.11 Conclusion and Future Research Directions

2.11.1 Summary of Key Findings

The literature review has shows and elaborated the details about the challenges and strategy of project management in both residential and commercial construction taking evidenced based on the findings of mega projects management. One of the evident findings of the research is the fact that construction projects particularly those dealing in residential and commercial building experience some measure of project risks due to the regulation acts, restrictions in funding and participation of several people with different interests. The sources like Thesing, Feldmann and Burchardt, (2021), also supports the facts that the project success is a function of planning, risk management and stakeholder management.

Project efficiency is a functions of stakeholders' engagement Another important finding made as results of the study is that stakeholders are central to ensure that projects become efficient. According to Alabdullah and Hussein, (2023), business ventures greatly need to have frameworks that seek to coordinate the different stakeholders within mega projects so as to instill accountability and responsibility in the residential and commercial construction projects. This is in accordance with Thesing, Feldmann and Burchardt, (2021), who maintain that information technology and especially BIM enhances collaboration in construction projects irrespective of their size. There was another major theme highlighted the issue of risk management especially with regards to financial risks, construction period delays and non - compliance with regulatory frameworks. From the works of El Khatib, Almteiri and Al Qasemi, (2021), it is consensus that increased use of risk registers and other tools like risk scenarios may enhance management of risks and so reduce the incidence of failure of projects. From them, it is apparent that residential and commercial project managers should undertake prescribed risk management formats as those from huge infrastructure projects.

Technology integration has also been noted as having a blind movie in shaping the process of project management. From the research of Denicol, Davies and Pryke, (2021), it found that, BIM and the digital project management platforms have enhanced efficiency within the mega-projects by minimizing the rates of reoccurrence, improved collaboration among the crew. This supports the opinion put forward by Ribeiro, Amaral and Barros, (2021), who affirms that the adoption of technology is a critical factor in enhancing productivity and cost-cutting in small projects as well. Based on the interview findings, it was found that the use of IT in residential and commercial construction firms has led to better results of construction projects. Summarizing the results, efficient mega project management helps to enhance the successfulness of the construction of residential and commercial projects in a number of ways. It is evident that stakeholders' management, risk management, the use of information technologies, and sustainability practices enhance project results. Nonetheless, enhancing professionalism of the workforce, decreased employee turnover, better work-life balance and service delivery improvements require overcoming of the challenges including financial restraints, regulatory issues, and organizational opposition.

2.11.2 Implications for Project Managers in Residential and Commercial Construction

From this literature review, the following conclusions have been established which may help the project managers working within the construction of residential and commercial facilities. The first of the recommendations that have been put forward as an issue of concern is the issue of stakeholder engagement. Reiff and Schlegel, (2022), that This is why I have found that using structured communication strategies and collaborative decision making framework is helpful in avoiding conflict and keeping the project on the right track. Throughout their projects, project

managers should make stakeholder mapping and the implementation of communication plans in order to foster better communication with the clients, the contractors, and the regulatory agencies.

Another factor that needs to be strengthened is management of risk heroes which refer to the attributes that organisations can highlight to make them simpler for employees to understand and navigate. According to El Khatib, Almteiri and Al Qasemi, (2021), it is evident that risks that lead to construction project failures are not well identified or managed. Risk registers should be used by project managers, project risk assessment to be conducted, as well as contingency to be implemented on financial, technical and regulatory risks. Further that the involvement of probabilistic risk assessment procedures applied in mega project deliveries may offer better clarification of risk aspects that characterise construction small projects (Cerić et al., 2021).

The last factor that should also be considered by project managers is on technology adoption. According to Cerić et al., (2021), the related applications of using BIM and digital project management tools have greatly enhanced the efficiency of large scale project. It is high time that both residential and commercial construction managers focused on adopting and incorporating these technologies in their projects with an aim of enhancing design collaboration, cost assessment and proper scheduling of activities. However, integrating with the help of digital twin technology as it has already been implemented in the smart city development can contribute to the obtaining of pertinent real-time data in the context of decision-making on small-scale construction projects. This is something that continues to affect project managers up to the present time due to its importance. Lalmi, Fernandes and Souad, (2021), research article state that sustainable construction practices are not a luxury but a necessity because of the increased focus of the authorities and environmental conservation objectives. Project managers need to incorporate green materials into structures, incorporate green designs for constructions and seek for green certificates including BREEAM and LEED. Many other lessons from mega projects highlight the fact that both development and implementation of the life cycle cost analysis coupled with the principles of circular economy lead to long-term sustainability of the project alongside reduced operational costs.

Therefore, there is the need for project managers to develop leadership skills, team and interpersonal relationships. According to Merrow, (2024), it is worth stating that leadership, team work, and risk identification and management play a crucial role in any project. In order for effective project leadership to be achieved, practitioners should ensure that they attend leadership courses in order to acquire the important skills that are related to the improvement of organizational project performance, and bring about organizational culture change that supports knowledge sharing. Collectively, the information gotten from this literature review should prove useful to project managers in the residential as well as the commercial construction industries. From mega projects, lessons gathered include the following: The management of stakeholders, risk evaluation and management, and technology in construction systems and sustainable construction principles. The future studies should consider how such strategies should be more tailored in addressing the issues affecting small scale construction projects (Cerić et al., 2021).

3 Chapter 3: Research Methodology

3.1 Research philosophy

Pragmatism is one of the research philosophies that hold with the consideration of the practical effectiveness and possibilities of the acquired knowledge. Coined by such authors as Charles Sanders Peirce, William James, as well as John Dewey, pragmaticism prerogatives dwelling on problem-solving and action-based cognition (Peirce, 1878; James, 1907). While positivism assume that empirical measures aim at obtaining objective reality and interpretivism focuses on the significance of social construction of reality, pragmatism takes all possibilities into account to explore research issues (Biesta and Burbules, 2003). Consequently, this paper evaluates pragmatism other research approaches and explaining why was adopted as the best approach to adopting in the research on project management of residential and commercial buildings. Pragmatism is a mode of analysis that evaluates concepts and ideas with respect to their usability. It supports methodological pluralism and again depending upon the nature of the research question, a researcher can choose to adopt either quantitative or qualitative research methods (Morgan, 2014). The credo of pragmatic thought is putting a strong focus on practice and dealing with practical concerns despite the academic purity (Tashakkori & Teddlie, 2010). In project management research, pragmatism is useful in dealing with issues such as risk identification, stakeholder management, and business case configuration. As project management focuses on multiphase processes that encompass interactions across multiple contexts, this serves to bring theoretical perspectives to bear within real-world environments (Saunders, Lewis, & Thornhill, 2019).

This sometime pragmatism, as a grounded research philosophy, can be seen in the specific choice of method employed in this study which is mixed methods research, the approach of the research in using an emergent design to collect data and the emphasis on problem-centred analysis. While positivist and interpretivist paradigms offer a structured approach to the examination of phenomena, the pragmatic perspective is focused on solutions and efficacy, and thus, suitable for examining the management of projects in residential and commercial buildings. Given the multifaceted nature of project management as a process with a strong focus on the tangible objectives and deliverables concerning expenditures and project duration as well as the attitudinal and perceptual aspects of the Stakeholders who participate in project development and the managerial decisions made in the course of project implementation, it was deemed appropriate to employ both quantitative and qualitative research methodologies. This section discusses how pragmatism shapes the research approach and methods used in this study, including data collection and analysis.

Positivism postulates that reality is out there and can be known by observation and measurement (Bryman, 2016). This approach tends to use quantitative methods to state causes and effect and generative laws. Thus, despite the usefulness of positivism, particularly, in counting issues and providing a precise cost, time, and other quantifiable factors of PM, it has been criticized for neglecting the sociocultural and behavioral factors that play an essential role in project success (Easterby-Smith et al., 2021). On the other hand, pragmatism is not inclined to predetermined structures. It encompasses the use of both quantitative and qualitative data so as to give a detailed account of the difficulties experienced in managing projects within residential and commercial buildings. For instance, whereas a positivist study may simply determine the frequency of cost

overruns, a pragmatic study may look at the rationales for such occurrences based on the negotiations and decisions made at the project site (Shannon-Baker, 2016).

Interpretivism is marked as a method that aims at deciphering the subjective meanings respondents assign to the occurrences (Creswell & Creswell, 2018). This approach is useful when trying to understand the account of project managers, workers and clients; so the study of leadership style or workplace culture is important. However, a strictly interpretivist approach lacks the possibility to generalize results or identify specific recommendations for project improvement. On the contrary, pragmatism covers the gap between the perception and research findings by making the insights from qualitative stories supported by empirical evidence. This is especially important in comparative analysis, for example, when comparing the efficiency of the project management in residential and commercial facilities (Johnson & Onwuegbuzie, 2004).

This existentialism, as developed by Bhaskar (1975), holds the prevailing view that reality is real and out there but it cannot be apprehended fully due to relational dimensions in the social world. It is useful for studying power relations and structural conditions within project work. Even though critical realism brings depth into understanding the structural factors and their effects, it may not contain enough hedge to incorporate practical implications. Therefore, pragmatism makes the subject more suitable to study how best to deliver projects within specified practical outcomes, the level of compliance with laws and how to effectively engage stakeholders in real estate projects (Maxcy, 2003). Residential and commercial building projects require a combination of technical delivery, team management and coordination, and adherence to regulatory requirements. The chosen method entails that the study goes beyond the documentation of principles but indeed seeks to provide usable objectives to both sectors (Morgan, 2007). It can therefore be seen that while housing construction naturally involves cost control and individualization of construction plans, commercial construction involves elements of scale and longer term investments, which mean that a strictly either qualitative or quantitative approach would not suffice.

This is important because Pragmatism supports the use of mixed methods which can be useful in comparing residential and commercial project management. For example, whereas a survey might establish the number of cost overruns in the two sectors, interviews would show how managers manage to contain them (Tashakkori and Teddlie, 2010). This makes the study more rigorous, in my opinion, since it tackles not only quantifiable characteristics but also context characteristics. Additionally, pragmatism facilitates a dynamic approach to data collection, allowing researchers to refine methodologies as the study progresses. Thus, the strict adherence to the qualitative or quantitative approaches may seem quite reasonable if we are in the field of project management but it is likely to lead to a partial analysis of the problem. To that end, through both, pragmatism makes it possible to refine the kind of conclusions gotten from survey research and develop a better explanation for them through qualitative findings (Creswell & Plano Clark, 2011). This is especially true when distinguishing between residential and commercial construction projects, which often highlights non-numerical aspects of project management. A pragmatic approach also helps to enhance comparisons and the use of secondary data analysis in making a sound conclusion. The use of historical project data, financial reports and government regulations puts into consideration things needed regarding project standards to widen the vision of the prospects (Saunders et al., 2019). This makes the study strengthen the comparative analysis of primary research and best-practice recommendations that can enhance project management.

Also, the use of triangulation is encouraged in pragmatism as it helps in the confirmation of a study that uses multiple variables. To reduce bias and increase credibility of the study, survey results are compared

with findings from secondary research and interviews with experts as outlined by Johnson and Onwuegbuzie (2004). Incase of residential and commercial building and construction projects, it entails not only the measurement of the difference or variance but the analysis of the cause of the variance in various data sets. In this case, pragmatism is appropriate in disciplines that involve practical application such as project management, since it focuses on outcomes. On the same note, pragmatic inquiry combines industry practices with academic knowledge, thereby guaranteeing that the recommendations made in a study would be workable in practice (Saunders et al., 2019). This means defining what should be done for residential and commercial buildings that not only is theoretically reasonable, but also implementable in various project scenarios.

The adoption of a pragmatic approach has a presupposition that an triangulation of different methodologies is achievable. The essence of pragmatic paradigm is the shift from dichotomy where quantitative and qualitative are seen as two poles, but the reality is that any research question requires pluralistic methods to answer it(Tashakkori & Teddlie, 2010). With regard to this study, using mixed methods enhances the comparative analysis of project management of residential and commercial building projects by combining quantitative and qualitative data.

The quantitative component of this research will include the gathering of facts concerning costs and the specific time schedules and costs of construction and implementation for the various types of buildings in question. Questionnaires administered to the project managers, contractors as well as financial analysts can measure the various performance benchmarks that define residential or commercial projects (Creswell & Plano Clark, 2011). Regression and structural equation modeling techniques can then be used to analyze this data set to discern trends and relations. However, project management cannot be limited to simple measurement by numbers. Small interviews are focused on explaining the experiences of the stakeholders, the dynamics of managerial decisions, and the concerns with compliance using case analysis. They enable the rich analysis of how the constraints are managed and how various techniques are used to improve efficiency (Morgan, 2007). There is always a way of ensuring that the results that have been obtained in a study, have quantitative as well as qualitative relevance; this basically makes it easier for the study to provide pragmatic solutions that are more likely to be helpful to people within the business world today.

Another important consideration influencing the research approach through its contingency is the essence of pragmatism, which is characterized by flexibility. Pragmatism, being more flexible than other approaches, provides requirements for collecting data depending on new findings and contextual circumstances (p.63, Biesta, 2010]). This flexibility is particularly useful in the field of project management where authors have to deal with tremendous fluctuations that may disrupt the research process.

For example, first quantitative data may show certain patterns of cost overruns which are different from what was expected and then qualitative data is collected in the form of interviews to get insights from the manager proactively. Likewise, if primary data collection shows differences in regulatory compliance between residential and commercial projects, it relevant secondary data sources could be complemented by further document analysis or focus group discussions (Saunders et al., 2019). It enhances generality as it helps to keep the study grounded at the outside world rather than bureaucratic and absorbing preconceived number Crunching.

However, pragmatism helps to adopt and use data from different sources, which adds more reliability and validity in the findings. A data triangulation technique is adopted for this study because the method holds

more validity when research information from different sources such as survey questionnaires, interviews, company financial statements, and policies are used in data analysis process (Johnson & Onwuebuje, 2004). This approach correlates with real-life situations in project management research where decisions are made based on changing conditions and engagements with other stakeholders.

Pragmatism is another perspective that has practical implications, which are also considered by definition: the problem-oriented one. In contrast to systematic theories that are based on structures and concepts, pragmatism aims at creating useful knowledge to address issues that exist within communities (Dewey, 1931). This research does not merely undertake a comparison between the various PM theories but its objective is to determine the practical solutions to the delivery of efficient projects in the residential and commercial buildings sector. For instance, through comparative evaluation of successful and failed projects this study can identify lessons that can help improve cost containment, resource management and stakeholders' management effectively. It is also important to note that this information is not simply for the purpose of academic debate in the organizational development field but can also be put into practice by people in the industry. Pragmatism therefore makes a virtue of the fact that the results of research are not abstract but are findings made for decision making and enhancing efficiency in project management procedures (Maxcy, 2003). Furthermore, pragmatism lets us put into practice what is being learned through research that improve on prior knowledge in successive cycles. This is especially useful in project management as practices change and are shaped by such attributes as technology, legislation, and the marketplace (Creswell, 2014). Through this cyclical approach, the study stays current and responsive to the identified research gaps, thus offering useful insights to the body of knowledge and practice.

Finally, pragmatism is in good harmony with modern tendencies of today's Sawyer, according to which objectives are achieved using data processing and analysis as the main focus of many industries. The philosophy underpinning surveys is the most appropriate for the study because it allows extracting practical conclusions while using additional analysis as a context. They found that pragmatic research is helpful in constraining the results of study so that the results remain useful in the current project management environment with digital tools and predictive analytics. On that account, pragmatism as a philosophical approach to PM in RB and CB research does present a balanced, editable, and effectively oriented analysis, which is why pragmatism is fitting as the optimal choice for PM comparison in the selected building types.

The construction projects in residential and commercial areas are complex and it has been observed that they involve several stakeholders that is contractors, investors, policymakers and the final beneficiaries. Pragmatism underlines concerns of all stakeholders because it takes into account different experiences so that issues to be solved by the project management are not hypothetical but grounded in reality (Maxwell, 2012). For example, a homeowner who is constructing a home for residential use will concern on cost and personal choice but a commercial person building a building for investment purposes will concern on efficiency and economic return. A pragmatic approach to this debate would fit the bill since they incorporate both perspectives in their study. When considering research philosophy for the assessment of project management practices of residential and commercial buildings, pragmatism is the most appropriate considering its applicability in practice and focus on practical solutions delivery. While positivism might ignore the context or the cultural aspects, and interpretivism may lack adequate grounding in empirical research, pragmatism resolves this by incorporating both perspectives. Further, it focuses on methodological pluralism, thus, provides a more general approach that encompasses both empirical findings and factors that can be measured quantitatively and qualitatively. Because of the great emphasis on the integration of theory and practice within the philosophy of pragmatism, the findings of this study will be

academic and professional for experts in the field. Therefore, comparing the project management approaches applied in various building sectors, it became evident that pragmatism provides the most useful framework.

3.2 Research design

Research design refers to the general plan of a given study on how data will be collected, sorted, interpreted and analyzed (Creswell & Creswell, 2018). A good research design makes sure that such a study is valid, reliable and able to provide the right information. Thus, while undertaking research in project management, especially when comparing between residential and commercial buildings, the research design adopted need to accommodate both quantitative and qualitative data.

Therefore, the Most Suitable Method for the current study is the mixed methods which comprises both qualitative and quantitative methodologies. There is nothing that compels for an exhaustive methodology to evaluate the interaction between the statistical measures such as the cost overrun, the project durations and the stakeholder's perceptions of the managerial actions and the regulatory issues. Thus, the use of mixed methods allows in this study is justified by reducing the risk of remaining confined to the reliance on norms for data analysis since it may bring up shallow contextual information or fail to produce generalizable qualitative research findings that lack validity (Tashakkori and Teddlie, 2010).

Therefore, this study is best categorized under the pragmatic paradigm, which involves the integration of qualitative and quantitative research in order to solve a particular problem. The strategy provides a more reliable way of integrating data from the different sources, thereby increasing the rigour of the data analysis (Morgan, 2007). This combination is beneficial because draws upon the unique and fluid nature of project management in residential and commercial projects and aims to capture the infrastructure factors as well as the human components of project success.

The use of the mixed-methods approach in this study is also warranted because of the research questions that address the subject of differences in project management in residential and commercial construction zones. In quantitative research a focused steady and statistical numerical data is obtained from the factors like cost control, time control and so on. On the other hand, qualitative research focuses on identifying why such differences exist by studying views of the stakeholders involved, trends within industries, and restrictions from regulatory authorities (Bryman, 2016).

However, a purely quantitative analysis would not be enough to explain the contextual factors that affect the project management between the two entities. For example, statistical calculations may suggest that the duration of the project is more extended than their counterparts', but, without doing a qualitative analysis, factors such as permit obtaining and coordination with other parties or contractors, resolution of disputes, and contracts' peculiarities, will remain undetected. On the other hand, a purely qualitative study may produce profound qualitative results without generalizability, which somewhat hinders the development of patterns that work across several projects (Denzin & Lincoln, 2011).

This research proposal has identified literature review findings from previous human and quantitative and mixed-methods studies within construction project management settings. For instance, Love et al., (2016) employed both survey questionnaire quantitative data together with semi structured interviews to assess the risk management techniques in construction projects. Similarly, Xue et al. (2018) adopted this design to

measure the viability of adopting digital tools for project management making it possible to establish the confirmatory style adopted in this study to corroborate such findings.

Through mixed method research, this study makes certain the results obtained are statistically and pragmatically significant. This approach can be used to do some form of methodological triangulation in a way that increases reliability and validity. Furthermore, it is in line with the pragmatic paradigm adopted in the study which focuses more on the practical rather than being theoretical (Saunders et al., 2019). Overall, the use of a mixed-methods research increases the richness of the findings and enables the identification of detailed and applicable strategies for project management in both residential and commercial settings.

Secondary data analysis can be referred to as the analysis of a set of data collected from an external source, which may include any type of publication, articles, organizational records, reports, and case studies as well as governmental publications among others (Johnston, 2017). In qualitative research primary data is used in a more general way in terms of spotting trends, theoretical frameworks and historical profiles of various subjects. To conduct this research, secondary data analysis is critical for establishing the context of project management practices in residential and commercial structures.

The following are the sources of secondary data that have been used in this research: Articles Journal and academic journal, Industry report, Government publications, and Case-studies. Scholarly journals contribute theoretical analysis and research articles about project management methods, key participants, and productivity measures to organizations (Bryde et al., 2013). Reports from organizations such as the Royal Institution of Chartered Surveyors (RICS) and the Chartered Institute of Building (CIOB) offer industry-specific trends, benchmarks, and best practices. Different policy papers, code of buildings regulations, legislation acts and other documents assist in the identification of the legal requirements that surround residential and commercial projects (HM Government, 2021). Furthermore, case studies are real that illustrate problems and their outcomes in project implementation (Gann & Salter, 2000).

Qualitative data analysis is ideal for secondary data analysis since it allows the pattern recognition procedure, theoretical themes, and linkages in project management to be determined (Silverman, 2020). For example, thematic analysis can be used to identify thematic approaches such as cost management, stakeholder coordination and compliance to regulatory requirements. Categorization of textual data, this is through coding enables one to realize patterns in numerous ways across different data sources (Krippendorff, 2018).

The quantitative research method adopted in this study is a survey this is due to its efficiencies of attaining grouped data from a large number of respondents in a short timeframe. Questionnaires are ideal for getting an overall picture or opinions or any set of numeracy data hence they will be viable in analyzing KPI's used in construction project management. Survey as a method of data collection allows for gaining structured data like cost overruns, project completion times, and managerial challenges and thus allows for a proper comparison of residential and commercial construction projects. In contrast to other methods such as experimental or observational, the survey allows to collect a greater amount of data within a relatively short time period.

The target population in this survey will include construction managers as they are the key individuals who determine the project direction, resource allocation and risk control. The first one involves the origination of knowledge about fundamental dissimilarities between the residential and commercial construction

projects that entail efficiency measurements, stakeholders coordination and regulation issues. The respondents are construction managers because they have practical and live encounter with the patterns of construction projects and therefore respond adequately to issues of time frame change, cost control and hindrances. Through the surveyed professionals with industrial experience, the study affirms ensures that the data obtained can be applied.

The questionnaire used in the survey had both closed and open-ended questions so as to enable a complete collection of data about construction project management. It featured Likert scale questions to assess attitudes and perceptions on certain matters, several MCQs since it has the nature of acquiring categorical data and a number of open-ended questions to enable the respondents to expound. Likert scale questions involved aspects like satisfaction with the timetables of the project, perceived regulatory concerns, and efficiency of risk management measures. Specific types of questions that could be included are multiple choice questions based on description details that involves average budget size, average time of completion and so on. The additional comments came in the form of open-end questions regarding other managerial problems and or the best practices in the industry.

Therefore, to increase the response rate, the survey was made available in several platforms like the social media platforms, professional organizations, and through individual connections on LinkedIn. Conventional distribution put emphasis on print media which helped in covering larger territory; partnership with professional bodies like CIOB and RICS was beneficial in targeting construction managers with experience working in the field. ALSO, through industrial conferences and business sells; there were several chances to distribute the similar communication face to face. The study used both purposive and random sampling in executing the sample. Purposive sampling facilitated the selection of experienced construction managers with the experience in the study area to offer relevant data while random sampling reduced the biases when selecting the samples.

The response rate for this survey is expected to be in the range of 20-30% depending upon the employees; it is quite standard for the industry studies. Even though increasing the response rate would make the results more credible, this study has taken strategies to deal with possible nonrespondents through the circulation of the questionnaire and follow up on the members/individuals that did not respond. A lower response rate would mean that non-response bias could be a likely occurrence which will mean that those individuals who are respondants may be different from those who did not respond. Though, there are other ways, for instance, weighting adjustments that can be made to filter this influence so that the analysis is more accurate.

When analyzing the survey data, some statistical techniques were used to get an insight into the findings of the study. For quantitative data set, descriptive method such as frequency distribution and means were employed. Regression analysis and t-tests which are inferential tools were used in making conclusions about the relationships between the different project characteristics and the managerial perceptions. For example, in establishing if the project size played arole in affecting cost overrun, the use of regression analysis was done while t-tests helped in comparing the residential and commercial projects on performance criteria. Furthermore, correlation test was used in the analysis of the relationships between project duration, the available project funds and stakeholders.

Pertaining to the ethical considerations, it was made a point to ensure that the participants would not be recognizable and that they consented to participate in the study willingly. It was necessary to explain to the respondents about the purpose of the study, their privacy rights to abandon the survey, and how their data

would be kept anonymous. Respondents' information was not collected in a manner that could identify them personally and all responses were safeguarded to avoid loss or misuse. To conduct a study that meets the appropriate research standards, ethical clearance was sought from the University' s relevant academic committees and the relevant industry's governing bodies.

However, some shortcomings need to be pointed out despite the advantages of this approach. One limitation is response bias, due to respondents being influenced to give what they believe the interviewers want to hear or as a result of interviewers' prejudice towards them. Secondly, use of self-reported data means that some information is obtained from the subjectivity of the construction managers in the reporting of project details. Another possible limitation is the sample of construction managers surveyed, as the availability and willingness of participants may limit the scope of the research. Despite attempts at increasing the pool of participants to attain non-slope representation in some sectors, it is still probable that the results witnessed variances in certain regions or sectors.

In conclusion, the use of surveys in this study is quite relevant as it offers a well-structured method to gather quantitative data concerning the construction project management. In terms of methodology the following considerations have been taken, concerning the key differences between the residential and commercial construction projects; The participants of the study are the experienced construction managers The quantitative data analysis techniques applied in the study offers a rigorous examination of the research issues being studied in the current research. The ethical issue and limits have been addressed so that the result brought useful information while following the requirement of a research ethic.

3.3 Research approach

In the context of constructions project management research, it is crucial to choose proper research approach in order to meet the goals and objectives of the study properly. This research incorporates both the quantitative and the qualitative research methods to enable the study to make reliable, consistent, valid comparison between the project management practices in the residential and the commercial buildings. In this integration there used inductive and deductive reasoning through which the pursuit of the subject content is strengthened. The paradigms of research are of three kinds, namely, induction, deduction, and abduction. Inductive in turn involves theoretical development through the establishment of hypotheses from gathered information, whereby the conclusions are reached by beginning with the observation of particular facts. On the other hand, deductive approach involves formulation of hypothesis followed by empirical observation to either support or reject it. According to Kistruck and Shantz (2021), abductive reasoning refers to the process of making an educated guess towards finding the most likely explanation of the certain phenomenon especially when the obtained findings are unexpected. Because of the differences in the application of the project management between the residential and commercial buildings, the research is not going to be straightforward. It is applied in the quantitative phase of the study, whereby questionnaires are developed from formulated theories and theories of construction management. This enables hypothesis to be tested of reasons why timelines proposed in a project should be adjusted, should particular costs be incurred or how best to engage certain stakeholders.

Similarly, the inductive component is used in the qualitative phase, especially secondary analyzes of qualitative data. An analysis of emerging trends in organisational culture from various academic articles, reports, and case studies can only generate themes and patterns which are totally new and unknown to conventional research studies. This two-step procedure is used to make sure that the study is firmly based

on positive knowledge while at the same time leaving the door open for new exciting discoveries in the framework of the collected data. Because of the differences that may exist between the ways in which project management practices are undertaken in residential and commercial building projects, it becomes very important to take a complex and rigorous research paradigm in the study. To address this, therefore, the study employs a mixed research approach that both inductively and deductively develops its research hypotheses and testing procedures. This doubles the effectiveness of the given research and makes it more credible and valid to explore the matter under consideration. The deductive approach is applied mostly in the quantitative aspect of the study whereby questionnaires are administered to construction project managers and other stakeholders and the questions formulated are structured. These surveys are developed from specially chosen and tested theories and theories and frameworks on construction project management. For instance, hypotheses based on project life cycle, cost and control, as well as risk are considered as major hypotheses in the given case. It means the researcher is able to start with certain theoretical assumptions and use them to undertake an empirical validation on the ideas within the precincts of residential and commercial building projects.

Kistruck and Shantz (2021) define deductive reasoning as a crucial component of the hypothetico-deductive model of research andunderstand it as an effort to test the validity of theoretical assumptions when the primary goal of the research is the evaluation of hypotheses that compare actual observation statements. This means that the quantitative phase of this study can be aligned with the principles of deductive reasoning to hasten constructs from its investigations that are anchored on and add to sets of knowledge. On the other hand, the inductive component is utilized in the second part of the research approach, that is, the phase of qualitative analysis of secondary sources of information. They comprise articles, journals, papers, reports, government policies, laws and cases. This is achieved by detailing key objectives of the study as the following in order to get fundamental insights which even tools and existing frameworks might have missed to reveal. This corresponds to the inductive type of research since it builds data towards the construction or improvement of theories. According to McKercher (2024), it might be particularly useful in industries and sectors that change more frequently that is for example construction or tourism in which the researcher is flexible to find patterns. Another reason for the decision to apply both inductive and deductive approaches is based on the opinion of Proudfoot (2022) stating that integrating both approaches in mixed-methods research is more preferable to provide a deeper interpretation of the data. Thus, using these two stratagem of analysis, researchers are in a position to corroborate their results, thus reducing hasty conclusions and embracing a holistic angle. Proudfoot stresses that it is possible to qualify conjecture by testing it and at the same time being ready for the unanticipated knowledge that may surface from the practice. For this reason, this methodology can be described as effective in the field of construction project management, where both a high level of structure and framework standardization and moderate context variations are required. Thus, inductive analysis will not only be employed in the process of developing the theory but will also be vital for examining the human and organisational factors that are expected to impact project performance.

According to Sibeoni et al. (2020), qualitative methods that involve exploration of self-stories of the stakeholders, such as the Inductive Process to the Analysis of Structural lived Experience (IPSE), can reveal some facts that may not surface when a quantitative approach is used. This paper does not use the IPSE method per se, but it aligns itself with such inductive approaches in that it probes considerably the actual stories, policies, and tendencies in both lack and richness of living and working spaces construction. In addition, abduction, which is not the main emphasis of the study, is incorporated into the research design

in a heuristic manner between inductions and deductions. Inductive approach is most helpful when occurrences are noted that were not anticipated and go outside of the existent hypotheses or theories. As Brandt and Timmermans (2021) stated, abductive logic helps researchers to provide the best explanation for the perplexing issues of the collected data, which can lead to theory advancement. In the present study, should there be variance on certain assumptions such as on the fundamental postulate of cost efficiency and if they differ with the hypothesis, then the researcher shall engage in abductive analysis to refine the hypothesis. This is consistent with the position of Kistruck and Shantz (2021), who consider abductive experimentation as the effective approach that can be used for dealing with ‘’grand challenges’’, particularly, for the management pf project activity. It is intrinsic to evaluate the role of abductive reasoning in relation with the issues that construction area experience in the present day. These and many other factors affect the project’s risk in terms of its implementation, the environment it is being implemented in, and the market it is implemented in. Such variances call for a versatile method of conducting research that will be prepared to meet any surprises. When formulated as knowledge-obtaining procedure, integrating abduction enables the researcher to adapt the movement of research when necessary. Thus, the identification of the chosen research approach improves both the theoretical reliability of the work and has relevance for collecting and analyzing data.

In the quantitative phase, the deductive framework helps to build strictly defined questionnaires and enables statistical data processing and production of generalized results. It is believed that these values should provide understanding concerning some of the most well-known factors used in construction management, including cost and time overruns, as well as the satisfaction of stakeholders. On the other hand, the inductive qualitative phase contributes more to understanding the socio-cultural, regulatory, and organisational contexts where such projects take place. For example, most surveys and case studies can be extended to compare the leadership pattern, group identity, and client preferences of both the residential and commercial properties. Having access to such detailed context is highly beneficial in planning how a similar project should be conducted in the future and in applying theory in practice. Thus, the concept of using mixed methods based on the assumption of inductive-deductive approach with the addition of abductive reasoning is quite powerful and versatile-enough framework for researching the project management practices in residential and commercial buildings. It not only helps in maintaining the methodological approach of the study, as well as in the development of theoretical concepts and their practical usefulness. This is due to the frameworks provided by Proudfoot (2022), McKercher (2024), Sibeoni et al. (2020), Brandt and Timmermans (2021) and Kistruck and Shantz (2021), enabling the research to add practical and valuable wisdom for the fostering of construction project management. Research carried out at the theoretical level in construction project management has over the years relied on positivism quantitative data and methodological approaches. Nevertheless, the current trends of the scholars’ discussions establish a more inclusive approach.

Sibeoni et al.(2020) applied such approach called Inductive Process to Analyze the Structure of the lived Experience (IPSE) to the medical field stating that understanding the experience of stakeholders can be crucial for practice. Using the similar logic and applying inductive approach to construction project management helps researchers to go deeper into the interactions of project managers, clients and contractors. It also enhances comprehension of the existing theoretical frameworks of the socio-cultural and organizational factors that have implications to project performance. This means that the type of research approach used in this study dictates the kind of data collection technique that was used in the study and data analysis of the research question. This is due to the fact that the quantitative phase empirical

questionnaires developed to capture the surveys are crafted with the aim of testing hypotheses formulated from theories. The use of standardized instruments is another advantage because by this the gathered data is consistent for comparison and capable up for statistic analysis. Whereas, the qualitative phase includes secondary data analysis through thematic data. This activity is indeed inductive in nature since it does not involve the use of formal hypothesis; rather, it implies the identification of themes or patterns from the findings. In her article published in 2022, Proudfoot appreciates the use of both inductive and deductive thematic analysis when conducting mixed-methods research as this methodology-rich approach promises to deliver a promising value. In this way, while analyzing the results of the data analysis and fine-tuning the emerging themes, the research guarantees that all the possible factors regarding the difference of the PMBOK project management practices concerning residential and commercial properties are revealed. Thus, it is evident that inductive and deductive reasoning remain illuminating and driving forces within the broad topoi of reasoning, but it is abductive reason that links the two fundamentally. Abductive reasoning can represent a process of developing the best working hypotheses when it comes to analysing some data, especially those that are counter intuitive.

Apart from that, Brandt and Timmermans (2021) underscore the importance of today's abductive reasoning in the context of dealing with the complexities of the data world. In this study, abductive reasoning is used when there is conflicting evidence of the theoretical prediction as well as result to formulation of better hypothesis or clarification of theory. Due to this dynamism in the construction projects arising from issues like changes in legislation, shifts in technology and market conditions, the research strategy should be very open. According to McKercher in the year 2024, he explained that inductive research is capable of being applicable in tourism since it is adaptable to change in study phenomena. Likewise, in communicating management of construction projects, an inductive approach enables the researcher to be more pertinent with the trends and methods they identify throughout the study. Furthermore, the integration of abductive reasoning facilitates the exploration of 'grand challenges' in the field. According to Kistruck and Shantz, 2021, abductive experimentation is recommended as a strategy in handling real world, multiple dimensioned issues. Identifying, for instance, relevant theories, exploring hypotheses, and implementing and evaluating hypotheses makes it possible for researchers to come up with he relevant and unique solutions to the problems that persist in managerial construction projects.

3.4 Data collection method

In the context of comparing project management practices between residential and commercial buildings, a comprehensive data collection strategy is paramount. This study employs a mixed-methods approach, integrating both quantitative and qualitative data collection techniques to ensure a robust analysis. The quantitative component involves a survey targeting construction managers, while the qualitative aspect focuses on secondary data analysis from existing literature and industry reports. This section provides an overview of these data collection methods, their justifications, and considerations related to reliability and validity.

Data collection serves as the foundation for empirical research, facilitating the gathering of information to answer specific research questions. Techniques can be broadly categorized into quantitative and qualitative methods. Quantitative data collection involves structured tools such as surveys and experiments to collect numerical data, enabling statistical analysis (Lim, 2024). In

contrast, qualitative data collection includes methods like interviews, focus groups, and document analysis, aiming to explore deeper insights into participants' experiences and perspectives (Islam & Islam, 2020). The choice of data collection technique is contingent upon the research objectives, the nature of the phenomenon under investigation, and practical considerations such as resource availability and time constraints (Keen & Tiemeier, 2022).

For the quantitative component, an online structured questionnaire survey was selected as the primary data collection method. Surveys are instrumental in collecting data from a large population efficiently and are particularly effective in capturing self-reported measures of attitudes, behaviors, and characteristics. The decision to utilize an online format was influenced by factors such as cost-effectiveness, ease of distribution, and the ability to reach a geographically dispersed sample of construction managers (Lim, 2024). Structured questionnaires provide uniformity in data collection, ensuring that each respondent is presented with the same set of questions, thereby enhancing the reliability of the data. Moreover, online surveys offer respondents the flexibility to complete the questionnaire at their convenience, potentially increasing response rates.

The target population for the survey comprises construction managers actively involved in residential and commercial building projects. These professionals are pivotal in project execution, overseeing aspects such as planning, coordination, budgeting, and supervision. Their comprehensive understanding of project dynamics positions them as suitable respondents for providing insights into project management practices. By focusing on construction managers, the study aims to glean information on both strategic and operational facets of project management, facilitating a nuanced comparison between residential and commercial projects (Islam & Islam, 2020).

The survey was meticulously designed to encompass various question types to elicit comprehensive responses. Closed-ended questions, including multiple-choice and Likert scale items, were employed to capture quantitative data on project management practices, challenges, and outcomes (Lim, 2024). These questions facilitate statistical analysis and enable the identification of patterns and correlations. Additionally, open-ended questions were incorporated to allow respondents to elaborate on their experiences and perspectives, providing qualitative insights that enrich the quantitative data (Huebner et al., 2021). The survey was disseminated online using a professional survey platform, with invitations sent via email to construction managers identified through professional associations, industry conferences, and company directories. This approach ensured a broad reach and facilitated the inclusion of participants from diverse geographical locations.

A purposive sampling technique was employed to select participants who possess specific characteristics pertinent to the research objectives. In this case, construction managers with experience in residential and commercial projects were targeted to ensure that the data collected would be relevant and informative for the comparative analysis. Purposive sampling is

advantageous when the research requires in-depth information from individuals with specialized knowledge. However, it is acknowledged that this non-random sampling method may limit the generalizability of the findings (Islam & Islam, 2020).

The expected response rate is a critical factor influencing the reliability and validity of survey findings. Low response rates can introduce non-response bias, where the views of respondents may not accurately represent the broader population. To mitigate this risk, several strategies were implemented, including personalized invitation emails, follow-up reminders, and assurances of confidentiality (Lim, 2024). Additionally, the survey was designed to be concise and user-friendly to encourage completion. Despite these efforts, it is recognized that achieving a high response rate remains challenging, and the potential impact on data reliability is duly considered in the analysis.

The analysis of quantitative survey data involves the application of various statistical techniques to interpret the data and test hypotheses. Descriptive statistics, such as mean, median, and standard deviation, were used to summarize the data and provide an overview of respondents' characteristics and responses. Inferential statistical tests, including t-tests and analysis of variance (ANOVA), were conducted to identify significant differences between groups. Regression analysis was employed to explore relationships between variables and assess the impact of specific factors on project outcomes (Keen & Tiemeier, 2022; Huebner et al., 2021). The selection of appropriate statistical methods was guided by the nature of the data and the research questions.

Ethical considerations are paramount in conducting survey research. Participants were provided with detailed information about the study's purpose, procedures, potential risks, and benefits, ensuring informed consent. Confidentiality was maintained by anonymizing responses and securely storing data. Participants were assured that their involvement was voluntary and that they could withdraw at any time without consequence. These measures align with ethical guidelines for research involving human subjects and aim to protect participants' rights and well-being (Islam & Islam, 2020).

While surveys are a valuable tool for data collection, they are subject to certain limitations. Potential response bias may arise if respondents provide socially desirable answers or if certain groups are underrepresented. The reliance on self-reported data introduces the possibility of inaccuracies due to recall bias or misinterpretation of questions. Additionally, the sample may not be fully representative of the broader population of construction managers, limiting the generalizability of the findings (Lim, 2024). These limitations are acknowledged, and efforts were made to mitigate their impact through careful survey design and administration.

For the qualitative component, secondary data analysis was conducted using existing literature, industry reports, and case studies related to project management in residential and commercial construction. Secondary data analysis involves the use of existing data collected for other purposes to address new research questions (Kern & Mustasilta, 2023). This method is particularly useful

for exploring trends, contextual factors, and theoretical frameworks without the need for extensive primary data collection. The justification for employing secondary data analysis lies in its efficiency and the opportunity to leverage a wealth of information that has already been vetted and published (Cave & Von Stumm, 2020).

Secondary qualitative data can offer a broader understanding of project management practices, especially when cross-referenced with primary data findings. Political science and educational studies, for example, frequently utilize secondary data due to its richness and accessibility (Kern & Mustasilta, 2023; Cave & Von Stumm, 2020). Furthermore, the validity of conclusions drawn from secondary data can be enhanced through triangulation—comparing findings across multiple sources (Lodi-Smith, 2020). This study, therefore, makes use of academic journals, government reports, and industry-specific whitepapers to complement the primary survey data.

The integration of secondary datasets can be complex but highly beneficial. Techniques such as Bayesian networks and data fusion algorithms have shown promise in enhancing the interpretation of data from diverse sources (Yet et al., 2024). These advanced methods allow for the combination of evidence across different studies, potentially mitigating the limitations of any single source (Chen, Wang & Chen, 2023). Moreover, the ability to include secondary outcomes—even in the presence of missing data—has been shown to bolster robustness and reduce bias in primary outcome analysis (Deng et al., 2024). In this study, the use of such methodologies was explored to maximize the utility of both quantitative and qualitative data.

Secondary data analysis also brings with it a responsibility to consider the context in which the data was originally collected. Researchers must understand the objectives, methodologies, and limitations of the original studies to avoid erroneous conclusions (Cave & Von Stumm, 2020). This awareness ensures that reused data is applied appropriately to new research questions, maintaining academic integrity and enhancing analytical depth (Huebner et al., 2021). Applied open science and meta-analytical approaches have been instrumental in this regard, facilitating a culture of transparency and reproducibility in academic research (Lodi-Smith, 2020).

In the evolving landscape of research methodologies, secondary data analysis has grown in prominence due to its efficiency and accessibility. With vast amounts of existing data available through surveys, institutional records, public databases, and cohort studies, researchers are increasingly turning to this method to explore new hypotheses without the need for fresh data collection. This approach offers cost and time benefits, while also enabling broader and potentially more representative samples (Kern & Mustasilta, 2023). However, the use of secondary data is not without challenges. A critical element involves assessing the relevance, accuracy, and completeness of the dataset in relation to the new research question (Chen, Wang & Chen, 2023). Robust methodologies have been developed to enhance the rigor of secondary data analysis. A contemporary conceptual framework, as proposed by Huebner et al. (2021), encourages an iterative process of hypothesis generation, data cleaning, exploration, and modeling. This

framework supports a structured approach to initial data analysis, which is essential to identify outliers, missing values, or patterns that may affect subsequent analysis. Data integrity is further reinforced by methods that integrate multiple datasets through efficient schemes, such as the one developed by Chen, Wang and Chen (2023), which synthesizes information from various secondary datasets to improve parameter inference.

Moreover, secondary data analysis allows for innovative statistical modeling, especially in the presence of missing data or complex relationships between variables. Deng et al. (2024) discuss robust integration techniques that incorporate secondary outcomes into primary outcome analysis, a practice that enriches analytical outcomes while accounting for incomplete data. The application of Bayesian networks, as highlighted by Yet, Baserdem and Rosenstock (2024), represents another innovative advancement, especially in evidence-based contexts like determining the factors behind childhood stunting. Such models are capable of revealing intricate causal pathways and offer a probabilistic interpretation of associations, which can inform policy and intervention strategies. Understanding the context in which secondary data was originally collected is a recurring theme in this methodological discourse. Cave and Von Stumm (2020) emphasize that researchers must be familiar with the objectives, sampling techniques, and instruments used in the original data collection to ensure validity. This aligns with the recommendations of Keen and Tiemeier (2022), who advocate for covariate selection and methodological rigor starting from data collection. When applied to secondary analysis, these principles help mitigate the risks of misinterpretation or misapplication.

A major advantage of secondary data analysis is the potential for replication and verification of prior research findings. As Kern and Mustasilta (2023) explain, beyond simple replication, secondary analysis allows for deeper exploration of underlying mechanisms and cross-contextual comparison, especially in political science and social research. This is particularly valuable in cases where primary data collection is not feasible due to ethical, logistical, or financial constraints. Transparency and openness in data sharing also play a pivotal role in supporting secondary data analysis. The open science movement encourages researchers to make their datasets publicly available, which fosters academic collaboration and accelerates discovery (Lodi-Smith, 2020). Furthermore, initiatives such as meta-analysis and systematic reviews benefit immensely from access to diverse datasets, as they rely on cumulative evidence to draw broader conclusions. These practices are underpinned by a commitment to reproducibility and methodological transparency, which are essential pillars of scientific integrity. Secondary data analysis is particularly powerful when addressing questions that span large populations or long timeframes. Population cohort studies, such as those referenced by Cave and Von Stumm (2020), offer rich data over multiple waves and can be used to examine developmental, social, or behavioral trends across lifespans. Education researchers, for instance, have employed such data to understand learning trajectories and outcomes over time. However, using such data also demands a keen awareness of cohort effects, sampling bias, and data harmonization issues.

From a quantitative research perspective, Lim (2024) offers a comprehensive overview of the strategies and guidelines for effective analysis. He highlights the importance of research design, data integrity, and statistical validity in quantitative studies. In the context of secondary data, these principles are crucial to ensure that the conclusions drawn are both robust and generalizable. This is especially relevant when dealing with complex or high-dimensional data, where assumptions about linearity, independence, and distribution may be violated. Islam and Islam (2020) further elaborate on the strategies for data collection and analysis, particularly in the context of political and social research in South Asia. Their insights underscore the necessity of contextually grounded interpretations of data. For secondary analysts, this translates to a thorough understanding of the sociopolitical and cultural milieu in which the data was gathered. Ignoring these contextual nuances may lead to erroneous interpretations or culturally insensitive conclusions.

Beyond statistical and methodological considerations, ethical aspects must also be taken into account when reusing data. Researchers have an obligation to respect the original consent agreements under which the data was collected. Anonymization, data protection, and ethical approval processes must be rigorously adhered to, even when the data appears to be publicly accessible. These safeguards help protect the rights of participants and maintain public trust in research. Moreover, secondary data analysis facilitates cross-disciplinary and interdisciplinary research. As demonstrated by Deng et al. (2024) and Yet et al. (2024), methodologies from statistics, computer science, and epidemiology can be integrated to solve complex research problems. This interdisciplinary approach expands the analytical toolkit available to researchers and enables the exploration of multifaceted social phenomena. For instance, combining demographic, health, and educational datasets can provide a more holistic understanding of social inequality or health disparities. Despite its many advantages, secondary data analysis does have limitations. These include potential mismatches between the original data objectives and the current research questions, limitations in variable definitions, and constraints in the depth of information available. For example, qualitative insights or contextual details that might be vital to understanding a phenomenon may not be captured in secondary datasets. This necessitates careful consideration when formulating research questions and interpreting findings. To mitigate such limitations, researchers are encouraged to adopt a flexible and iterative approach to analysis. Huebner et al. (2021) propose a multi-phase process involving initial data exploration, hypothesis refinement, and iterative model testing. This approach allows researchers to remain responsive to the data while maintaining analytical rigor. It also supports the development of more nuanced and contextually relevant interpretations. In conclusion, secondary data analysis stands as a vital pillar in the modern research ecosystem. It offers unparalleled opportunities for hypothesis testing, replication, and large-scale analysis. When conducted with methodological rigor, ethical sensitivity, and contextual awareness, it contributes to the advancement of knowledge across disciplines. As highlighted by Lim (2024), Islam and Islam (2020), and many others, the key to successful secondary analysis lies in a balance between technical proficiency, critical thinking, and ethical responsibility. With continued innovation in data integration, modeling techniques, and

open science practices, the future of secondary data analysis is poised to become even more impactful and inclusive.

In conclusion, the data collection strategy adopted for this study—comprising a structured online survey and a thorough secondary data analysis—provides a comprehensive framework for comparing project management practices between residential and commercial buildings. While each method has its strengths and limitations, their integration allows for a richer, more holistic understanding of the topic. By drawing upon both primary data from experienced construction managers and validated secondary sources from the literature, this study ensures reliability, depth, and academic rigor.

3.5 Data analysis

3.6 Sampling technique

3.6.1 Sample Size

3.7 Ethical Considerations

4 Chapter 4: Findings and Discussion

4.1 Findings

Project cost overruns are more frequent in commercial projects than in residential projects					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	32	21.3	21.3	21.3
	Disagreed	43	28.7	28.7	50.0
	Neutral	44	29.3	29.3	79.3
	Agreed	31	20.7	20.7	100.0
	Total	150	100.0	100.0	

The survey shows mixed views about the Civil Works frequency in excess of cost in commercial developments as compared to residential ones. Of the 150 respondents, 21.3 % said no strongly and 28.7% said no to the statement which means that 50% of the sample do not agree that cost overruns are more frequent in commercial projects. Another 29.3% were undecided meaning that they could not distinguish between the issues related to cost overrun small projects or large-scale projects. Thus, only 20.7% expressed their con to the statement meaning a conclusive perception that commercial projects are relatively likely to experience cost overruns. This distribution helps to achieve the analysis of the research question about the process of project management in residential and commercial buildings. This is to support the idea of indicating that cost overruns have not been perceived universally to be common or more probably in commercial projects than and need more research on the management practices, risk factors and budget controls on each sector. The high neutral level indicates either lack of knowledge or variation across subjects, thus underlining the need for an empirical approach in the research.

Time delays in commercial construction projects are primarily due to regulatory approvals.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	31	20.7	20.7	20.7
	Disagreed	43	28.7	28.7	49.3

	Neutral	34	22.7	22.7	72.0
	Agreed	42	28.0	28.0	100.0
	Total	150	100.0	100.0	

The findings are useful for understanding attitudes towards the concerns of management when it comes to business and housing construction. As depicted in the first table, 284 of the respondents disagreed while 207 strongly disagreed that regulatory approvals are the main reason for delay in commercial construction projects. A mere 28% percent concurred, this indicates that while regulatory issues may be a possible nuisance, the average business person does not pin their blame to this as being fully responsible for time overruns. This conflicts with a hypothesis and suggests that there may be other ways that are more decisive, such as design modifications or stakeholders' synchronization.

Managing stakeholder expectations is more complex in commercial projects than in residential projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	34	22.7	22.7	22.7
	Disagreed	35	23.3	23.3	46.0
	Neutral	33	22.0	22.0	68.0
	Agreed	48	32.0	32.0	100.0
	Total	150	100.0	100.0	

The second table shows that there is a higher perceived difficulty in managing stakeholder expectations in the commercial projects. 23.3% of the respondents said they disagreed while 22.7% strongly disagreed it, 32% agreed while 22% answered in the neutral stance. This can be attributed to different and multiple interests of the stakeholders in the commercial properties as compared to the interests shown in the commercial ones. This way the findings support the research aim by establishing that there are differences in terms of management complexity and delay factors between the two project environments.

The use of digital project management tools significantly improves efficiency in construction projects.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	41	27.3	27.3	27.3
	Disagreed	41	27.3	27.3	54.7
	Neutral	36	24.0	24.0	78.7
	Agreed	32	21.3	21.3	100.0
	Total	150	100.0	100.0	

It demonstrates various sentiments related to the efficiency of the tools used in project digital management in construction projects. This corresponds to 54.6 % of the attempts within the population showing a conclusive negative perception on the usefulness of the digital tools with 27.3 % strongly disagreeing and 27.3% disagreeing to its efficiency enhancing abilities. At the same time, 24 of the respondents were in the middle position in terms of agreement, and only 21.3% of respondents either strongly agreed or agreed with the statement. This can be interpreted as moderate to low level of trust and satisfaction with digital PM tools used in construction projects among the professionals. When connected with the research aim that focuses on comparing project management in residential and commercial buildings, the mixed responses might reflect various extent of digitalization or performance in the two categories. The commercial projects are generally bigger and more complicated; therefore, they may require more digital support because of comprehensive coordination and other calculations. As for the residential works, it could be possibly controlled or easier by using the standard approaches. The lower percentage provokes the idea that companies in distinct sectors need better management of such tools and their efficiency indicating the necessity of sector-based project management approaches.

Residential projects require less stringent risk management strategies compared to commercial projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	45	30.0	30.0	30.0
	Disagreed	34	22.7	22.7	52.7
	Neutral	28	18.7	18.7	71.3
	Agreed	43	28.7	28.7	100.0
	Total	150	100.0	100.0	

The data gives a clue of the requirements in terms of risk management in the residential and commercial project, in relation to the research aim of investigating on project management in the two sectors. Fifty two point seven percent of the respondents strongly disagreed or disagreed with the statement that residential projects call for low risk management mechanisms in their assessment; therefore, conforming to the above postulation that risk management in residential projects is as important as or even more so, than the other kinds of projects. Another 28.7% agreed to the statement, though it indicates that there is a significant portion of the contractors who think that commercial projects are intrinsically risky. The 18.7% grey perspective is evidence of some amount of uncertainty or concomitant with the belief that the level of risk keeps fluctuating from one case to another. Such distribution also suggests that while many people view the commercial projects to be bigger and difficult, the residential ones also need strong risk control measures. The findings also help explain why effective project management practices should be implemented in both categories emphasising that risk is not solely size dependent but depends on factors such as stakeholders, rules and regulation and variability in the design.

Procurement processes differ significantly between residential and commercial construction projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	39	26.0	26.0	26.0
	Disagreed	40	26.7	26.7	52.7
	Neutral	35	23.3	23.3	76.0
	Agreed	36	24.0	24.0	100.0
	Total	150	100.0	100.0	

The information collected revealed attitudes that there is disparity in procurement procedures for residential and construction projects. Essentially, 53% of respondents either strongly disagreed (26%) or disagreed (26.7%) with the statement meaning more than a half of the participants presume procurement processes in the two sectors are fairly alike. 22.1% concurring, 23.3% being indifferent thereby making it a split scaled decision. It is relevant to the research aim, which

anticipated comparing the project management of residential & commercial buildings. This implies that even though the nature of procurement may vary in terms of size, sophistication and the appropriate level of the actors involved, the basic processes can be entertained to be uniform across various sectors. This could mean that the project managers use the same procurement methods regardless of the type of building, or that, there is standard practice across industries. The neutrality in the overall results also implies that the authors are themselves unsure or have little direct experience in these sectors, and suggest that using qualitative data could give a deeper analysis when comparing and contrasting the procurement practices of the two sectors.

Construction firms prioritize sustainability initiatives more in commercial projects than in residential projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	35	23.3	23.3	23.3
	Disagreed	46	30.7	30.7	54.0
	Neutral	38	25.3	25.3	79.3
	Agreed	31	20.7	20.7	100.0
	Total	150	100.0	100.0	

The figure below shows the opinion of the respondents on as to whether construction firms give more emphasis on sustainability measures in commercial projects or in residential ones. On the contrary, many of the respondents disagreed with this statement; 30.7% responded that they disagreed while 23.3% strongly disagreed implying that there is a perception that sustainability is not more emphasized in commercial projects. Moreover, 25.3% of participants expressed no preference which can be interpreted as having positive and negative attitudes or being unsure. Thus, about 20.7% of the surveyed participants expressed their opinion in favor of the statement, which indicates a relatively meager support for the notion that commercial projects are given more focus on sustainability. This data will be useful in achieving the research aim of comparing project management in residential and commerce buildings. Consequently, the results of this study indicate that, in the eyes of the stakeholders, there is no significant gap in sustainability priorities between the private and the public sectors. This does so and therefore urges that there are other facets of project management such as budget, project time line and stakeholders that could equally offer major differences. In long term, the management of the projects in either residential or commercial may not have differences in terms of sustainability.

Delays caused by supply chain disruptions are more prevalent in commercial construction projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	36	24.0	24.0	24.0
	Disagreed	34	22.7	22.7	46.7
	Neutral	46	30.7	30.7	77.3
	Agreed	34	22.7	22.7	100.0
	Total	150	100.0	100.0	

This shows the variation of the perception of supply chain disruptions on the delays of commercial construction projects. On the other hand, 24% of the respondents strongly disagreed and 22.7% disagreed thus meaning that a total of 46.7 % did not consider it be a big issue while 30.7% remained indifferent, 22.7% agreed to the statement. Such a split testimony gives a clear scenario of how supply chain management is a complicated issue in the commercial construction industry. Connecting the given data to the research aim of evaluating P management in residential and commercial constructions, it is clear that though supply chain delays are admitted, they are not necessarily considered more common in business structures. Hence, company structure might be more beneficial for the residential construction where there are less people involved and there is most likely capacity for increased flexibility and quick response to disruptions. The high neutral response also suggest that there is minimal agreement on the impact of supply chain as it shows that project managers may differ in experiencing the impacts as per the scope of project, its geographical location or efficient planning of the supply chain. It is important when providing management strategies to understand each sector's challenges as required in this insight.

Regulatory compliance is a bigger challenge in commercial projects than in residential projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	35	23.3	23.3	23.3
	Disagreed	31	20.7	20.7	44.0
	Neutral	37	24.7	24.7	68.7

	Agreed	47	31.3	31.3	100.0
	Total	150	100.0	100.0	

This fact gives the required information on the response to the question of whether regulatory compliance is more challenging in commercial or residential projects. Out of 150 participants, 31.3% supported the notion that compliance is a big issue in commercial projects than in residential ones with 24.7% having no opinion. Still, 44 per cent meant either disagree or strongly disagree which shows some disagreement among the participants. This variance implies that although a proportional number of the professionals thought that commercial projects are bit tougher or regulated with higher standards, a significant number do not consider this difference to be much of an issue. This paper fits in the research aim of focusing on the differences in project management in the construction of both residential and commercial structures. Legal requirements are one of the centerpiece components of project management that can affect both time and cost, as well as risk mitigation. This has been evident from the mixed results obtained in this study and shows that there is a need to consider factors such as scale and location of the project, as well as the regulatory authorities in place that may influence these perceptions. So, the research shall proceed to demonstrate how compliance affects the projects in a different way across residential and commercial segments.

Project scope changes occur more frequently in residential projects than in commercial projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	33	22.0	22.0	22.0
	Disagreed	51	34.0	34.0	56.0
	Neutral	33	22.0	22.0	78.0
	Agreed	33	22.0	22.0	100.0
	Total	150	100.0	100.0	

The data presented shows different opinions on whether the scope of the change occurs more so in the residential projects compared to commercial projects. Out of 150 respondents, most of the responses were found to fall into the disagree category on the statement meaning that many of the professionals do not necessarily agree to the notion that there are more in residential projects. Only 22% of the respondents reaffirmed the result, whereas another 22% remained in the middle ground,

making the overall reception ambivalent. Out of all the respondents, only 22% strongly disagreed with the statement while 22% agreed with the statement, thus meaning the views are almost similar. Such a variation is quite crucial when considered in the context of the overall study approach that focused on comparing practices in the project management of residential and commercial buildings. While the study indicates that scope management may vary depending on the stakeholder's experience, project size, and number of stakeholders involved; it may not be possible to compare the two sectors and determine that there are differences in the two sectors. These findings of the two articles support the idea of the economic undercurrents of commercial projects and also imply that commercial projects have to go through changes of certain sorts as often as residential projects do, thus refuting the hypothesis that only residential projects are vulnerable to frequent scope changes.

The use of Building Information Modeling (BIM) is more common in commercial projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	34	22.7	22.7	22.7
	Disagreed	37	24.7	24.7	47.3
	Neutral	43	28.7	28.7	76.0
	Agreed	36	24.0	24.0	100.0
	Total	150	100.0	100.0	

Using the table below, it is possible to analyze the data regarding approbation of Building Information Modeling (BIM) in commercial projects. While observing the level of agreeableness in the current BIM usage, 28.7% of the respondents have responded neutrally, and 24% agreed that BIM is quite commonly used. However, 47.3% of the respondents disagree or strongly disagree with this statement indicating that there might be some misunderstanding or implementation shortfall of BIM in commercial projects. When comparing it to the research aim of comparing project management in residential and commercial buildings, it raises the issues of BIM take-up in these different sectors. Given that commercial projects are considerably larger and possibly more complicated than residential ones, they would likely have more to gain from BIM; the lower degree of agreement might indicate difficulties with adoption or knowledge of it. For instance, the use of BIM may be even lower in residential projects than in non-residential ones, indicating the variations in the ways of managing the projects, the approaches that are used to implement technologies and the perceived requirements of the usage of complex tools like BIM in small scale projects.

Residential projects typically have fewer subcontractors involved compared to commercial projects					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	43	28.7	28.7	28.7
	Disagreed	38	25.3	25.3	54.0
	Neutral	35	23.3	23.3	77.3
	Agreed	34	22.7	22.7	100.0
	Total	150	100.0	100.0	

The table highlights views concerning the engagement of substandard contractors in home construction in relation to the commercial construction projects. The result shows that only 15% of the respondents agree or strongly agreed on the statement shown below claiming that residential projects have less number of subcontractors than the commercial projects, while 54% of the respondents disagreed or strongly disagree to the same statement suggesting that they may require more or equally subcontractors when undertaking residential projects. That is, only 22.7% responded in the affirmative to the statement indicating that a few believes that residential projects pose fewer subcontractors. 23.3 % went into the 'neither' category suggesting that these people have no strong attitude towards the matter. In regards to the research aim of comparing the project management in residential and commercial buildings, this data proves useful. It indicates a disagreement with this assertion in as much as more respondents doubted on the fact that residential projects are less subcontracted. This is in line with the specific research aim that focuses on the potential differences of project management between the two categories of construction projects – that of residential and commercial structures and the additional difficulties and management processes that may apply to each of them.

Commercial construction projects have a higher frequency of contract disputes than residential projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	37	24.7	24.7	24.7
	Disagreed	30	20.0	20.0	44.7
	Neutral	39	26.0	26.0	70.7

	Agreed	44	29.3	29.3	100.0
	Total	150	100.0	100.0	

The survey responses include survey results from 150 people where they compare contracts disputes that occur in commercial construction projects to contracts disputes that occur in residential construction projects. The results indicate a clear pattern of the participant's attitude to the frequency of the disputing activity. With a cumulative 49.3%, a good portion of respondents could not concur with the statement that the commercial projects are prone to more disputes or strongly disagreed implying that there is a wrong perception about the residential construction projects inasmuch as they are also prone to the same or even more. However, 29.3% were in support of the statement that commercial projects are prone to more disputes, hence meaning there is a percentage of the respondents who feel compelled to believe that commercial construction is more challenging or has more disputes than residential construction. This data is relevant to the research aim of establishing distinctive between project management of residential and commercial buildings. If commercial projects are prone to more contract disputes, this simply means one has to increase the stringency of managing commercial construction projects on issues such as risk management, communication and involvement of the stakeholders in bid to curb and avoid incidences of contract disputes.

The budgeting process is more flexible in residential construction than in commercial construction					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	39	26.0	26.0	26.0
	Disagreed	35	23.3	23.3	49.3
	Neutral	36	24.0	24.0	73.3
	Agreed	40	26.7	26.7	100.0
	Total	150	100.0	100.0	

The table shows the responses on the flexibility of the budgeting process in residential and/or commercial construction for the purpose of comparing construction project management between the two areas. This is solved in the sense that more participants are inclined to the opinion that budgeting is more flexible in a residential construction than in a commercial construction. This study tested the perceptions of the respondents in relation to the statement where 26.7% said yes while 26% said no meaning that the respondents were divided in their opinions. It is important to agree with the statement that the level of flexibility in construction budgeting is an important factor In relation to the survey outcomes, 23.3% of the participants disagreed on how there was a lack of flexibility on construction budgeting on both types of construction while 24% of the participants remained neutral on the same. This distribution recognizes the

fact that the commitment of a project budget process varies depending on factors such as the size of the project, needs of the client and legal statutes. The findings drawn from the research emphasize the importance of conducting more research on the critical determinants of budget contingency within the residential and commercial construction ventures. This analysis corresponds with the purpose of the study of this paper, which is to discover and discuss the differences in the project management practices related to budget control for buildings of both types and their consequences.

Risk assessment protocols are standardized across residential and commercial projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	34	22.7	22.7	22.7
	Disagreed	45	30.0	30.0	52.7
	Neutral	37	24.7	24.7	77.3
	Agreed	34	22.7	22.7	100.0
	Total	150	100.0	100.0	

The table below shows the level of agreement in relation to the data collected on the standardisation of risk assessment about projects of residential and commercial nature. In response to the statement: Risk management protocols are consistent across such types of projects, the majority of respondents (52.7%) disapproved or strongly disapproved, thus asserting a perceived inconsistency of implementing them. As for the rest of the respondents, 24.7% can be described as indecisive, which speaks to the absence of information or insufficient decision-making material available for the situation. Regarding the question ‘Standardisation is not applied uniformly’, only 22.7% disagreed with the statement while the same percentage strongly disagreed in extremity concurred with the notion. With regard to the research question that focuses on the subject of examining the management of projects under construction of residential and commercial buildings, these truths suggest how risk management may be managed diversely. From this data, suggested practices or dealing with risks appear to be different or may be flexible depending on the type of project and can affect project performance, time, and cost. These differences should be further understood for the purpose of enhancing the overall levels of standardization and in turn, the efficacy of the projects.

Design modifications are more common in residential projects than in commercial projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	41	27.3	27.3	27.3
	Disagreed	36	24.0	24.0	51.3
	Neutral	31	20.7	20.7	72.0
	Agreed	42	28.0	28.0	100.0
	Total	150	100.0	100.0	

The table contains answers concerning the degree of change in design in residential and commercial projects. A considerable percentage of participants (27.3%) do not agree with the opinion that alterations occur more frequently with designlarman homes residential projects. Meanwhile, 24% disagree, and 28% agree. The rest of 20.7% also do not possess a strongly positive or negative attitude towards the matter. This means while there are many who are of the view that there are more design modifications in residential projects, the scores do not indicate such. Nevertheless, a greater part of the respondents shows either disagree or neutral opinion, which may indicate the commercial nature of the projects where design fluctuations could be more limited and individual due to the presence of several regulations and client's requirements. While this could be attributed to the relatively higher percentage of disagreement observed in the study this could be due to the fact that residential projects have room for modification which may have been exploited by some of the participants to distort the surveys. This aligns well with the research question that seeks to look at a comparison of project management in residential and commercial buildings, with a view to identifying a difference such as in terms of design changes and flexibility as well as the frequency of these changes.

The decision-making hierarchy is more complex in commercial construction projects.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	41	27.3	27.3	27.3
	Disagreed	36	24.0	24.0	51.3
	Neutral	29	19.3	19.3	70.7
	Agreed	44	29.3	29.3	100.0
	Total	150	100.0	100.0	

The results found a significant difference in a concern for design changes for this type of work meant for residential and commercial application. Overall, there is a 51.3% of the participants' disagreement or strong disagreement with the postulated notion of design change frequency in residential projects. This suggests that many of those involved rely on the notion that commercial projects have less change in comparison to more rigid nature with set up designs. However, 28% concurred with the statement arguing that such changes are more frequent in residential projects. This could be attributed to the fact that compared to most other types of projects, flexibility is often needed when constructing residential buildings, clients' demands are the ones called to determine changes, while regulatory demands are not very high. From the perspective of project management, these findings imply that the residential projects could be characterised by higher level of variation and frequent changes during the construction activity. As for the commercial projects, they will require a more rigid, regular approach in view of numerous regulations existing in this field of activity. This is a clear segregation of management structures; the residential constructions are possibly executed with client orientation while the commercial constructions possibly meet regulation orientation.

Financing options for commercial and residential projects follow the same approval process.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagreed	38	25.3	25.3	25.3
	Disagreed	35	23.3	23.3	48.7
	Neutral	46	30.7	30.7	79.3
	Agreed	31	20.7	20.7	100.0
	Total	150	100.0	100.0	

The data provided in the table shows the perceptions of the general public regarding the effects of the availability of skilled labor towards commercial and residential construction projects. There is equally a high dissemination of responses when it comes to how the skilled labour availability influences both types of projects with 31.3% of the respondents disagreeing with the statement while 22% strongly disagreed. Out of the respondents, 53.3% selected 'disagree' or 'strongly disagree', indicating that respondent believed that the availability of skilled labour might affect commercial and residential projects in a different way. However, there was 29.3 % of the candidates who were in the indecisive category, probably having no clear stand on the issue or were in a dilemma. Analyzing the given responses, only 17.3% of respondents stated that the skilled labor impact is the same for both sectors. This information relates to the area of research intent on proving the difference between residential and commercial building, where skilled employees are expected to be regarded as a factor in project management for the commercial building with negative connotations as compared to the positive perception of the same for the residential building. The authors believe there is an indication that for project management professions in these sectors, it may require a different approach if the categories of project work also requires different type of labour. It is possible for

the research to ascertain the impact of these differences on the projects as well as the completion time and resource utilization.

4.2 Discussion

4.2.1 The challenges faced in project management in residential buildings in UK

4.2.2 Cost overrun

Construction projects especially sub-projects for instance residential buildings, require project management with specific characteristics. It is important to note that there are unique challenges that are peculiar to residential construction projects which include; cost control challenges, time challenges, and challenges in managing the stakeholders. Such challenges can be further compounded by these factors as the regulatory framework, leadership practices, and technology implementations. This section will touch on these challenges, meaning survey results and data from other studies to establish the dynamics in the residential construction projects management.

It is clear that cost overruns are common in construction projects in both residential and commercial premises. However, its occurrence may vary depending on the type and size of the project or the amount of project complexity. In the case of construction of residential buildings, although cost overruns are not rare, they are said to be less explicit in this type of projects as they are in commercial buildings ones. This is well supported by survey data where a considerable number of respondents strongly disagreed, 21.3% to be precise, with an additional 28.7% who also disagreed the notion that cost overruns is more frequently seen in residential builds than in commercial builds. The assumption made here is that commercial projects are more likely to be budgets than other projects given the factor that they are usually large scale projects, take longer time and are complex FM projects. It does not also exclude the possibility of cost overrun in residential project as this is also occasioned by challenges that are naturally associated with residential construction projects.

The reasons that are most likely to cause increased costs in residential projects are changes to the design, the unavailability of materials, and the situations concerning the site. Like, for instance, changes in design come with alterations of the project's requirements hence adding cost. These may include clients' taste changes during the construction process, structural changes that were noticed during the construction process, or even the implementation of new legal provisions that may call for changes in a particular construction plan. Also the transportation of material also forms a problem in construction since Latimer needs to wait for the workers to finish the construction, this means that the construction timeline is likely to take longer and the labor cost will also increase since the workers are paid by the number of days they spent at the construction site. Even when plans are drawn, and contracts signed there are often several circumstances that may lead to extra costs in a residential project such as soil conditions, the presence of historical structures or relics, and environmental factors that may pose unfavorably on the progress of the project hence requiring certain measures to be taken.

In their study, Anwer et al. (2022) have claimed that leadership types in PM do affect the level of cost CTRL and probability of PUSH. Specifically, the transformational leadership has been deemed as a suitable approach to encouraging the execution of budget and time lines. This leadership approach stimulates

creativity among staff, promotes a sense of responsibility for the end outcome of the project among the team members, and enforces the idea of cooperation, which all can play a part in preventing cost overruns from happening. On the other hand, ineffective leadership practices, or the absence of efficient communication in the project team would result to misunderstanding, wrong implementation, and inefficient utilization of resources that would greatly add to the cost of the project.

In addition, when discussing the issues connected to cost overruns, Arogundade et al. (2023) noted that poor initial planning of projects is one of the major evolutionary risks in the UK's residential sector. Lack of planning may result to wrong cost estimates, failure to consider any risks that may be present and poor draw-up of budgets based on contingencies. Besides, high risks which are not managed effectively, for instance, inadequate assessment of conditions in the site or supplies of material adds more weaknesses of productivity cost in constructing a residential building. Another factor that contributed to the increase in the cost of residential projects in the recent past includes external pressure like increased cost of material and disruption of supply chain especially during the Covid-19 crises. These elements, which may not be influenced by contractors and project managers, have created new challenges to the management of costs of residential structures.

This paper recognizes great importance of management tools and risk management in reducing or avoiding cost overruns. Chadee et al. (2022) as well as Chattapadhyay et al. (2021) have focused on the function of these tools in assisting group/teams in handling the resources, time and costs. Even when conducting only residential projects where application of complicated project management software might not be applicable, one should follow the essential standards of PM. The Program Evaluation and Review Technique (PERT) and the Critical Path Method (CPM), which are planning tools, enable the control of the timelines together with the use of resources and therefore costs. Due to key activities identification and the determination of dependencies and other factors that may pose potential challenges in the course of delivering a project, these tools assist the project managers in developing better schedules and cost estimates and, therefore, have a lesser tendency of going over the planned budget.

4.2.3 Time Delays and Regulatory Approvals

Delays are another common factor of which has been prevalent in residential constructions and even though these delays may not be as severe as those experienced in large commercial buildings, their impact herein may considerably affect the total construction period. As to the question about whether the time delays in commercial projects originate from regulatory approvals only 20.7% of the respondents strongly disagreed that the statement is true with another 28.7% of the respondents also disagreeing. This implies that the commercial projects are subjected to managerial challenges whereas a the residential construction projects also encounter several time related challenges in terms of acquiring planning permission, respecting and Fulfilling the local building codes as well as safety and environmental permits.

Typically some level of delay is observed in RES in the pre construction stage since developers have to undergo a most cumbersome process of seeking permission from the local authorities in terms of planning permission as well as other zoning laws. Such disposition of time is even more pronounced in urban regions where residents and rights groups are usually sensitive to structures under construction. In the opinion of D'Amico et al. (2024), the approval process is invaluable for receiving sanction for residential projects, which complies with particular requirements in terms of safety, environment, and look. However, such a procedure may take a long time mostly if public hearings or protest from the local people are involved. These delays taking place in the regulatory phase can contribute to a relatively longer time frame in

accomplishing the residential construction hence causing a lot of inconveniences and even more costs in the process.

Using their own study with reference to the Iranian context, Charkhakan and Heravi (2019) mention that these regulatory delays should be taken into consideration from the start of the planning process. Assuming that necessary clearances will be obtained within a certain period of time can result to lengthy project downtimes, increased costs, and source of conflict with other interested parties such as the government and those residing in the area. Hence, it is important to prevent such delays by frequent and effective communication as well as adequate planning at pre-phase. Some of the general strategies to address these challenges include; building good working relations with local authorities, obtaining knowledge about the current zoning laws or regulatory change, and gaining knowledge on the approval process of different stakeholders.

4.2.4 Stakeholders' management

Stakeholders' management is a critical factor for any construction project; its degree of difficulty depends on the project nature and the number of stakeholders. Managing stakeholders' expectations is even more complicated in the case of residential construction because this process is oriented under the participation of a number of stakeholders with specific expectations towards the project. About 32 percent of the respondents agreed with the assertion that managing stakeholder expectations is relatively difficult in commercial projects than in residential ones as gathered from the surveys done. This serves to post further that despite the fact that commercial projects are characterized by complex and many stakeholders than the residential project, the latter also pose challenges with regard to the relations between the homeowners, tenants, regulating authorities, the contractors, and other parties in the project.

Among the challenges, there is the conflict of interest in residential construction since it involves multiple stakeholders. The owners or developers of the property may have certain expectations on design, cost and time while the occupants of the property or potential buyers may have different expectations all together. While for the local councils and regulatory bodies focus slightly differently and are more concerned with issues of compliance to zoning laws, safety measures and environmental laws. According to Azeem et al. (2020), senior author concluded that conflict and delay result from poor communication coupled with changing expectations from clients. Small-scale development residential constructions are notorious to involve a large number of lesser qualified entities who may not fully understand the construction process. This can result in setting highly ambiguous goals and objectives, frequent alterations of the scope of work to be done, and end up exceeding the planned financial estimates.

This paper seeks to determine the ways in which leadership practices in residential project can enhance the management of project stakeholders. In a similar study carried out by Arshad et al. (2023), the management was seen to adopt the pattern of sharing the decision-making process with other employees, thus it enhances cooperation between the involved parties, hence preventing conflicts. Through engagement of the stakeholders in decision making and making sure that the concerns of the stakeholders are met, the project managers can ensure that the stakeholders have devoted their selves towards the progress of the project and thus practice control over the tasks at hand. Carmeli et al. (2021) provide that there is the need to establish confidence and clear communication since it removes confusion and fosters a good relationship between the various parties.

4.2.5 The use of digital project management

The use of digital project management tools in construction projects has become a breakthrough innovation of the present time. These have applied in the enhancement of productivity, communication and results in handling of business projects. Nonetheless, their application in the field of construction, especially at the residential level, has been considerably slower and problematic, with a different perspective on their efficiency. In a survey conducted regarding the use of digital project management in construction, some discoveries were made. As for the hypothesis about the enhancement of efficiency in planning and management of residential construction projects achieved with the help of these tools, only 21.3 percent of the respondents agreed, while 27.3 percent strongly disagreed. This bifurcation implies that these tools have really been adopted but their effectiveness indeliverying efficiency gains remains questionable within the residential construction context. Here are some of the factors that are likely to explain such differences; the first one is the cost of implementation of new technologies in project management, secondly, there might be a need for staff training, and thirdly, there are differences in the ways in which technology is integrated with the conventional methodologies of project management.

The application used in construction that can be considered to be common is Building Information Modeling (BIM). Co-ordination can be done easily in a BIM environment due to availability of all facets of construction in the virtual picture and integrated plan for project's design and delivery. In his article, Dao et al. (2021) have elaborated the benefits of BIM that include enhancing of stakeholder coordination and accurateness of expenses estimation and project planning. The technology fosters improved collaboration of architects, engineers, contractors, and clients and hence there is a decrease in incidence of overlooking some important aspects by one party or the other. BIM also has the possibility to study problems in the course of creation, which will minimize losses if new changes and pauses are to occur in construction.

Nevertheless, the implementation of BIM in residential construction space s has challenges especially in the following areas. The principal problem is the expensive software that is required for the introduction of BIM with additional costs in training the employees on how to use the new system. Moreover, when it comes to incorporating BIM with other best practices of project management, tremendous change of managerial approaches is inevitable, which inevitably face opposition from various stakeholders who have been used to conventional project management. Therefore, though technology offers several benefits for designing and estimating, the integration of BIMs and other technology within residential construction has not yet reached its potential. Another application that is on the rise in the residential construction works is the project management application including Procore, Buildertrend, and Co-constructor with the app utility. These platforms allows it to track the progress, control the expenditures, to convene with the staff and to be sure that it is on time. They assist in efficiency of the various processes to be achieved in the project and also updates all the parties concerned with real-time information concerning the project. Even if these software tools have been reported on the optimality in business ventures, their effectiveness in the residential structures projects has not been quite easy to determine. Small-scaled residential projects involve limited number of entities, hence a small scale project does not necessarily require a complex project administration tool in the initial stage. Despite this, as the industry moves forward in the use of new tools technological the use of the software platforms are also expected to advance in the construction of residential buildings.One possible solution to improving the effectiveness of digital tools in residential construction is the adoption of agile project management techniques. Agile project management, which emphasizes flexibility, iterative development, and continuous feedback, has

been successfully implemented in a variety of industries, including construction. Balaban and Đurašković (2021) argue that agile approaches can be particularly effective in residential projects, where changes are often required due to unforeseen site conditions or client requests. By breaking down the project into smaller, more manageable phases, construction teams can adapt quickly to changes and maintain a higher level of responsiveness. Agile methodologies also allow for ongoing client input, ensuring that the final product meets the client's expectations. However, the widespread adoption of agile techniques in construction is still in its infancy, and further research is needed to determine their effectiveness in residential construction projects.

4.2.6 Sustainability in Residential Construction

Key areas Influencing sustainability in residential construction The following are considered as the key areas that have influenced sustainability in the construction of residential buildings: The drive to curb on carbon emissions, energy consumption as well as emissions of waste has forced different stakeholders to search for probable strategies that could be used to incorporate sustainability in residential construction. But the implementation of sustainable measures in the buildings specifically in residential areas has not come without some hitch. The survey results point that while sustainability is adopted, there is somehow a gap in the concern of sustainability in residential building construction than in commercial. A total of 23.3% of the respondents strongly disagreed and 30.7% disagreed with the notion that construction firms give more emphasis on sustainability measure in commercial project than in residential project. This means that even though sustainability is becoming a concern in the construction of residential buildings, then it is still some few decades before this factor fully becomes mandatory. Sustainability measures in residential construction concerns may include aspects such as better energy usage, use of sustainable materials, and minimization on wastage. Still, as stated by Azeem et al., (2020), despite the significance of such pressures to cut costs, the result is the degradation of sustainability. Some of the sustainable development features are costly, hence, deploying green building technologies in small residential buildings will be costly to the developer and therefore will not be adopted willingly. Banihashemi et al. (2023) has specifically supported that a long term advantages associated with green building technologies include reduced operational costs and better performance while a high capital cost can be involved when implementing these technologies a factor that may limit its adoption by developers.

In the same regard, it is also observed that perceived value of sustainability in constructions especially the residential constructions can be subjected by the market demand forces. Clients once again may prefer cheaper, compact, and rather unsustainable in terms of resource utilization approaches to a project and so developers may opt for inferior products. This is due to the fact that there is low awareness among the stakeholders particularly on the efficiency of sustainable construction and such things that are more beneficial down the line such as lower operating costs as well as high property value. In response to these challenges some scholars have attributed them to inadequate regulations and incentives to developers who should take measures to build green homes. As stated by Chadee et al. (2022), there is a need for governments to offer rebates to buildings' developers who will incorporate green building technology in their development as well as put into practice sustainable practices. Any of these could be in the form of tax exemptions or subvention for the provision of green materials or waivers on fees for environmentally friendly building projects. Therefore, preconditions for implementation of Green Infrastructure in the territory of residential areas could be created by making towns friendly for people and improving the ways

of sustainable urban development. Nevertheless, as mentioned above, Banerjee Chattapadhyay et al. (2021) note that there are still challenges facing the achievement of SSGs within residential construction. These barriers may range from organizational and technical factors for the adoption of sustainable built environment such as resistance from developers and contractors who are reluctant to embrace change in their construction practices. However, there seems to be a general public and consumer ignorance of the advantages of adopting the green building technologies in construction.

Therefore, herein are the persistence risks of project management within the UK residential construction project that includes; Overbudget cost, Delays, Stakeholder Management, and Technological advancement. Despite, there are other advantages such as BIM tools and project management software tools on information technology to increase productivity, the applications in residential construction are still limited compare with commercial building projects. They attributes include the high costs of implementation, the impact on staff, and lack of will to embrace the change. Nevertheless, expansion of the knowledge of the possibilities of using the digital tools and the tendency towards the adoption of the agile project management methods can assist to overcome some of these obstacles in the future. Likewise, the issue of sustainability in construction has been considered mostly in relation to houses. Even today, there is much focus on the practice of applying sustainability processes in the building industry due to many factors:.Type of Paper: However, there is a challenge of high costs of implementing Green Building Technologies, and pressure to reduce steep costs. But stronger regulation and legislation, favourable policies to developers and architects, and better focus to green urban design could put dynamics to more extensive sustainable practices in the residential construction. All in all, advancement of residential construction project will chiefly hinge on the capacity to address the above challenges on the part and of implementing conventional and sustainable technologies and practices into practice. To enhance and advance the performance of construction projects, there is merit on the need to improve the way planning is conducted and the communication between stakeholders to be stronger with better approaches to managing construction projects within the residential building industry.

4.2.7 Compare and evaluate leadership Skills, Team Building, Planning, and Control in Residential and Commercial Buildings

Leadership plays an essential role in the management of construction projects with huge differences regarding the residential and commercial construction industries. That means the differences in the leadership styles and their performance could be due to the size, nature and the type of project, the involvement of people and the level of regulation. This section provides a comparison of the strategies adopted in leadership within residential and commercial constructions studies based on the available literature to explain the effect on the project.

There is also a difference between residential construction project which take less time to complete, are less complex generally and have fewer number of people involve than commercial construction project. Therefore, leadership in this respect rather tends towards the transactional ones. Transactional leadership directs its concern towards the aspects of role, obedience, and reward-penalty. As stated by Abbas & Ali (2023), in the context of residential projects, project managers often follow the mechanistic approach, making sure that the daily tasks are performed, require little deviation from the given plan or process. This leadership style is used more effectively in the short-term oriented organization where there is more focus on implementation of plans and schedules as well as cost control. However, although transactional

leadership results in an organised and smooth running of the organisation's operations, it is not very effective in encouraging creativity or granting much freedom to organisational subunits. As Che Azura & Rashid Ali & Rasheed (2021) stated that it may lead to micromanagement and eliminate the creativity in solving non-standard problems in on-site situation.

Moreover, commercial construction differs from residential construction in that it is typically more significant, takes a longer time to execute, involves a team of interdisciplinary experts, and is subject to increased levels of supervision. These factors warrant leadership style that is more complex. In this regard, transformational leadership has found favour especially because of the ability to change feelings and actions of followers towards the achievement of long-term goals. Similarly, in the structure of workforce of commercial construction, the roles, responsibilities, and accountability of being a transformational leader include; Innovation, collaboration between departments, and ability to manage change as presented by Ansari et al., (2024). This is why transformational leadership is especially suitable for the commercial projects where the team needs to be responsive to the change and new emerged client requirements and challenges.

In the same way, transformational leadership also helps to create correlation between project goals and organizational mandates hence enhancing project performance. In any construction, there is usually the investor, the client, the government, the architecture and the subcontractors among others. In such a context, a leader should be able to co-ordinate other teams as well as integrate individuals with different objectives. According to Abhayawansa and Adams (2021) it is the implication that transformational leaders are in a better place to arrest these challenges as they have competencies in relationship orientation, bargaining and ethical reason. Such capabilities are very useful when dealing with sustainability issues, regulation of emissions, and meeting the corporation's governance requirements.

Another aspect of challenge that is related with commercial construction is stakeholder multiplicity and the question of the leadership. New from academic researches indicate that culture of participation and understanding a notion that increases the staff engagement and results of the project. However, the existing and expanding role of women in leadership within the construction industry has now started focusing on changing paradigms. Building on Alabdullah and Hussein (2023), it has been observed that women leadership in commercial construction settings are likely to be associated with increased ethical climate, better communications, and more effective conflict resolution. These traits are advantageous especially in the commercial products, whereby ethical issues and responsibility towards the public is very crucial. Also, worker and communications-inclusive leadership can also reduce some of the unforeseen risks that are likely to be encountered in large scale construction like labor strikes or misunderstandings. This in return leads to increase engagement with the goals in the project, and makes the members want to be part of the team. This will be even more important in the case of the commercial constructions especially since delays or synchronization faults may lead to big costs. Therefore, the attitudes that support leadership for inclusiveness and Emotional Intelligence is no longer an option but a business necessity.

However, residential projects achieved a more basic goal and can be said to be executed by a combination of transactional and some aspects of transformational leadership. For instance, the first and second types of change can be achieved using transactional approaches while the third and fourth goals of customer satisfaction, space for design change, and sustainability can fit well into the transformational idea implementation strategy. Thus, according to Abbas and Ali (2023), this hybrid model can contain this

flexibility to reply to the changing clients' solicitations without demurring the solidity essential for finishing projects on time and within money limits.

The other major difference in leadership in the two sectors is in the operating authority within decision-making and delegation of the same. In regards to residential construction, project managers have authority in terms of manpower and process, which leads to faster decision making and more active involvement. Nevertheless, concentrating all authorities in one person might sometimes pose a problem, especially if the leader is overloaded, or lacks relevant expertise. However, such project implementations require the decentralized leadership which is appropriate for commercial projects. Delegation is critical, and these kinds of leaders are likely to depend on aggressive middle management to bring it. In their 2024 articled , Ansari et al have mentioned that delegation and disempowerment not only serves as a talents' reliever for top leadership but also brings extra brightnesses of ownership and accountability to the team. Another area that seems to reveal variation by sector is leadership style in relation to safety culture The main influence from this research was the variation observed when comparing the two sectors in terms of safety culture. The general management of safety is vital in both constructions happening in the residential areas and the commercial areas, but due to the existence of many workers and more complex conditions in the commercial construction projects, it is very essential to have strong safety leadership. Risk adverse organisations and more specifically transformational leaders that focus on employees' welfare and wellbeing schemes are more capable to moderate these risks. They are good role models on the field, and they push for allowing as much training and education on safety, as well as they encourage employees to report accidents and near-misses without expecting consequences. It is not the same to what many facilities embrace in the residential environment where safety is seen more from a compliance perspective than in terms of leadership (Abhayawansa & Adams, 2021).

In essence, one cannot determine that leadership in construction projects is similar in all situations. It is therefore my view that to positively transform commercial construction, leadership should take one of the following approaches: Transactional or hybrid leadership may well work positively in residential construction organisations, but commercial construction needs its own revolution which starts with this premise: New vision, new stakeholders, new inclusiveness, and new virtue. The expectations for commercial projects are increasing with the need to incorporate green initiatives and integration of other disciplines for enhanced team work makes it crucial to find leaders who can mobilise, empower and nurture faith within and outside the project team. Furthermore, the appearance of leaders of different types of leadership – especially females and other types of the leaders are proved to have positive impact on the performance, ethic, and satisfaction of stakeholders. Thus understanding these kinds of differences makes it possible to specific kind of leadership training, selection and development suitable for construction environment.

The dynamics of group formation within construction project may differ between residential and commercial, this could be because of the size, complexity and the make up of the team as well as technological advancement. It is useful to know these differences in order to measure project success and in order to address the matters of workforce in general.

In residential construction, groups are smaller in scale and more geographically contained compared to non-residential construction and more dependent on the building of rapport. The fact is, the organization is

informal and members engage in various activities together making it easier for them to understand one another. As stated by Babalola and Aigbavboa (2022), the dependency that is usually seen in residential constructing projects is the long-term relationships between small contractors and local subcontractors. Such repeated cooperation also promotes trust, reduced hierarchy and thus, better communication on the field and fast decision-making in response to on-site issues. But such an environment is more favorable for free-thinking and application with flattened hierarchies and an inclination to adapt new approaches; it is far from the rigid hierarchy system with multifaceted construction problems and complicated application of technologies.

Such structures are common in residential project teams because of their flat structures. In such environments, leaders take on many roles and closely interact with each team member at the first name basis. It will help in making motivations, morale and loyalty of employees high hence increasing efficiency and productivity. However, as stated by these authors of Babalola and Aigbavboa (2022), there is a contradicting perspective in that an informal team leads to a formal flow and systematic sharing of knowledge and procedures. This is because some of the sharp procedures are not well defined or carried out in a standardized process, and due to this when a new or even temporary worker joins the business then their performance may not be as desired. However, it is noticeable that the informal communication which is suitable when solving the problem in groups may be problematic when the number of participants increases or when working with members outside the team.

However, commercial constructions do differ from residential constructions in terms of size, intensity and the number of parties involved whereby. Most of these usually involve interactions with other sub contractors, consultants and architects, engineers as well as government departments. This type of work requires a certain level of organization and formation of the teams, which are different from what can be seen in single company projects. According to Anwer et al. (2022), one of the critical factors this is the number of inter-organizational collaborations and good implementation of consistent structures for define and sustainable methods of communication and delegation of assignments. They are normally backed up by contracts, project management tools, checklists, guidelines and report formats, which ensure that various teams are answerable for their actions and decisions.

Whereas in residential projects one may deal with individual individuals, families and mere households, yet in commercial projects one is likely to meet; with various objectives; people from different working backgrounds and having different ways of working and communication. Evident from the issues highlighted above, failure to address these impurities may result to a clash, time wastage and more expenses. Akomea-Frimpong et al. (2021) establish that it is imperative for the commercial project leaders to champion the culture of collaborative, synergy, and identity where there is openness, goal congruence, and respect. This can be by organizational events such as creating a sense of cohesiveness among the different department through incentive events as well as holding cross-functional meetings that will effectively reduce rivalry that is expected when many entities with personal self-interests come together. In addition, commercial projects are usually more bureaucratic in terms of how power relationships and accountability arrangements

are defined and imposed, which helps organization but might hamper innovation or slow down work in the case of ineffective communication.

However, the integration of Construction 4.0 technological advancements in the commercial construction is another factor that has added another level of complexity in the process due to technological applications like BIM, digital twin models, and projects delivery systems. Such technologies are fime used to facilitate communication and improve coordination in teams that are located in different geographical locations. According to Adepoju et al. (2022), digital tools help enhance the elements of team integration in hostile vocational context by enhancing the probability of sharing data, remote working, and monitoring the teams' performance. Not only the preserving of transparency but also the reduction of silos in the project and proper coordination of all participants no matter whether they work in one organization or are members of distant offshore teams.

One may not underestimate the importance of digital collaboration platforms in criterional commercial projects. Applications such as BIM are Information and knowledge management systems that acts as central hub of design and construction information for all.The use of BIM by construction professionals can be regarded as a radical shift towards Distributed Knowledge Management Systems that are shared over the Internet. This particularity facilitates communication, decrease the level of errors in translating plans into actions, and fosters proactive management of problems. In addition, digital technologies provide accountability since any decision made, the action taken, or the change made can be documented by the peers, and this comes with a record. Adepoju et al. (2022) believe that these tools greatly assist towards better integration of individuals in a team, particularly if direct physical communication is impracticable due to scope or other issues involving project requirements.

However, there are many drawbacks of applying technology in managing the teams. Despite the great benefits of Construction 4.0 tools for commercial projects, Construction 4.0 technologies are not widely used in residential construction projects. The core challenges include; high costs of adopting building information modelling, lack of adequate skills in running BIM, and resistance to change according to small contracting firms that still insist on the normal ways of working. This keeps on highlighting the differences in the manner the two sectors have approached the issue of building a team. Thus, the return on investment of technology in residential projects may not be possible since such buildings are different from large construction projects in terms of the extent of investment in technology solutions; project size and complexity, meaning that traditional handover communication mediums remain dominant (Babalola & Aigbavboa, 2022).

However, in the context of commercial construction, there is also need to consider the social culture of the members forming the team. Thus, the team should address language differences, cultural differences and expectations of the individuals involved in the project. Akomea-Frimpong et al. (2021) point out that only effective and cultural communication approaches are required to create an environment of mutual

understanding and respect. In addition, they should be able to understand the generation gap and especially the profession between people with and without digital skills.

Another important difference between the two is leadership style. Leadership in residential projects can be authoritative or it can be that leaders are elected based on their seniority or experience in that project. The primary example is a foreperson or a site manager who supervises subordinates and responds to situations, while decisions are made on-scene. In a commercial setting, on the other hand, the leadership role seems to be more decentralised. It is apparent from the above explanation of duties that both project managers, design consultants and the contractors are all responsible for the leadership and execution of a project hence calls for an integrated leadership system. Although this form of distributed leadership is helpful for coordinating numerous activities, the management of complexity can present demands the need for high level of communication, and clear goals from all the concerned parties (Anwer et al., 2022).

Project planning is one of the most crucial aspects of project management, and its process highly varies between the residential and the commercial construction domains. These variances reach customer's engagement level and concerning work scopes, timespan, standards and regulations, or technical aspects. On the same note, prerequisites in residential building projects are less complex than in other types of building projects and usually involve a sequence of steps. Gantt charts and CPM schedules are commonly used tools that are easily accessible and rather easy to employ (Bagshaw, 2021). These methodologies are especially applicable for projects whereby time line is somewhat shorter and flexibility in variables is reasonable for residential projects. However, this means that with this design flexibility is one area that tends to suffer greatly. For instance, one of the emergent risks in the construction of residential buildings is the scheduling of changes by clients which is not a very rare event and often leads to such consequences as extra time spent, extra costs, and inefficient use of resources. This only justifies why development of better time management systems which would enable the management to plan beforehand for any such changes should be enhanced (Abd-Elazeem et al., 2023).

Commercial projects on the other hand are much more complex and require contractual solutions for project risk, sustainability, and function to be incorporated as one project system. The scale and versatility of the commercial buildings require an elaborate planning approach, which is beyond time and cost estimates. Notable among these is building information modeling (BIM) which is fast shaping up as a standard tool in commercial construction planning. BIM supports designs for simulation, visualization, analysis for identify areas where clashes occur in the real construction environment and come up with strategies to avoid clashes before constructing the building (Alzoubi, 2022). In addition, the aspects of BIM include working with sustainable project models allowing architects, engineers, contractors, and clients to work at the same project model as well as address various issues affecting the project.

An important element of commercial project planning different from other project management fields is the use of life cycle costs and assessment of the project's impact on the environment. These tools are very important in creating long-term prospects of retail framework within the building environment. Even though they can be employed in individual houses for a luxurious look, their usage is much more frequent and regularly seen in the commercial category. As indicated by Ali et al. (2024), upon reviewing global commercial project management factors, logistical compliance with local municipalities, transportation

departments, as well as utility companies is another crucial consideration of commercial project planning. This coordination enables achievement of a project that meets intentions of general urban development and enhances the existing infrastructure regarding permits and public reception.

In the recent past the Hybrid planning models have proven to supplement large scale commercial development models by offering some viable workable options. These are hybrids of the conventional project management framework known as PRINCE2 and the Waterfall or the newly adopted agile framework that has aspects of flexibility, iterative development and feedback from stakeholders (Azenha et al., 2020). Agile can be said to enable a culture that makes it possible to accommodate changes that may be present in a development project while still maintaining the structure required for such projects. For instance, grandparents can be used scrum sprints within the general plan of action and activities and regularly check how things are going. The management at the various firms identified can benefit from this approach especially due to the dynamic nature of the commercial world where clients and market forces stress the need for quick and change.

Thus, despite the fact that the planning phase is also vitally important for both the residential and commercial constructions, it should be also mentioned that its implementation process should be adjusted to the specifics of the specific construction type. Despite possessing a clear planning instrument for residential plans, they need greater freedom than commercial ones to change to the clients' directions. Commercial projects require a stricter and more comprehensive planning system in order to adapt to project complexity, compliance requirements, and such long-term issues as the project's longevity. BIM and hybrid planning models, as well as other forms of advanced technologies are introduced as future directions within the field of construction projects planning.

There are several reasons why construction projects require proper control on their activities; time, cost, and quality of the project which is to be accomplished. Similar to the case of planning, the control mechanisms are by all means not similar in residential and commercial projects. In housing construction, power is provide in an organizational fashion through direct observation, weekly progress meetings and sporadic check up by the client. These are reasonable practices in cases where only a few stakeholders are influenced by project decisions and these targets can be conveyed with ease (Akhavan Tabassi et al., 2019). Nonetheless, the type of structure involved in residential project is not so formalized as the commercial ones which often include different amount of data and checking over by professionals.

On the other hand, different construction contracts are characterized by the setting of a more comprehensive control mechanism in order to fit the requirements and size of the business. Such systems may also comprise real-time KPI dashboards that deliver regular updates on the project budget compliance, calendar and other essential project parameters, safety issues, and resource utilization (Annamalaisami and Kuppuswamy, 2021). There are also much higher standards when it comes to the quality assurance of the works which is recognised with commercial construction projects being monitored by third parties, materials being tested and constructions being done according to international standards. Risk management mechanisms are complemented with the real time tracking that gives the business possibilities to simulate and prevent difficulties such as long-term supply chain delays, labour unrest, or regulatory changes.

Financial auditing is another important element of control in commercial projects as well. Based on the high level of investment that goes into the business, the commercial development is also well monetary regulated. The aspects of fund management will be made clear to prevent situations where the project experiences excessive costs or financial impropriety (Alencastro et al., 2023). Such audits normally coincide with formal governance standards that call for reports to be delivered at certain intervals to the project sponsors, the regulators and any other interested parties.

Moreover, there are number of works that emphasize on the need for controlling adaptability to address the dynamics requirements in construction projects. In a bid to learn from the conditions that prevail on-site, Ward et al. (2022) suggest that the adoption of inductive research approaches is the right approach to take. It is peculiar to commercial developments as every construction site is specific in terms of the conditions that may relate to logistics, environment, or legislation. Thus, project managers can continually gain new insights from actual data and practices collected from the war front, and improve upon his control approach and prevent adverse outcomes. This is complemented by the Interpretative Phenomenological Stakeholder Engagement (IPSE) which is a method that focuses on the future autobiographical control tactics of the project stakeholders (Sibeoni et al., 2020). With the help of interviews, focus group discussions and other reflective processes that are involved in the IPSE it is possible to identify things that may not be perceived through quantitative data approach. For instance, frontline workers may be aware of impediments or risks to safety that may not be included in daily track and progress reports on the status of a project, yet they greatly affect the output of the project.

4.2.8 Compare and evaluate Project Management in Residential and Commercial Buildings

The management of projects is crucial in construction processes mainly through determining the specific roles of project management in construction projects mainly for residential or commercial purposes. Considering that both sectors are aimed at managing projects with definite goals, such as temporal, financial, and quality constraints, their specific features define the approaches to the projects' management. Most apartment construction works have a small scale of works and therefore the general goal of providing living spaces for people or families. On the other hand, commercial building is whereby construction of offices, shopping malls or Industrial building that tend to involve considerations on more of business aspects, legal procedures, and sometimes may involve confirmation of administrative and physical resources. Nevertheless, both sectors have certain requirements in terms of professional competence of managers, efficient communication, and utilization of up-to-date PM methods to achieve beneficial results.

As for the type of projects, it is easier to define scopes and deliver timelines of residential projects because the issues are not very complex and housing construction is quite similar in many projects. These projects scenario are rather lesser in terms of regulations as compared to the scenarios of commercial buildings where more specific analyses are needed concerning functionality, safety, and sustainability. There are tend to be more customisation in commercial projects and may require professionals in terms of design and material selection like green building technology and high end office solutions. Based on these differences, residential construction

projects still apply conventional PM techniques than can be compared to commercial ones, which are characterized by the flexible use of agile and hybrids PM methodologies due to the unpredictable modern business environment.

Sibeoni et al. (2020) and Abbas & Ali (2023) have also highlighted about how the leadership styles affect the project and customers, both the residential and commercial regarding the importance of change ad preparedness in managing the stakeholders. From these findings, implication can be made that it is important to have appreciation of these challenges and demands of each sector for the purpose of enhancing appropriate management approaches to leadership, as well as meeting clients' expectations towards both the residential and commercial projects in as much as adopting to the sectoral complexities as necessary.

One of the features that set required and desired projects of the residential and commercial buildings are the size and scale of those projects. The residential buildings generally contain a small no. of units and have a more defined project cycle and less number of rules and regulation as compared with the commercial buildings. These projects are more of a routine and usually constitute fewer quantities of contractors and consultants, so that the project's management has a much better overview and simplified administration. Project managers in residential construction concentrate with relative ease on conformity to various building codes and the management of the construction projects hence containing few influential variables to deal with. This makes the overall coordination and planning of the project to be more estimable in terms of time, cost, risks, and has more control and idea of the kind of measures to be taken if in case of its occurrence.

Commercial facilities are comparatively colossal and intricate structures that include the investors or property owners, the government, and various independent contractors or sub-contractors. The project manager further intensifies the job in these environments due to characteristics of the construction phase that may involve site selection, material purchase, designing and executing the plan. Large-scale projects may need an evaluation of the consequences they are bound to have on the environment, and due to participation of multiple players, you are likely to find it difficult handling their expectations. Similar intricacy that is inclusive of such projects is also applicable to the installation and integration of specific systems that include but are not limited to the elevators, fire alarms and extinguishers, and HVAC systems all of which poses certain specific and general scheduling needs.

According to Kim (2022), contracts of large commercial projects include more complex methodologies such as risk management strategies and predictability analysis in case of any delay and cost increase. While, the use of these tools, the following techniques have critically applied in the residential sectors, although the there is a vise versa of some of the above tools in the sectors through using conventional methods in delivering some projects such as Critical Path Method (CPM) or Program Evaluation and Review Technique (PERT). As highlighted by Bunni and Bunni (2022), on the other hand, projects that propose construction of houses are often constrained by a comparatively small budget and a slightly limited range of possibilities, whereas construction of

commercial-object buildings is difficult with no previous market analysis, forecasts of profits and means for maintaining the object's functioning for a long time. There is one fundamental difference in the approach to risk management in commercial projects which is that they tend to feature a broader look at the potential costs and benefits of each applied procedure and outcomes of maintenance, with increased attention to interaction with stakeholders and contingency planning of unforeseen situations and potential issues.

All constructions especially those in residential and commercial buildings have to meet certain imposed legal regulations but the level of compliance that is required in the two segments may be different. There are some general and rather specific state decisions that refer to residential constructions and their usage as dwellings in accord with the local zoning laws, building codes and housing regulations. These matters of regulation might differ from one area to another, but the area of concern is not as too broad as that of compliance with commercial buildings. The structure, systems, as well as the finishes have to conform to the law on safety, energy efficiency and conducive livability in the project.

However, the commercial buildings have a stronger regulation, most of which have local, state, and national guidelines that can vary depending on the type of the building. For instance, if it is for an office building, it is going to have certain health and safety, fire and other regulations, and accessibility features which are going to be different from that of a residential building and thus the need for different measures. In addition, it may be important to include parameters associated with an industry, as, for example, an environmental impact assessment, special certification for sustainability (as LEED), or requirements for the structural integrity of commercial buildings which could be required in case of a natural disaster. Such regulations are usually elaborate and as a result the commercial project manager may require the services of legal advisors, urban planners and other specialized consultants especially from the following.

According to Adepoju et al. (2022) and Verma & Verma (2020) it is evident that business legislation not only makes the construction of the commercial project prolonged but also added new risks such as change in legislation or introduction of new legal norms during the work progression. Therefore, the commercial project managers must stay fairly fluid that have been applying the agile project management approaches in order to respond to change in compliance or regulation. In addition, for the commercial segment of construction and development perhaps due to the fact that this segment was found to be subjected to significant environmental and sustainability requirements, as highlighted in the works of Ahmed et al. (2022) and Arogundade et al. (2023). These extra requirements seem to add a higher level of difficulty to the commercial projects and hence there is need for extensive planning and risk management to enable the achievement of the timelines and costs within the set time and budget.

In project management in residential as well as in commercial buildings there is a distinction that is evident in the approach applied in both areas of construction. New constructions in particular employs best practices in building construction programs; one of these is the Waterfall approach,

which is unidimensional citing. These methodologies match the requirements of residential kind of projects since there is no much need for change orders. FSM Waterfall defines all the subsequent phases and their outputs, timeframes, and goals, hence is more suitable for small and linear projects with a fixed scope.

On the other hand, large-scale commercial constructions are lengthy, complicated and require this parallel or dual or Agile/ Waterfall approach. These are ideas are widely being used in commercial construction projects, because of their flexibility, to meet emerging and complex realities in construction. Agile approach such as in managing projects makes it possible to have planning, execution, and control, reduce the occurrences of the risks involved in delays and other setbacks. Indeed, by employing AG working, project managers can afford more agility, rigidity and responsiveness especially when it comes to change in the design or in regulation, or the conditions of the market when constructing the project.

Ward and Hawkins (2022) and Azenha, and Fong (2020) agree that adapting to the use of agility in commercial construction is capable of engaging clients and stakeholders effectively frequently." This is especially helpful when running extensive operations, especially the needs of the client or aspects of the market change frequently. Furthermore, there is the blend of both the water fall and agile methodologies which are being incorporated in the commercial construction due to the different complexities. The integration of the agile project management with CPM or PERT techniques allows the application of flexibility and considerable extent of orderliness of the traditional management systems. These approaches are helpful in conditions that characteristic by a higher level of unpredictability or if the decision-making process needs to be fast, for instance, experimental civilian-commercial large-scale projects that can have several sub-processes or phases, or may undergo changes due to shifts on the markets.

When it comes to the construction project in both the commercial and the residential buildings, one cannot downplay the importance of finance management. However, regarding the financial management in terms of the budgets and funding, the two sectors may differ considerably. A further characterization of projects can be made based on where they are going to be located, for instance, residential projects generally cost less than commercial projects and in terms of budgeting they are relatively easier to handle. This is normally accomplished by beginning a financing campaign from private clients, banks or financiers, with key funding areas getting into material costs and labor and overhead expenses. Residential construction tend to be more straightforward than that of a commercial construction and therefore managing the costs, expenses and ensuring that the project is on the right track as far as the amount of money that has been allocated for the project is relatively easy.

Commercial building projects are quite different for they are more complex and require much larger amount of money for investments. These types of project need capital from various sources such as private or venture capitalists, institutional or commercial banks or through government grants or subsidies. This is because commercial projects require different designs, materials, and

the kind of work done is extensive hence requires; calculating the fees for the design, the cost of labor, and other expenses such as those in the future when in operation. However, since the duration of the commercial construction projects is significantly longer compared to residential projects, costs such as inflation and market changes must also be deliberated on.

Azeem et al. (2020) opine that an application of complex tools and techniques however for better management of sales, cost, etc., in context of commercial construction involves value engineering, earned value management and cost benefit analysis. These tools assists project managers in cost estimation and determining how better to control the project in terms of cost in order to prevent its going over the budget that has been set. Further, in a paper by Banihashemi et al (2023), they argue that contractors should provide a more detailed process of cost management in the commercial project by predicting the financial glitches, cost estimation models, and risk identification. Such a level of focus on the financial books is helpful in ensuring that the commercial buildings projects are able to generate appropriate demand as well as returns on investment by stakeholders.

It has been remarked that Value engineering is one of the most common tools in commercial construction due to its capability to find out the most efficient techniques in terms of cost, which does not necessarily lessen the efficiency of the product. This is the assessment of what has been constructed in the particular project to look for areas where some alternatives can be made that would reduce costs but not affect much on the functionality and safety of the building. In value management, project managers are able to look at other constructions, materials or design that provides the same value at a cheaper price. This is when this approach is particularly effective because in most cases, especially when a project is almost nearing completion, cost overruns are more probable. The aptness of value engineering has been found to be especially effective when applied at the early stage of the design process and that delays and costs resulting on redesigning the whole system are avoided when Value engineering is used. Further on, it assists the project team to obtain value perspective of the project for the stakeholder, to ensure the project implementation meet on the specifications required without adding extra cost.

Earned value management or EVM is the other tool of cost control and project performance evaluation. EVM allows one to measure the performance and monitor the progress of a project by comparing the planned activity to the performed activity. It gives the managers the clue on the aspect of time and financial forecasts required for completion of a project to estimate whether it will be financially and time wise feasible to complete the particular project. The most important values determining the situation in the project are planned value (PV), earned value (EV), and actual cost (AC), which help calculate Cost Performance Index (CPI) and Schedule Performance Index (SPI). These are helpful in demonstrating the project's ability to optimize the resources in terms of budget, as well as the ability of the project in adherence to timely schedules. For example, the CPI assists in defining if the project is over or under-cost to ensure that the project managers

notice signs of an excessive cost. EVM is especially useful in over the commercial projects since it gives real-time information on productivity of the project in order to have prompted action taken to ensure that the project regains its correct course.

Cost – benefit analysis is widely used as an effective tool that allows for the assessment of profitability of business concerning commercial construction projects. This technique only requires one to compare the expected costs of a certain project with the expected benefits going forward in an endeavor in an endeavor so as to establish whether the project should be commenced or not. It aids in determining whether the financial requirements needed for the project are likely to give out returns that would warrant such an amount to be spent. When undertaking a commercial construction, which attracts massive investments, one must understand whether the project can generate enough revenue to fund the costs and give a good return on investments (ROI) for the investors. The CBA proves useful when it comes to early stages evaluation, as it depicts the risks and benefits involved in the process of carrying out a particular project. It also used as the framework for working priorities in a project and changing objectives in the light of financial goals. That is, when the cost estimation to construct the project surpass the anticipated ROI, the stakeholders may consider ways of reducing the scale of the required construction, look for different means of financing the project or find out how to lower the cost by implementing value engineering.

In addition to the above mentioned technique, Banihashemi et al. (2023) agree that contractors should take a more comprehensive approach in cost management, specifying such things as financial hitches, use of cost estimation models and risk identification. Budgeting and control of financial risks and spending are essential in commercial construction projects since most projects take long and entails various risks that can affect costs. As for the non-frequencies and limitations, Banihashemi et al. See it is crucial to forecast possible financial hazards beforehand. This makes it possible for the project manager to identify possible risks that may come along the way and put in measures to avoid incurring so much in the course of the project. Risk analysis is important here as implementing this strategy is likely to yield costs which could stem from changes in the market and supply chain or other unpredictable problems to the business. In the case of risks, project managers were able to ensure that they get resources to help them address any of the risks that are likely to occur or allocate contingency budgets that one is likely to use incase of any incidences.

Also, the idea of utilizing cost estimation models is another measure employed by Banihashemi et al. in order to minimize the discrepancies between financial forecasts. Cost estimation as a process aims at determining the expenditure that is expected to be incurred on a project in terms of man power, material, machinery, and other related expenses. Cost control is important for purposes of budgeting with a view of establishing workable costs which should not be overdone during implementation of the project. Other methods including the use of past data from similar projects and the current market price data, as well as the project specific data will produce better estimate. These models assist the project managers to determine which resources

to buy, how to approach this, and when to do it to ensure that the business remains profitable all through the duration of the project.

This paper analyzes the financial management strategies as discussed by Azeem et al. (2020) & Banihashemi et al. (2023) in regards to the manner in which they facilitate the completion of a commercial building project on time, within the set budget, and most importantly, at a reasonable return on investment. These strategies aim at giving a step by step preferred approach to cost control, risk control and decision making. Therefore, in most large scale commercial projects where risks and returns are considerably high coupled with complex operations the incorporation of these tools in the project management becomes crucial. By use of Value engineering, earned value management, cost benefit analysis and through the use of cost management that is proactive in nature, cost issues in commercial construction can be managed in a manner that would make the complete building adhere to the financial goals and objectives of the business without under-delivery of quality work that the business intends to offer to its clients. These techniques also assists in the creation of responsibility in the company and financial prudence that is mandatory to achieve sustainable competitive advantage within the intense commercial construction business. In collaboration with other tools and methods, the project managers can come up with acceptable project deliveries that will help meet and deliver the needs of both the clients and the actual business needs for ultimate business value returns.

4.2.9 Compare and evaluate risk and conflict management in Residential and Commercial Buildings

Risk and conflict are critical issues in construction project management in the modern world especially for residential and commercial constructions. They are both related to the built environment but they are on different level of complexity in as much as the people involved are different. This discussion seeks to draw a contrast and assess how risks and conflicts are managed in house and business structures with focus on differences in risk treatment for each sector. The paper uses various peer-reviewed articles regarding the management of these aspects in construction projects.

In the area of residential building solutions, risk management mostly includes safety, the compliance/conformity with the code requirements, costs and time constraints. The size of the construction of residential buildings is moderate, this means that hazards are readily contained; however they are very colossal and can compromise the success of this project. As stated by Abd-Elazeem et al. (2023), time management plays an important role in the design aspect for the residential buildings, whereby time-related factors might increase the construction costs. Well, it is possible to learn about such risks ahead of time and minimize their possible impact on the projects' budgets and schedules. External factors are normally associated with residential constructions since they limit the number of workforce available and weather conditions also poses challenges to constructions. According to McKercher (2024), the instances of disruption in the

residential construction may be explained by weather conditions and if the project contracted specialized works with the subcontractors. Moreover, projects related to residences that are being built for single homeowners or small investors, make stakeholders' expectations excessively vague and unpredictable. Such variation bring different risks that are not common in commercial building where the stakeholders are more professional and well organized.

Thus, the residential sector largely adopts both formal and informal approaches to risk management, including the use of experts' opinions and date collected from past realizations. But, as Verma and Verma have mentioned, new process such as Building Information Modeling (BIM) are being implemented to avoid several construction risks. Studies show that, through BIM, there is enhanced coordination and thus better evaluation of the prospective problems at different phases in construction.

On the other hand, commercial building projects are larges-scale as compared to residential building projects in terms of size and complexity the structure and interaction of the various parties involved. As it mentioned the risks of commercial buildings include financial risks and risks associated with technology as well as contractual risks as identified by Akhavan Tabassi et al., (2019). Due to increase investment and challenges that are associated with the commercial buildings risk management approach tends to be more systematic and elaborate.

The primary distinction between residential and commercial construction project risk management has to do with the level of development in BMC with buildings of commercial use. In their paper published in 2023, Abbas, & Ali compared and analyzed the correlation of the use of transformed leadership in the management of risks in large scaled project. They equated it to the commercial type because in most of the commercial projects, leaders are required to assess more risks than in the other types, as well as make sure that all the stakeholders are on the same side of the project. Referring to the ideas of Aliu et al. (2023) about the importance of strategic leadership and communication in the commercial projects, it is important to note that the risk management process should have a clear and built-in structure due to the higher budgets and the increased influence on the business area.

Also, commercial projects here may have certain factors that may affect their existence namely the legal requirements associated with the zoning laws, environmental concerns and sustainability requirements. For instance, Adebowale and Agumba (2023) explained that to achieve environmental sustainability objectives and bufferSize[Missing text] it is necessary for construction companies working on any commercial building projects to enhance the risk management procedures; incorporating environmental principles with the national and or international construction standards. The rising implementation of green construction practices also amplifies the already rising risk management challenge, which requires an enhanced adopting of the two such as financial and environmental risks.

The causes gravitating to conflicts in residential construction are as follows; Foreseen and unforeseen differences in client expectations and demands, Change orders, and construction,

construction material and design disputes. Conflict management in the residential construction projects concerns solely on the inter-personal level, between contractors and the homeowners. McKercher (2024) noted that there is constant conflict of communication failure a result of interacting with clients who lack adequate knowledge in construction project processes. Thus, implementing ways of managing conflicts and disagreements involve having open channels of communication, reporting progress meetings and the conducting of a mediation when necessary. According to Ward et al. (2022), the inductive type of conflict management in residential buildings involves soliciting information from all the key stakeholders especially homeowners in a bid to understand what has brought about the conflict. This is in line with the more elastic and improved method of handling conflicts in that more emphasis is placed on the idea of compromisive conflict solving where the parties' relationship is important in such a way that conflicts will be solved at the earliest instance.

Also, due to the specifics of most of the residential construction projects, persons involved may have higher eros personal on projects, therefore, handling any available conflicts can be sensitive. Within this context, a mediator's contribution becomes extremely important in reconciling the technological considerations of constructing a building with the individual dreams of ordinary people. As mentioned, the relationships within and around the construction site are more complex in conflicts of commercial construction than in residential construction projects due to the involvement of many stakeholders in professional capacities. It is quite common to find disputes in commercial buildings due to contractual misunderstandings, alterations in cost, time issues, and issues to do with numerous interpretations of specifications. Whilst there are normally many parties involved in a project such as the developers, contractors, subcontractors, and consultants, the different stakeholders are usually likely to have different perception of the expectations of the project and this they may lead to against the provision of the project success. So, negotiating conflicts in business- related project work requires legal enforcement of the decision and the decision making tools such as the arbitration and litigation mechanisms in case of a contract dispute.

Moreover, conflicts are larger and professional that is why they are solved with more frequencies with reference to strict military conflict settlement. According to Abbas and Ali (2023), issues related to conflict in commercial structures can be best tackled through encouragement of leadership types such as the transactional type since the leaders lay down guidelines on how such discords should be handled. Through power that is carefully embedded, the risks of conflicts arising that may hinder the progress of the project by causing delays or incurring extra expense are minimized.

In addition, commercial projects require interaction of actors from different fields and levels, thus, conflicts over decision-making patterns are likely to be in sight. Adebowale et al. (2022) noted that these conflicts especially need a fair amount of application of negotiating tact and the inclusion of formal legal provisions that would dictate the ways through which one could resolve the conflict.

Therefore, effective contract both written and concise roles, and responsibilities can help in reducing chances of conflict within commercial projects.

Thus, the difference between the management of risk and conflict in residential and commercial buildings can be explained by the differences noted in the level of complexity of projects. This is because they are comparative small and involve individual tenants, such that management style and methods implementing may be most effective require more extensive communication between the manager and tenants. Conflict and risk management here are less proactive, where keen concern is only realized once it emerges, and the major approach to handling the conflict involves direct communication and mediation.

Whereas in the case of small businesses or individual homes, these remain manageable by their owners, through simple personal decisions, commercial buildings and commercial spaces are more complex and are under the various stakeholders' control Therefore, while the risks in business space may be similar to those in home space, the management of risks in commercial buildings entails different methodologies and goes through a more rigid process compared to the one that is followed in business space. Hence, utilizing more sophisticated RM frameworks, such as financial models and environmental risk analyses, are useful in the higher exposure level in commercial construction. Also, arbitration and contractual management of the disputes are normal activities with an aim of resolving disputes in effective manner.

A unique feature that can be attributed to development of the two sectors is professionalism and experience of the stakeholders. In general, conflicts and misunderstandings are more likely to occur in the residential construction projects because most of the stakeholders involved in the project are more inexperienced. As for the difference between the two, the first is a process of several professionals where each field of knowledge has its value, although this leads to the decrease of some forms of conflict but the increase of the need for rigorously managed risks.

The international distinction between residential and commercial construction is not only relative to the construction plans of structures but also to the risk and confrontation measures in projects depending on the extent of their complexity. As for risks, they also can be less diverse and manageable in residential construction as opposed to other areas of construction, this is due a higher level of simplicity in the projects as well as lower overall scale of work. Here, professional expertise, if at all exercised for construction or renovation of homes, is done by limited professionals by the homeowners. Personal decisions, therefore, are frequent in residential construction as may be demonstrated by simple actions or decision of the owners or small contractors. Therefore, the RM process may be rather simple, without a clear structure, and, in many cases, without reference to specific frameworks.

However, managing risks in the commercial buildings, where consequences can be larger and the area of concern is wider, is much more sophisticated and systematic. Construction works for

commercial buildings involve numerous, interrelated factors as they are intricate, time-sensitive and face numerous risks that make it challenging to organize them. It also in most cases entails additional players, who make their research inputs into the project, and who thus have a stake in the final results. This implies that there is more systematic and cooperative mechanism of risk management in Commercial buildings involving specialized contractors, legal persons and financial analysts for ownership and management of the buildings. In addition, there are risks such as legal, financial and environmental risks that may be prone to commercial construction projects, that have their measures of risk control. For instance, project cost, benefit analysis and capital risk appraisal are more frequently used in commercial ventures so as to mitigate potential financial risks and ensure that the investment is sustainable (Abd-Elazeem et al., 2023). Also, concerns of environmental risks such as sustainability and energy efficiency are more critical in the commercial sector hence the need to use enhanced tools in the assessment of these risks (Ward et al., 2022).

Moreover, commercial construction tends to subsector be more complex in terms of some processes including contract formation and implementation as well as the available mechanisms for solving disputes for instance through arbitration. These help in preventing conflicts which might occur between the stakeholders either as a result of delays, extra cost, or any other factor of the operations. In commercial buildings, contractual relation are well defined and they play an important role in preserving the interest of different partners for instance the developer, tenant, architect as well as the contractors. Disputes are therefore more complicated often because it involves a number of players each with his/her own interests. Consequently, the risk management processes involved in these projects might expand symbolically because its failure may lead to significant consequences in terms of time, cost, or feasibility of the project. Hence, effective and properly defined dispute resolution techniques such as arbitration are central for the achievement of these projects. This way, it is possible to avoid the situations when conflicts take too long time to be solved or when the solution increases the overall costs (Akhavan Tabassi et al., 2019).

Another reason why there is variation of risk and conflict management between residential construction and commercial construction is due to expertise and professionalism in each sector. When it comes to construction of houses, mostly in civil constructions and or constructing buildings for small business, owners, investors or building contractors may lack adequate knowledge, experience or skills in risk assessment or management. Although, homeowners seek easy and convenient means to handle such problems, which include hiring a general contractor or using their own instincts in regards to choosing materials, the time frame, and budget. Although this is good enough when undertaking small undertakings, it is inadequate to offer the detailed analysis or the ability to predict some of the problems that may likely to occur when undertaking the construction process (Sibeoni et al., 2020). For instance, lack of proper communication or

perhaps lack of adequate communication between the team members can cause or create some problems such as delay or even safety problem, which when it happens can contribute to the costs.

As for commercial buildings, it requires professional input from different experienced personnel such as architects, project managers, certain quantity surveyors and lawyers, financial analysts among others. Coversation with these professionals enables an insurer to fully understand various risks and their implications or impacts as viewed from technological, legal, financial and many other angles, thereby minimizing possibilities of conflict arising as a result of ignorance. This is because than in residential construction, commercial construction is more complex, which creates clear lines of hierarchy; Coordination is less ambiguous as the profession of the construction of each specialized company is more delineated (Kim, 2022). This can be attributed to the fact that the development of commercial property usually requires contributions from professionals in the field who have adequate knowledge concerning the legal, financial and managerial issues surrounding such projects. Therefore, the various risks that are seen to occur in such projects are looked into carefully and planning for control measures against such risks established from time to time.

Even more, in the case of commercial construction projects, since the structures are larger and the scale and the involvement of the various stakeholders also affect the risk exposure level, the exposure is considerably larger than it is in the construction of residential buildings. The large size of the project and the long term nature of the leases involved in the commercial business require that commercial buildings are more exposed to financial risks such as market risks, fluctuations in the demand for the buildings and tenants' dispute. Hence, there is more use of elaborate techniques like financial risk maps and portfolio reviews of the environmental influences. For instance, in the financial risk model one may find sensitivity analyses, scenario planning and stress testing as some of the techniques aimed at identifying how changes in the market or any eventuality might affect the financial structure of a project (Adebowale & Agumba, 2023).

Indeed, the construction of commercial buildings also occurs in populated areas to realise the project may have an impact on the economy, infrastructure and environment of society at large. In these cases, one is likely to find himself also posing at risk not only in the immediate building construction projects. Social and environmental impacts—such as the displacement of local communities, changes in traffic patterns, or pollution—require thorough risk assessment and mitigation strategies. Another stakeholder group is the commercial developers who must also consider feasibility of the building in terms of energy, waste, disposal and any other issues of this nature that may come up after the construction (Alencastro et al., 2023). Therefore, there is a higher likelihood of installing sustainable measures, improved technology in designing and constructing

commercial entities and consequently a higher chance of making the risk management a much more elaborate affair.

4.2.10 The role of project management in International Management of Mega Projects

The role of project management in international mega construction projects depends with the type of construction; that is, between residential and commercial constructions with several differences in size, risk, the number of parties involved, sustainability factors and level of innovation. These differences require proper solutions regarding the project's governance, budgets, and evaluation criteria. The different approach illustrated the dynamism and the importance of structuring in project management for the achievement of positive outcomes. Thus, strategy formulation of dwelling construction and particularly in the context of large development projects is highly shaped by social sustainability and overall affordability requirements. According to Garba et al. (2024) case of sustainable architectural solutions in Nigeria, affordable housing expects to serve long-term social good through innovative and cost-effective design of houses. This suggests the need to seek, where possible, cheaper building materials, cheque the extent to which the company is adopting housing policies on the community, and check if the company has complied with the set housing policies. In contrast, commercial projects focus on revenue, productivity, and effectiveness, it is using newly existed technologies and intensive capital measures.

According to Duodu and Rowlinson (2021), in organisational performance improvement and innovation, commercial buildings are developed to enable the improvement of organisational efficiencies especially in matters touching on the intellectual capital efficiency and architectural efficiency. This is evident in the fact that while mega residential projects largely manage risk, mega commercial projects seek it out. This paper examines some of the risks affecting residential projects hence challenging because there is constantly changing consumer market, communities and policies. Similar to the study of Dipakbhai et al., (2024) they made an attempt to discuss the impact of dynamic model of risk of construction utilizing residential construction as the area of focus and identifying the usefulness of risk management strategy being adaptive. On the other hand, the experimental learning type of commercial buildings has to do with market risks and environmental volatilities, which are overcome by the strong project sponsorship and leadership (Franke et al., 2022). Therefore, while project managing in the commercial context copies more intact the forecasting models as it centralizes in computed things like the momentum based performance analytics (Ezzeddine et al., 2022).

Energy sustainability is also used according to a different strategic perspective. In residential buildings, solutions correspond with RE applications and DSM, more and more. Davarzani et al. (2021) pointed out that demand response as an optimum method in residential distribution networks needs to be implemented. There are certain pioneering developments to involve the consumer directly in the energy market through integrating smart technologies into homes; hence, project managers have started integrating energy flexibility in the early stages of projects. Regarding commercial factors, energy communities and green building are the main forces that define strategy. De Lotto et al. (2022) presented a review of structural and legislative characteristics of energy communities and noted that different commercial buildings exhibit higher propensity to participate in the collaborative energy production schemes. All of them are also shifted more to long-term sustainability and social responsibility perspectives of companies. One of the greatest differences in using integrated elements for strategic planning is the definition of green finance. According to the study conducted by Debrah et al., people

(2022), there is a relatively large finance deficit in green residential buildings, which prevents the enlargement of environmentally friendly designs. This has the potential to emphasize on policy change campaign by the project managers as well as demanding for bonuses. Green bonds are therefore fixed-income financial instruments that have, in commercial projects, been adopted as an efficient means to mobilise sustainable infrastructure funding (Fatica and Panzica, 2021). Therefore, more complex and developed commercial approaches include not only factors of financial performance but also the orientation to the environmental outcomes.

In terms of the organization, megaprojects require coordination that involves several activities, but the level of coordination may well differ from sector to sector. Denicol et al., (2021) discussed the structures of megaprojects and highlighted the need for adaptive structures in megaprojects to be delivered. Another reason for the development of multi layered governance structure in commercial building projects such as in construction of infrastructure for the London 2012 Olympics was systems integration and project complexity. In strategic project management here it was possible to accomplish modular planning, multiple levels of leadership and coordination of many contractors. However,with regard to housing developments, the partnerships and collaborative stakeholder environments would need to be more locale focused and developed (Dwivedi and Dwivedi, 2021). Much the same, stakeholder dynamics also impact on the implementation of strategy. This is because residential development is complex and managed by various parties such as the residents, civil organizations, town administrators, and city planners. Sometimes they work in opposites and thus any team planning should integrate them and ensure there is honesty in all communications (El-Wafa and Mosly, 2024). Commercial developments are stakeholder-rich too but they are more involve investors, corporate customers and governments within a different perspective that focus on contractual assurance and investment certainty. In both cases, literature has established that the skills such as those under emotional intelligence, if mastered by leaders are likely to improve stakeholder satisfaction and the success of the projects (El Khatib et al., 2021).

Leadership strategy also differs as to the content and measured actions. In the community, leaders are usually transformational to ensure those around them embrace common beliefs and sustain themselves. This is akin to the conceptual leadership model posturing vision and empathy where leaders need to adopt (Fokina et al., 2023). Business managers, in contrast, pay attention to the level of decision-making accuracy and its outcomes; thus, they can be attributed to the transactional leadership (Arsham, 2020). According to Duggal (2024), leadership in rather commercial shape entails delegation, monitoring, and planning for returns, valuable characteristics that make organization competitive within international markets. However, culture and regulation differences of different countries have to be taken into consideration while developing international project strategies. In the case of residential construction, this involves ensuring that the planned construction norms correspond with the laid down housing code and the population density. According to Ferede et al. (2021), establishing risk management solutions for construction projects in different cultures calls for cultural intelligence for enhanced leaders' leadership. Commercial projects need to address global building codes, tendering and procurement issues and global supply chains. The study conducted by Fathalizadeh and her colleagues, 2022 critically pointed out that the major challenges that affect the success of sustainable project management across countries include regulatory misalignment and the issue of poor knowledge transfer. Project managers in these contexts therefore have to put more focus on planning, the standardization of contracts and knowledge management. The measures toward knowledge management and capacity building also differ to some

extent. In the case of residential projects, training of local labour force and incorporation of learning that is from the community has been a common area of focus. According to the scholarly critique by Edwards-Fapohunda (2024), the development of communities involves adult education for the inhabitants of the megaprojects. On the other hand, commercial endeavours focus a lot of effort and resources towards employee training on information technology and optimizing business procedures. Deb & Li (2024) pointed out that the workforce has to be skilled for future commercial infrastructure which is using AI, BIM and smart sensors.

It is therefore easy to see why the application of standardized project management methodologies separates strategic execution even more. Kokol [Erkol (2023)] supported the use of PRINCE2 in this complexity since such major construction projects, especially in the commercial sector, have a high requirement for contractual responsibility and paperwork. Residential projects may have more ad-hoc process frameworks which are a blend between the agile and the structured system in view of the objectives and interaction with the community. The issues involving delay and the efficiency reduction are the most strategic ones. Delays in construction projects are common in residential projects in particular because of procedural issues, land acquisition issues and route the community. In his research, El-Wafa and Mosly (2024) noted some of the barriers like contractor constraints and lengthy approval processes as being repetitive . Environment and supply chain disruptions, therefore, affect commercial projects more than the industrial ones. Franke et al. (2022) stressed that satisfaction with the sponsor heavily depends on the latter's involvement during disruptions in commercial undertakings.

Lastly, education as well as teamwork and the communication strategies also substantiate the strategic difference. Fernandes et al. (2021) pointed out that performance within the contexts of project-based learning generally benefits from structured teamwork and is relevant to both sectors but has different expressions. In the construction of residential buildings, teamwork means engaging workers in identifying potential problems and addressing them most effectively and for accommodating the members involved; while as in construction of commercial buildings teamwork may encourage innovation and competitive implementation. Franz and Roberts (2022) demonstrated that the goal congruency, clarity and communication, and conflict management were the important factors that influence commercial project team success. As a result, although the management of the mega-projects residing in residential and commercial buildings is similar in terms of project management processes, it has distinct strategic directions because of difference in aims, interested parties, threats, and contexts. While the residential projects tend to promote the concept of the community with the aspect of affordability and social inclusion, the commercial projects rely on the concept of the ability to perform, by being profitable and as unique as possible. These dynamics indicate that project management should be responsive to these contexts regarding the strategies of typologies as well as types of stakeholders involved to achieve positive outcomes in different global realms.

The increase in the construction and real estate business across the world has called for proper management of mega projects especially in housing and commercial structures. It is pertinent to note that the management of such big projects is facilitated by project management as a field of study. In this case, the application of IS has been established as a key success factor when it comes to the coordination of activities, risk management, and sustainability of mega projects in the international environment. This section provides an understanding of the way that project management operate internationally in the mega projects; especially in terms of the adoption and success of information systems in the residential and commercial buildings.

It is not uncommon to find that mega projects have a higher degree of project risk because of the size of the project, the number of individuals involved, duration of the project and cross national boundaries involvement. This means that there are complicated structures of project management and the application of information systems for harmonization and decision making (Denicol et al., 2021). The London 2012 Olympics is a good example where project facing issues of complexity and system integration was achieved using sound project management methods and integration of efficient information systems (Davies and Mackenzie, 2014). The authors claim that the actual delivery of such mega projects strongly depended on the foundation of the system integration, which, in its turn, indicates that without sophisticated IS the_indx project integration would have been virtually unfeasible.

In residential construction, IS is creatively employed in the management of dynamic risks in the use of materials, human resource, and legal requirements that are compulsory to follow. As elaborated by Dipakbhai et al. (2024), in residential construction project, comparative asessment by using information system facilitates risk management, and more sensitive planning. These systems yield real time results whereby the managers concerned can foresee such set backs as time extension, additional costs and scarcity of resources. The kind of information systems implemented in managing residential buildings is somewhat more accurate compared to commercial construction projects, which are centered on systems interconnectivity and synergies in an organization.

It should be noted that mega-projects in the commercial context are more often associated with the higher degree of systems integration and interrelatedness in terms of its implementation by multidisciplinary teams. Technological, architectural and stakeholder systems which integrate form the crucial back bone of commercial megaprojects according to Davies and Mackenzie (2014). This is in agreement with Duodu and Rowlinson (2021), whereby they concluded that intellectual capital and innovation which are supported through information systems improve performance in construction contracting firms. Some of the IS platforms applied to commercial projects include BIM where one have to involve in constructing building information, ERP and the use of framework of collaborative decision making in line with technological needs of such projects.

This challenges mega project management to adopt to other factors that arise from it, for example; cross cultural affair, differences in the regulation and the logistical details. According to Deb and Li (2024), the intricacies can be effectively dealt with if there is increased human capital enhancement for e-competency. The involvement of IS in the international project does not only simplify project management processes but also helps to fill the gap in knowledge and prepare the workforce. However, in the Residential Construction projects, especially in the regions that are under development, they may not afford such sophisticated tools and therefore there is high probability that they rely in the localized Project management practices and less integrated systems.

Another of the critical issues in the framework of mega projects is sustainability and energy saving. Davarzani et al. (2021) state that, the use of demand response strategies and IS is controlling power consumption and partakes in active distribution management in residential application. Their application in construction projects highly depends on project integration in the construction processes, and they prove how IS can benefit the operation and environmental aspects of the residential buildings. De Lotto et al. (2022) also pointed out the energy communities' appearance and the need to involve technical, legislative, and planning aspects into the commercial building's project management, though primarily in Europe.

Information systems are equally of prime importance to risk management. Warning, according to the paper by Ferede et al. (2021), is one of the most common problems that construction organisations continue to experience, despite the general implementation of qualitative risk management approaches, and that this can be addressed by use of IS solutions. Enterprise systems in residential projects in particular are able to predict and monitor characteristics of risk activities due to the fact that in such projects, the level of risk is higher as orders from the clients may change at any time, funding may not be stable constantly, and so on. On the other hand, IS assists commercial projects in the compliance with environmental and safety standards and KPI for performance per departments (El-Wafa and Mosly, 2024).

It is evident that leadership and decision-making are also involved in the application of IS in project management. According to Arsham (2020), it is evident that the role of IS platforms is to offer timely and accurate data to improve decision-making in the leadership process. This is especially true in commercial buildings because plans and decisions regarding them may need to be made while the construction is ongoing since there is a higher amount of investment at stake. Fokina and Budin Arana (2023) also emphasize that, in the field of project management, the concept of leadership has also changed over the years, due to the presence of information technologies that help to control and facilitate the control and communication as well as decision making processes in the organisation.

In addition, according to Dwivedi and Dwivedi (2021), there is a need to engage all stakeholders to maximize on the successful delivery of a project. IS supports this through check-point communications and documentation, awareness and activity sharing, and knowledge repository system. This is even more important when it comes to mega projectsSPAN across the country as the number of stakeholders may pose a problem towards the overall project coordination. Smaller residential projects are unlikely to have a rigid structure, but IS may still provide value by keeping the records of the stakeholders in an orderly fashion and properly coordinating their communication.

In their financial perspective, Debrah et al. (2022) identify a gap in green finance for green buildings; they stipulate that IS can help address this gap by showcasing savings and improvements in efficiency to the investors. It is relevant for both residential and business construction but in different ways; for the residential construction, the IS can be used for managing energy consumption data whereas in the

business construction, the IS can include other modules, such as financial ones, to track sustainability indicators.

Another facet in which IS positively influences is the ability of project performance prediction. Ezzeddine et al. (2022) extend the implementation of singularity functions and the momentum forecasting within the LPS for forecasting performance consequences. Such methodologies are integrated into the IS platforms and enable managers in the commercial projects to make necessary adjustments strategically. While residential projects may not require depending on such high-stake analytics, it means that even basic preparation, they can have embedded within an easy to use project management system. Lastly, this paper has identified that information systems have a strong impact on the function of project management within the context of international mega projects. Although IS is useful in both the residential and the commercial buildings, the utility and value differ. While residential buildings emphasise more on risk control, energy conservation, and flexibility, commercial building projects are more inclined on systems incorporation, organisation coordination and performance investigation. Both the second and the third modern forces complicate matters, which is mainly insured by the highly developed IS platforms that tend to establish unified procedures, foster communication, and provide support to strategic decision-making. Credence for these differences rooted in the academic literature and pinpoints that mega projects require further development and implementation of IS in the PM process in residential as well as commercial sectors.

4.2.11 Recommendations for effective management approaches for Residential and Commercial Buildings

Management strategies when it comes to the construction and utilization of both residential and commercial structures equally play significant roles in determining the feasibility of the projects, their ability to meet the expectations of its stakeholders as well as the sustainability of the buildings. Some of the managerial challenges familiar to both building types include: stakeholders coordination, risk management and responsibility to compliance with the law Apart from those, there are some key differences between the two in terms of scalability, complexity, sustainability and users engagement. This section highlights and contrast methods of managing residential and commercial construction projects, the current literature is then consulted to offer samples of proper management.

It also important to understand that there exists some differences between the residential and commercial Construction Projects: while the former are normally less complex compared to the latter. Of the two, commercial buildings are often considered to be far much more challenging than residential buildings mainly because commercial buildings are bigger, cost far much more to be constructed, have expanded mechanical and electrical infrastructures and involve more parties than residential buildings. According to Denicol et al. (2021), it is important and crucial which lessons learned for commercial construction complexity can be learned about project management that have strong and adaptive rather than resilient project governance frameworks and the integrated delivery systems. Large construction projects like contracting of business complexes, offices,

hospital facilities or schools involves several contractors and sub-contractors, consultant and experts, ordinances and clients among others. This implies that there is an essential need to facilitate effective communication among these stakeholders, document control, and effective project management information system.

According to Davies and Mackenzie (2014, p.382), the kind of systems integration as found in the Olympic infrastructure, for instance the Olympic city project largely required integrated working of government departments, contractors and private sector players. Indeed, their case study highlights the fact that there is need to involve contractors in the project early enough and integration of systems and hence meeting the set project targets. Such principles are now integrated in to the commercial building projects with the help of BIM, a model which offers a virtual description of a building and its uses. BIM enhances the integration of decisions on project teams and the construction process where BIM is used design and construction phases.

Residential building construction on the other hand is relatively smaller and requires much less complex management techniques than the ones applicable in other types of construction fields. Dipakbhai et al. note that standardisation in construction of residential buildings make it possible to adopt repetitive work flow, and that lean construction management could easily address such work flow. The methods like JIT delivery and value stream mapping and cycles of continuous improvement are beneficial for residential projects to minimize the amounts of waste. These projects also characteristically have less number of stakeholders and therefore the issue of stakeholder management becomes easy. The last difference is about risk management, which is more applied to commercial and industrial projects compared with residential ones. In commercial projects, much more risks are at play than in residential and public ones as the cost of a delay or operation failure is always attractive. This is due to complexity of the systems and the various stakeholders involved where these can give room to miscommunication and contractual misunderstanding, as well as poor coordination. For this reason, business ventures need to have contingency planning, quantitative risk analysis and risk modelling for the commercial projects. It can be observed that various tools such as Monte Carlo simulations or risk registers can be used to assess risks and manage them from the project initiation phase to the closure phase.

While they are not exempt from risks, the risks that are associated with residential projects are more manageable and hence would involve things like cost overrun, delayed due to shortage of material or change of client's demands. The following are some of the risks which can be managed easily through client communication, proper budgeting and managing time. Furthermore, in case of the residential sector especially the power driven housing units, risks in these building projects are controlled in advance through replica of designs, construction techniques and patterns. This is also unique in the level of stakeholder engagement where the public sector's participation in stakeholder engagement is considerably higher than that of the private sector. Bpc refers to the commerci al project participants which include the client, the contractor, financiers, regulatory authorities, facility managers sometimes the public is also involved . This diversity of stakeholders requires the development of a strict stakeholder management plan that outlines all the conceivable

anticipated expectations, methods of communication and reporting and escalation plans. Communication within and between the stakeholders is another crucial element of the project since it is the key to avoiding misunderstandings and boosted trust.

The main actors in residential construction are normally the occupants or owners of the buildings, the builders as well as very little or no involvement from the local authorities. It is more interpersonal and in most of the time, the project managers need to attend to some specific clients' needs and wants. This interpersonal aspect require soft skills such as the ability to understand the clients needs and personality, negotiation and conflict solving particularly in small-scale housing or self-build companies. Problems of sustainability are currently at the focus of attention in construction projects of new houses as well as business buildings, though the strategies may differ. New construction projects are generally more prone to attain the highest sustainability assessment certification BREEAM or LEED compliance and include components like energy use, water efficiency, indoor environment quality and choice of materials. These processes help to achieve the set certifications during the design and construction stages and the monitoring during and after construction as well as providing reports on the same.

Common strategies in the residential construction of the building include integration of efficient energy, insulation, renewable energy, and water. The codes and incentives provided by the local administration can directly influence the use of innovation in putting up of solar tiles, energy efficient windows and low flow water fixtures. Although housing may not sign up for certification to the extent that commercial buildings do, the contributions made by sustainable housing to optimum environmental performance cannot be relegated thereby; this through large-scale projects in developing housing complexes. An example of a difference between residential and commercial projects' financial management is; Typically, financing of the commercial buildings involve different forms of financial agreements that include loans, equity, and on some occasions; PPPs. This is because commercial projects impose many protocols and formalities in the financial management aspect which includes cost control and financial reporting at some period within the project duration. It can be used to determine the estimated return on investment, analyse and predict cash flow and properly distribute the resources at the developers' disposal.

It is conceived that residential building projects especially those that would be undertaken by individual homeowners or small scale developers are less complex regarding financial structures. Nevertheless, the aspect of budgeting, especially in instances where the concerned home is constructed using this method, requires considerable attention if unnecessary expenses are to be averted. The other factors that determine the level of financial success for any residential construction are market factors, the location of the construction and time required to complete the construction.

Thus, it becomes critical to understand that the types of maintenance and different facility management strategies employed in the two building types after the construction stage are different. As with other buildings, communication and control involve structured facility

management services usually outsourced by different commercial buildings to specialized firms. Services that are may be offered include heating, ventilation and air conditioning, elevator maintenance, physical security, sanitation and waste disposal. To enable this happen, an effective maintenance management policy that focuses on preventative maintenance and reinforced by Computerized Maintenance Management System (CMMS) enables the prevention of system breakdowns and increase in the item's useful life. On the other hand, maintenance of the commercial buildings is the uptown that of the owners of the buildings or managers of the buildings. Inspection and maintenance activities are not very complicated hence require local management and can be planned for. But in cases of such complex buildings as multi-unit residential structures or housing estates, there may be hired professional property management companies to maintain consistency and proper efficiency of the services.

Overall, it is often seen that the commercial buildings excel in the aspect of technological integration. If any commercial building project today is to be implemented, it can contain sophisticated features like smart building systems, IoT sensors, the energy management and control platform, and the integrated security program. They bring improvements in operation and control, energy management, as well as comfort of the occupant. For instance, the incorporation of AI, machine learning algorithms in the building management systems can foster predictive maintenance, intelligent light control, or instantly monitor occupancy of a building. Smart technologies are already evident in residential structures especially in new constructions implemented in various building designs. Some of these are the smart thermostats, systems that recognize voice, and much more including lights and security system. Although not very advanced when compared to commercial building technologies the technologies used in residentials are centred on convenience, safety, and energy.From a risk management point of view Dipakbhai et al. (2023) state that the typical characteristics of residential construction are dynamic risks which include changes in the price of material, scarcity of labour, and contract losses due to unfavourable site conditions. Strategic risks also exist for commercial buildings because of the magnitude of investment and the time span of between three to five years, hence, the need for modelling, contingency plans, and contractual risks transfer (Ferede et al., 2021). Therefore it is apparent that dynamic risk assessments are critically significant for residential procedures but on the other hand commercial procedures work best if risk governance procedures are systemic.

Project delay is still a major factor that affect both building types, but the factors that lead to such delay are not the same. El-Wafa and Mosly (2024) noted that contractor related delay has financial management, planning and communication as its indicators in both sectors but often impact on the commercial sector than on infrastructure since contractors involved deal with many other sub-contractors and are often pressed with tight time constraints. According to El Khatib et al. (2021), enhanced levels of emotional intelligence correspond well with enhanced project outcomes in project managers especially interacting a diverse stakeholder environment such as in commercial builds.

In addition, leadership and decision-making behavior has significant impact on the project success. Arsham (2020) states that managerial leadership is anchored on participative decision making and clear' vision, which are easily implementable in small-scale vigorous residences. Duggal (2024) also makes the distinction between leadership and management as leadership motivates while management plans for its implementation. As for the large commercial parties and interdisciplinary activities, the shift between transformational and structuring leadership together with the use of methodologies such as PRINCE2 (Erkol, 2023) is more suitable.

The authors Dwivedi and Dwivedi (2021, p 213) noted that the analysis reflects higher significance of stakeholder alignment in various angles and types of commercial projects as compared to development projects because of their complexities, and high public profile. On the other hand, the number of stakeholders engaged in a residential buildings' construction is normally much fewer, for example; the clients and the local planning authorities and therefore managing the stakeholders is easier although plays extreme roles in determining customers satisfaction. Edwards-Fapohunda (2024) explores community engagement as an effective tool in the management of socially-conscious housing projects, the only very few of which can be deemed successful.

Sustainability is another area in which the management approaches must become different. Commercial buildings are major advertised projects for green standards and energy efficiency since they are conspicuous and financially profitable in the long run. Franco et al. (2021) recommend strong polices in green building within cities which concerning usually refer to commercial buildings. While they are often smaller, scale-based initiatives, residential programs are very important for making a significant effect on the volume of emissions in large cities. Debrah et al. (2022) discovered a green finance lack which shows that further specific financial instruments for the construction of residential building are needed for improving energy efficacy.

According to Davarzani et al. (2021) with regard to energy management: Consumer demand response measures including smart meters and energy saving by the consumers will improve the distribution network. Such strategies are less used in commercial projects in which energy systems are controlled by building management systems (BMS). According to De Lotto et al. (2022), they can additionally enhance both building types from the point of view of infrastructure and supportive policies.

The last but not the least recommendation involves expanding on intellectual capital in order to encourage innovation. According to Duodu and Rowlinson (2021), there is a positive correlation between IC, which is skills, knowledge, and relationships, and innovation and performance in construction firms. Commercial buildings are, almost always, more exigent in their needs and hence may demand more in training and developing the human capital. Two studies cited in Deb and Li (2024) emphasize the need for upskilling the workers in the United Kingdom The given recommendation could not be more relevant to the teams that operate within the sphere of commercial project management.

The techniques used in the project planning also vary on efficiency when practiced in residential and commercial projects. Ejiofor and Ovat (2023) continue and ascertain that sound planning enhances the level of performance in infrastructure projects. This applies to both sectors but more crucial for commercial projects because the identified methodologies such as PRINCE2 are highly complex (Ejiofor, 2023). On the other hand, the nature of the agile form of working may suit smaller residential developments better due to the ability to make changes during the project's life cycle.

Another way that defines the management strategies of residential and commercial building projects relates to team performance and collaboration and. Regarding what is best for the team outcomes, Fernandes et al. (2021) appeared aiming at embracing scrum based methods in which they pointed out that iterative feedback loops for residential construction are very effective. Such are more often associated with more contacts with the client, the shift of tastes, and certain site-specific exigencies. Therefore, the methodologies like Scrum offer the right level of openness to experience the changes that happen from time to time. Revisit, sprints, and other cases help to maintain its orientation to clients and stakeholders, as well as to guarantee timely and cost-effective accomplishment of established objectives.

On the other hand, commercial construction projects entail more extensive collaborations and often have larger facilities; they, therefore, utilize quite different collaborative instruments and approaches. Franz and Roberts (2022) have investigated ten successful climbing teams and provided an overview of specific features of a good team in construction across both building types. These are trust, communication, accountability and expectations and roles understood and agreed on. As it was found out by their studies, the principles which are at the root of the teamwork does not change but the approach taken might be quite different depending on the given project. For example, it is normal for commercial project to have official project management systems and communication channel hierarchy in order to standardize and synchronize the coordination with many professional fields.

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constructed, have expanded mechanical and electrical infrastructures and involve more parties than residential buildings. According to Denicol et al. (2021), it is important and crucial which lessons learned for commercial construction complexity can be learned about project management that have strong and adaptive rather than resilient project governance frameworks and the integrated delivery systems. Large construction projects like contracting of business complexes, offices, hospital facilities or schools involves several contractors and sub-contractors, consultant and experts, ordinances and clients among others. This implies that there is an essential need to facilitate effective communication among these stakeholders, document control, and effective project management information system.

According to Davies and Mackenzie (2014, p.382), the kind of systems integration as found in the Olympic infrastructure, for instance the Olympic city project largely required integrated working of government departments, contractors and private sector players. Indeed, their case study highlights the fact that there is need to involve contractors in the project early enough and integration of systems and hence meeting the set project targets. Such principles are now integrated in to the commercial building projects with the help of BIM, a model which offers a virtual description of a building and its uses. BIM enhances the integration of decisions on project teams and the construction process where BIM is used design and construction phases.

Residential building construction on the other hand is relatively smaller and requires much less complex management techniques than the ones applicable in other types of construction fields. Dipakbhai et al. note that standardisation in construction of residential buildings make it possible to adopt repetitive work flow, and that lean construction management could easily address such work flow. The methods like JIT delivery and value stream mapping and cycles of continuous improvement are beneficial for residential projects to minimize the amounts of waste. These projects also characteristically have less number of stakeholders and therefore the issue of stakeholder management becomes easy. The last difference is about risk management, which is more applied to commercial and industrial projects compared with residential ones. In commercial projects, much more risks are at play than in residential and public ones as the cost of a delay or operation failure is always attractive. This is due to complexity of the systems and the various stakeholders involved where these can give room to miscommunication and contractual misunderstanding, as well as poor coordination. For this reason, business ventures need to have contingency planning, quantitative risk analysis and risk modelling for the commercial projects. It can be observed that various tools such as Monte Carlo simulations or risk registers can be used to assess risks and manage them from the project initiation phase to the closure phase.

While they are not exempt from risks, the risks that are associated with residential projects are more manageable and hence would involve things like cost overrun, delayed due to shortage of material or change of client's demands. The following are some of the risks which can be managed easily through client communication, proper budgeting and managing time. Furthermore, in case of the residential sector especially the power driven housing units, risks in these building projects are controlled in advance through replica of designs, construction techniques and patterns. This is

also unique in the level of stakeholder engagement where the public sector's participation in stakeholder engagement is considerably higher than that of the private sector. Bpc refers to the commerci al project participants which include the client, the contractor, financiers, regulatory authorities, facility managers sometimes the public is also involved . This diversity of stakeholders requires the development of a strict stakeholder management plan that outlines all the conceivable anticipated expectations, methods of communication and reporting and escalation plans. Communication within and between the stakeholders is another crucial element of the project since it is the key to avoiding misunderstandings and boosted trust.

The main actors in residential construction are normally the occupants or owners of the buildings, the builders as well as very little or no involvement from the local authorities. It is more interpersonal and in most of the time, the project managers need to attend to some specific clients' needs and wants. This interpersonal aspect require soft skills such as the ability to understand the clients needs and personality, negotiation and conflict solving particularly in small-scale housing or self-build companies. Problems of sustainability are currently at the focus of attention in construction projects of new houses as well as business buildings, though the strategies may differ. New construction projects are generally more prone to attain the highest sustainability assessment certification BREEAM or LEED compliance and include components like energy use, water efficiency, indoor environment quality and choice of materials. These processes help to achieve the set certifications during the design and construction stages and the monitoring during and after construction as well as providing reports on the same.

Common strategies in the residential construction of the building include integration of efficient energy, insulation, renewable energy, and water. The codes and incentives provided by the local administration can directly influence the use of innovation in putting up of solar tiles, energy efficient windows and low flow water fixtures. Although housing may not sign up for certification to the extent that commercial buildings do, the contributions made by sustainable housing to optimum environmental performance cannot be relegated thereby; this through large-scale projects in developing housing complexes. An example of a difference between residential and commercial projects' financial management is; Typically, financing of the commercial buildings involve different forms of financial agreements that include loans, equity, and on some occasions; PPPs. This is because commercial projects impose many protocols and formalities in the financial management aspect which includes cost control and financial reporting at some period within the project duration. It can be used to determine the estimated return on investment, analyse and predict cash flow and properly distribute the resources at the developers' disposal.

It is conceived that residential building projects especially those that would be undertaken by individual homeowners or small scale developers are less complex regarding financial structures. Nevertheless, the aspect of budgeting, especially in instances where the concerned home is constructed using this method, requires considerable attention if unnecessary expenses are to be averted. The other factors that determine the level of financial success for any residential

construction are market factors, the location of the construction and time required to complete the construction.

Thus, it becomes critical to understand that the types of maintenance and different facility management strategies employed in the two building types after the construction stage are different. As with other buildings, communication and control involve structured facility management services usually outsourced by different commercial buildings to specialized firms. Services that are may be offered include heating, ventilation and air conditioning, elevator maintenance, physical security, sanitation and waste disposal. To enable this happen, an effective maintenance management policy that focuses on preventative maintenance and reinforced by Computerized Maintenance Management System (CMMS) enables the prevention of system breakdowns and increase in the item's useful life. On the other hand, maintenance of the commercial buildings is the uptown that of the owners of the buildings or managers of the buildings. Inspection and maintenance activities are not very complicated hence require local management and can be planned for. But in cases of such complex buildings as multi-unit residential structures or housing estates, there may be hired professional property management companies to maintain consistency and proper efficiency of the services.

Overall, it is often seen that the commercial buildings excel in the aspect of technological integration. If any commercial building project today is to be implemented, it can contain sophisticated features like smart building systems, IoT sensors, the energy management and control platform, and the integrated security program. They bring improvements in operation and control, energy management, as well as comfort of the occupant. For instance, the incorporation of AI, machine learning algorithms in the building management systems can foster predictive maintenance, intelligent light control, or instantly monitor occupancy of a building. Smart technologies are already evident in residential structures especially in new constructions implemented in various building designs. Some of these are the smart thermostats, systems that recognize voice, and much more including lights and security system. Although not very advanced when compared to commercial building technologies the technologies used in residentials are centred on convenience, safety, and energy. From a risk management point of view Dipakbhai et al. (2023) state that the typical characteristics of residential construction are dynamic risks which include changes in the price of material, scarcity of labour, and contract losses due to unfavourable site conditions. Strategic risks also exist for commercial buildings because of the magnitude of investment and the time span of between three to five years, hence, the need for modelling, contingency plans, and contractual risks transfer (Ferede et al., 2021). Therefore it is apparent that dynamic risk assessments are critically significant for residential procedures but on the other hand commercial procedures work best if risk governance procedures are systemic.

Project delay is still a major factor that affect both building types, but the factors that lead to such delay are not the same. El-Wafa and Mosly (2024) noted that contractor related delay has financial management, planning and communication as its indicators in both sectors but often impact on the commercial sector than on infrastructure since contractors involved deal with many other sub-

contractors and are often pressed with tight time constraints. According to El Khatib et al. (2021), enhanced levels of emotional intelligence correspond well with enhanced project outcomes in project managers especially interacting a diverse stakeholder environment such as in commercial builds.

In addition, leadership and decision-making behavior has significant impact on the project success. Arsham (2020) states that managerial leadership is anchored on participative decision making and clear' vision, which are easily implementable in small-scale vigorous residences. Duggal (2024) also makes the distinction between leadership and management as leadership motivates while management plans for its implementation. As for the large commercial parties and interdisciplinary activities, the shift between transformational and structuring leadership together with the use of methodologies such as PRINCE2 (Erkol, 2023) is more suitable.

Based on stakeholder engagement, Dwivedi and Dwivedi (2021) state that stakeholder management is more important in the commercial-projects due to their complexity and high profile nature. On the other hand, the number of stakeholders engaged in a residential buildings' construction is normally much fewer, for example; the clients and the local planning authorities and therefore managing the stakeholders is easier although plays extreme roles in determining customers satisfaction. Edwards-Fapohunda (2024) explores community engagement as an effective tool in the management of socially-conscious housing projects, the only very few of which can be deemed successful.

5 CHAPTER 5: CONCLUSION

Conclusion

The research has found that it is important to have a clear understanding of how the two areas of construction are different from each other especially concerning residential and commercial building projects management. Such differences may include differences in the complexity of projects, level of involvement of the stakeholders, cost factors, levels of sustainability, and operational expectations that are vital in defining the best approach likely to be viable in construction type in place. From the above-discussed aspect of residential and commercial construction project management, it is crucial to emphasize the notion of a tailored approach to achieve the targeted result. The first difference between the two categories is quite apparent in the level of difficulty of projects required in each field. Commercial buildings involve complex activities due to their size, the number of parties involved, the amount of money used in the project and special mechanical and electrical requirements. Delivering a commercial building or commercial real estate is a systematic process of engineering, designing, and executing, which exactly follows legal requirements, compliance norms, and sequential and interrelated processes. Project of this nature call for project management practices, sound decision-making approaches

and appropriate systems of cost control. These elements are crucial to keep the project schedule integrity and to ensure that hundreds of activities interrelated to construction works are well co-ordinated. Residential construction projects are also less large or large format and also less complex as compared to commercial construction projects. These projects mostly require simple methods of construction; fewer and standardized building systems; and in most cases,fall under fewer restrictions than the commercial ones. In the case of residential projects, the structure is less complex and so the system adopted is more liberal in that it can allow for alterations or modifications as per the changing situation. Such freedom enhances efficiency because decision making is shifted closer to the project teams and where it targets personal client needs. Some of the ways through which construction management increases efficiency and effectiveness include lean planning and streamlined communication in the residential construction.

Stakeholder engagement is another important factor that sets residential and commercial construction apart. In the commercial projects, the number of stakeholders and the kind of stakeholders involved in the project is much larger. Some of these constituencies include investors, government, architects, engineers, contractors, facility managers and the public. Due to the involvement of multiple stakeholders, there are several areas of conflicts in interest, coordination of goals and objectives besides communication challenges in commercial projects. Commercial construction management can be regarded as the process that requires particular success factors, such as the effective reflection of stakeholder management strategies to enhance cooperation and reduce conflict.

On the other hand, residential constructions will involve a few people such as the homeowner, the developer, and the construction team. However, the number of stakeholders is less than that of non-residential ones, and they are more deeply interested and engaged emotionally personally in the living projects. People who own homes, therefore, may have predetermined desires and standards on the style, use and even stature of their homesteads. This requires relationship-oriented motives with regards to stakeholders where managers have to build a rapport, communicate frequently, and be receptive to customers. One of the most important aspects that need to be controlled is stakeholders' expectations and their needs should be met in the residential construction project.

Risk management is one of the essential elements of construction project management that may differ depending on the building types, residential or commercial. The business ventures are vulnerable to a variety of risks as indicated below: In light of the factors related to commercial developments as presenting significant investments and certain characteristics, any hitches, cost increase or non-compliance liabilities can be profound. In commercial construction, risk management entails a projection of the risk, an evaluation of such risk and coming up with measures to prevent its occurrence. In an effort to avoid risk while delivering a project, these management plans must be sound and instituted right from conception and sourcing for resources, during the launch and even up to the completion of the project. In, for example, construction of residential building, risk is comparatively more specific to the project andoged. Some of the

ordinary risks are scarcity of materials, labor unrest, adverse weather conditions, and client changes in requirements. Though not always financial, these risks may slow down the overall project completion date and affect [esoler: the client satisfaction levels in a similar way as the financial losses encountered in conventional business ventures. Hence, it is crucial for residential project managers to be knowledgeable and adapt to the practical risk management tools needed to attend to on-site issues while enhancing essential near-adjudication. Flexibility is the other area where a contractor is expected to achieve quick control over his/her project; this is vital in residential construction as it is characterized by many unanticipated challenges that crop up.

Nowadays, sustainability and environmental elements are rather essential characteristics of the construction that can relate to both residential and commercial spheres. However, here the signification of the concept of sustainability is different from that in each of the other contexts. The commercial establishments are operated according to the environmental laws and are generally required to possess high levels of sustainability. This encompasses setting efficiency goals in the use of energy, reduction targets in wastes produced, and adoption of renewable energy systems. Sustainability is primarily defined by compliance with the regulations required by the government and industrial standards, but may also entail planned corporate and social responsibility, and increased competitiveness in the market. The sustainability standards such as green certifications and environmentally considerate designs are viewed as features that could add value and appeal to the commercial assets. In many sectors it is slowly becoming an issue within the residential sector to focus more on the issues of sustainability although more emphasis tends to be placed on factors of cost and functionality. Today's homeowners and people who want to build their own home, consider the factor of energy efficiency as crucial for a comfortable living, cost savings and for the betterment of the environment. The homeowners are increasingly demanding the use of eco- friendly materials, energy conserving electrical appliances and insulated walls in constructing residential facilities. Nonetheless, the level of sustainability that organizations adopt in their construction projects depends on their available budget and the legal requirements in the region. It is therefore evidence that management of residential construction must also factor sustainability without compromising the financial impacts.

Computer technology has revolutionized procedures of carrying out different construction projects right from planning to overseeing the progress. In commercial construction, advanced technology is always involved in aspects such as Building Information Modelling (BIM), project management software and analytical tools, among others. These tools facilitate the co-ordination, accuracy and supports data analysis for better decision making. There are the use of IT to plan for activities, monitor projects, adhere to deadlines and models developed in the construction of the commercial projects. Electronic construction business is revolutionizing the delivery process of commercial construction in ways that are hard to ignore. Technology is similarly advancing in the use during residential construction construction in the areas of design, communication, and customer relations. Virtual home designs and reality, as well as client virtual tour, and smart home technologies are such tools that are helping the client and at the same time aiding better service

delivery. Technology is also being used to enhance construction site management, time, and works progress, quality assurance, among others. As to the technological aspect, it is important to say that residential construction, unlike commercial construction, does not involve high levels of application of complex technological systems; nevertheless, there is a trend to incorporate simple yet efficient and relatively cheap technologies, which positively affects clients' satisfaction. Managing leadership and team in residential and commercial construction is a critical success factor for any client. Organizational projects are complex since they involve various activities that demand enhanced leadership, supervision, coordination of people from different disciplines, and operations in complex financial and legal systems. Leadership in commercial construction is beginning with a vision as well as ensuring effective communication, conflict-solving, and certainly to get consent from the involved people. Since a project establishes a team of workers from outside the company as well as from different organizations or departments of the same company, it is the responsibility of the project leader to set common core values among the team and ensure that the team is working cohesively towards the achievement of project goals.

In the residential construction, leadership is more tactical in managing the working processes, the quality of services and controlling relationships with the clients. The project managers have to be able to engage themselves physically, availability and timely to respond to their teammates and the clients. In the leadership approach communication is more personal, people care more about creating the trustful environment, keeping the proper communication with others, and solving the arising problems. Professional and skilled construction leaders allow themselves to understand the needs of their clients, to have the ability to change and make various adjustments to finish the construction project as per the set time, cost estimates, and meeting the satisfaction of those involved in the project.

These two aspects of cost and time are major success factors in relation between organizational structure of both sectors. Budgeting and scheduling are two other crucial factors that cannot be overlooked in commercial projects especially since these are estimated to take some time and are expected to cost some significant amount of money. Big budgets and timelines imply great attention to details and planning at different stages, management of resources and keeping track of work progress. That is why it is imperative that delays or costs over running especially in large projects, which can significantly affect the viability of the project and the confidence of the stakeholders. Hence, it is veritable that commercial project managers need to impose stringent costs control measures, negotiate well with the suppliers, or contractors and provide corporations with adequate informations. Just like large projects, it is also significant to keep an eye on the cost as well as time expectations in the residential projects also. The clients use most of the times, limited amount of money and have specific time estimates they want their projects to be completed in. Thereby, cost overruns or delays can be an output that has a direct influence on the satisfaction of the client as well as on the profitability of the project. Richard is going to analyze the ways how project managers residing in residential buildings have to regulate expenditures, purchasing of

materials, and project advancement. Proper time and appropriate use of finances are critical factors if one has to succeed in the building of residential facilities.

Therefore the management for the residential and commercial construction projects needs to understand the prospect and challenge that emerged from two different sectors. Though there is a significant organizational demand, scheduling, planning and use of technology requirements in the commercial build projects, residential projects are far more fluid, tactually client oriented and would require more one on one interaction. Two that before decimalization benefit from effective risk management, stakeholder management, and sustainability while the latter before decimalization more focused on effective risk management, client management and sustainability. It can therefore be considered that the future of Construction project management rests on the progressive application of these specific approaches to clients, regulates and the environment's demands. Avocado tree kpmg as the industry grows, such lessons are useful in developing good practices that could be adopted from residential and or commercial to construction management at a small scale or large complex or even customarily built commercial buildings where one could define complexity from the number of rooms, floors, design differentiations and additional services and features. The effective management of the construction process in the private and public sector, the awareness of modern technology in project management and the genuine interest in the client's needs will set up the successful, sustainable and client-oriented managers for success.

It is evident that the construction industry, whether focusing on residential and commercial buildings, has evolved over the last few decades. These developments have been catalyzed by developments in the society such as changing needs and wants, concerns over sustainability, heightened stakeholder pressure, and Information technology breakthrough. This research work has also compared the management practices for residential and commercial construction, analyzed some of the practices, and consider how technology has influenced the outcomes. This concluding chapter recapitates the work that has been done, reflects on its significance, and presents the key lessons for construction practitioners, government officials, and scholars. The first significant differences compared in this analysis are the level of complexity in residential and commercial construction projects. Despite the similarities of having a conceptual and operational framework, their implementation differ in terms of specificity, scope and the number and kind of stakeholders that are often involved in a commercial project such as investors, corporate clients, and regulatory authorities among others expected to get value added through use of the constructing built form. Thus, the higher level of project complexity requires proper management of such processes, better communication and more effective risk management tools. On the other hand, the management of residential spaces is even more standardized and predictable, yet they cannot do without innovative solutions and approaches and need to be managed using flexibility due to the instability of the specific market circumstances and individual customer requests.

Effective management in both sectors hinges on careful stakeholder management. The study points out the fact that while engaging stakeholders it should be done continuously and more so not fit

into the calendar approach. First and foremost, non-opaque communication, the possibility to participate in decision-making processes, and effective cooperation all enhance the level of trust between individuals and organizations. The structure of work and the communication with large number of stakeholders that may have opposing interests when working on a commercial project make the usage of SC and DCT highly effective. On the other hand, residential construction projects involve direct correspondence with the homeowners hence offering what they need or want that reduces complaints afterwards. Risk management has also turned out to be another crucial area that could define major the success of failure of a construction project. Construction risks are generalized into several categories which include; financial, operational, environment and reputation risks. More specifically, risk management in commercial projects employs risk prediction models, legal actions as embodied in the contracts between contractors and sub-contractors and legal requirements in the management of risks. Choosing residential projects as the type of projects is more conservative in terms of value at risk although this segment is characterized by operation risks such as disruption of supplies, problems with labor force and issues related to planning. So one of the findings of this study is the need to embrace dynamic risk management frameworks that are capable of being adjusted based on the real-time dynamics. Combining these frameworks with the assistive technologies boosts their applicability on trending findings since digital gadgets offer real-time statistics.

Sustainability assurance has gradually emerged as a significant component of construction management. Nonetheless, there is growing pressure on both the residential and commercial sides to produce environmentally friendly buildings. Nonetheless, positive influence for sustainability goals varies with implementation of measures between the two. Commercial running initiatives may embed the management of sustainability goals in their corporate social responsibility plans and policies or to meet green accreditation schemes. Such types of constructions are more likely to have installed energy efficient systems, use sustainable material and innovative construction methods. In the residential sector, sustainability initiative is usually a result of buyers' choice and reduction of costs like efficient electrical appliances or utilization of installations for solar energy. This research confirmed that successful sustainability is most effective when realised during the project planning, design, construction and operational phases.

The study has also highlighted many more useful technologies in the organization and management of project planning, coordination, execution, and post construction operations. BIM, scheduling application, mobile application, and cloud-based applications are now almost essentials in any contemporary construction process. These tools allow detailed planning, less failure, communication and efficiency, and real time evaluation on the efficiency of the project. These technologies can be employed effectively into the commercial projects since these are large and complex in most cases. Specifically, the capability to simulate different micro construction conditions and control vast amount of information is crucial in such cases. Why, residential projects utilize these tools to enhance the level of precision when designing, to reach out to clients, and minimize the time and cost needed to finish the construction. One of the critical areas

elaborated on in this research is leadership and management of teams for effective project delivery. The construction leadership defined as individuals who possess technical skills and also people skills the ability to communicate with workers, feel for workers, and think well under pressure. In constructing a commercial building, leadership roles are not limited to project director, site manager, and other coordinators of subcontractors. It allows delegating important responsibilities, being simultaneously possible to control attended subordinates, but presupposes accurate definition of roles and responsibilities. Self-organizing work in residential projects is less common as these are usually led by a project manager or a contractor. Irrespective of the organizational structure, promoting an organizational culture that enhances safety, respect, and learning-based behavior is imperative in enhancing the efficiency of the team.

Financial control and cost estimate are also vital component in construction project management. The commercial projects are funded more elaborated than the non-commercial projects and they are usually established on higher budget. Another area of financial management that prevails in such projects is cost estimating, value engineering, and cash flow management. Over-budget and time delayed consequences such as early investor lose confidence and unsustainability of the idea are some of the consequences that can be brought about by Delays or overspending. Residential construction finances are usually smaller, but the attention to budgets is still paramount, because such construction involves private individuals or small construction companies. A lot of attention should be paid to such points as financial transparency and clear contracts as they help to decrease the chances of conflicts and increase the possibility of completing projects within the scope of financial expectations.

Pertaining to quality assurance and compliance, the studies carried out in this research has been emphatic. Construction work involves a number of regulations, articles and standards irrespective of construction type, this is for safety standards, structural engineering and legal aspects. Regulations are thoroughly applied in commercial construction, especially due to the interaction with a public zone, extensive population capacity, and functioning peculiarities. As for the residential projects, the codes remain the same, but the quality of completing is at different level due to contractor difference and restricted sources of funds. These issues have however been effectively managed by the provision of digital inspection tools and standard operating procedures with regard to the quality of the project phases. Another area is post construction operations and facility management where both, technology and strategic planning are valuable. Non-residential structures such as corporate buildings, retails, business, and industrial buildings need constant maintenance, control of energy consumption, and the management of occupancy. Accurate and real-time performance records of equipments, scheduling of maintenance, energy consumption are some of the crucial matters where integrated facility management systems are effective. In constructed buildings type, the post construction activities far as related more to warranty, customers' satisfaction, and maintenance schedule. This way, both the sectors are dependent on digital documentation as well as centralized system which more and more assist in the issue solving as well as tracking of assets.

A common feature of this investigation is the fact that the importance of agility and innovation is steadily increasing. It became for several years evident that construction companies and industries, in general, have been reluctant to novelties and innovations; however, changing market tendencies and the advancement of technology have made this adaptation inevitable. Leveraging on innovation, training and development of employees, and organizations' operative flexibility are factors that equip companies for responding to the contemporary difficulties. In principally, this may include testing the application of modular construction or having smart buildings in commercial projects. This may be applicable in the immensely by incorporating home automation in homes or applying prefabrication in residential places. Construction management of the future is built on the concept of enhancement and embracing change as the best innovation strategy. After reviewing the findings of this research, it is evident that, although there are distinct differences between schematic, size and social relations of residential and commercial construction projects, these projects have underlying commonalities in their management. Long-term relationships, efficient communication and planning, use of modern technologies, and concern for quality and the environment are not limited by the field. It means that the relations of the principles are rather flexible and depend upon some features of project type and context in which it is implemented. There is potential of technology, especially the growing trend in the technological advances to erase most of the previous gaps in construction practice.

For construction professionals it has many implications. This way, improvements in technological trends can be monitored, cross-functional competencies developed and proactivity in stakeholder relations can be useful in increasing success in project. Based on the analysis to the current constraints in the construction industry for policy makers there is need to encourage innovation through endorsing policies that support research on sustainable construction and funding research and development, drive enforceable legislation and coming up with encouraging policies on sustainable and innovative constructions. For the researchers, extension of the study to existing and future technologies, cross-country comparison, and the assessment of impacts of the project over a period will be of immense value in the context of construction management. In the end, the construction industry finds itself at an important juncture that requires a considerable amount of attention to be paid to the systems used in it. The growing impact of climate change, globalization and urbanization as well as economic inequalities entail more appropriate, reliable and visionary constructal approach. In a way this research contributes to that vision by pointing out good practices, the centrality of technology and the constant processes of learning and change. The outcomes support the pragmatic postulation that construction does not solely entail developing structures, but also establishing environments that can be effective, adaptive and accommodative, particularly in the current and future society.

Therefore, it can be concluded from this research analysis that, while both the residential and commercial construction projects are managed based on similar administrative principles, they require different approaches to implementation because they are different in terms of size, complexity, stakeholders' expectations and long-term goals. Such disparities show that it is

necessary to adapt kinds of construction management strategies with regard to the nature and requirements of the given kind of project. However, it must be noted that both the domains set out common values of communication, planning, technology utilization and embracing and maintaining quality and sustainability. From this study, there is considerable understanding on how these principles are proactively enhanced and follow suit to form the overall construction project environment. When dissecting the findings of this study, project scale and complexity turned out to be significant characteristics of construction management. As the construction of commercial purposes is generally related to large scale including the development of numerous offices, shopping m als, and industries, additional complex PM structures are required for those types of constructions. These projects are generally cross-sectional and encompass corporate clients, municipal councils, regulatory boards, and several contractors. This doing requires employment of complex stakeholder management strategies and organisational cooperation, communication, and networking. Residential projects are vice versa, have less number of people involved, and in most of the cases definite procedures. But they also stand to gain efficiency from a structured management where issues to do with time, costs, and outcomes regarding the clients are of utmost importance.

The third significant concept discovered in this study is the awareness of stakeholders. Both the internal and external stakeholders work collaboratively for construction projects; nevertheless, the levels and types of interaction may vary between these two types of construction projects. Definitely, in commercial projects, there exist countless numbers of stakeholders, and their interaction is constant and normally channeled through official means of communication. It involves raising capital from investors, organizing for the right zoning approvals and considering safety issues in the work done, and ensuring that the construction and planning meet business objectives. Stakeholder engagement seems to be easier in residential projects; however, homeowner's, communities, and developers involved in the projects bring the social factor into play. For personal satisfaction, one has to have empathy, clear guidance of his expectations at an individual level, and accountability throughout the construction procedure. In the case of people, technological integration can be seen as the most or one of the most unifying issues in construction management that affect both the residential and the commercial sectors. Technologies such as BIM, project management software, scheduling software, and other real-time collaboration systems have significantly changed conventional practices. In the commercial contexts, technology aids in the coordination of complex scheduling, monitoring and evaluation of other key performance indicators and overall inter-org communication across wide networks of people and large diverse teams. Technology in residential construction involves aspects such as enhanced design process, capability to deliver unique design solutions to customers, and more efficient construction process. There is also effectiveness and convenience in tracking the project's productivity, finances, and quality assurance in relation to digital tools that can reduce risks and causes of project delay. Sustainability and environmental issues are now focal in construction management due to change in consciousness of people and firms, as well as regulatory requirements and customer demand. Today, housing construction, as well as the construction of

other buildings, including commercial ones, are required to include elements of sustainable design, lighting, and materials. The commercial development is subjected to tighter regulatory controls and public attention, which makes them implement a broad sustainability strategy. One of the advantages of having fewer large projects is that residential projects provide the chance of applying green measures that would directly improve people's lives through such features as clear indoor air and efficient use of resources. In both circumstances, the approach of using sustainable and reliable sustainable methods in construction planning is non only good for the environment but also profitable throughout the long run.

The fourth element of construction management is quality assurance and control. Regardless of whether constructing a business block or a house for one's family, there should not be any compromise when the standard to be achieved is set. This paper also reveals that the way of handling quality might qualitatively differ depending on the type of projects and the expectations of clients. Residential projects, on the other hand, are mostly non-conforming to formal quality assurance systems and third-party inspection services since the civil projects do not abide by strict building codes and legal requirements. Residential projects on the other hand may require substantial use of builder experience, client feedback or periodic inspection to enable achievement of positive results. Still, both sectors require strict proactive measures in the quality management to prevent rework, maintain the customer's confidence and safe delivery. On the scale ofoutsourcing, cost control is the factor that stands out as central to every aspect of building structures and habitation and/or business spaces in the context of residential and/or commercial construction. Although, the role and position of finantial supervision is totally dissimilar. Business related projects are usually associated with much larger funding than any other project, more funding sources and substantial reporting system. Achieving this involves cost controlling in terms of identification, assessment to risks and indeed, value engineering. Compared to other kinds of projects, residential projects are less of a budget therefore means that excess costs are not easily accommodated as they are in commercial projects. In the case of homeowners and smaller developing firms, financial stability is paramount implying that their spending should be well outlined and every expenditure monitored meticulously. Whether big or small, however, all these financial issues contribute to the project success as well as the client satisfaction.

There is also an implication of flexibility and adaptability in construction management as this research shows. It is important to note that projects are generally vulnerable to change singularly by weather condition, supply chain or a client's needs changing. Due to the capability of these changes to cause disruptions, managers have the responsibility of dealing with it in a responsive and efficient manner but without affecting the quality of the project. In general, in commercial construction adaptive management can refer to rearrangement of the time table, alteration of the contractual terms or shifts of resources. In residential construction, flexibility may be defined in terms of changes made to the constructed plan or alteration of site plans with other conditions encountered on site. The need to be proactive in dealing with change is very important especially when implementing change since it will help to sustain the forward movement and ensure that

output is achieved. Leadership and collaboration also determine the outcome of the project. E.A strong leadership sets the direction, encourages teamwork, addresses issues and assumes responsibility. Large scaled commercial projects require hierarchical leadership as per the designation assigned to an individual. It requires the project managers to effectively manage both the project and the people in the setting though most of the time the settings contain a very large workforce. Contrary to commercial construction, leadership in the residential construction might be more involved and have more contact with the client. Sometimes it has a hierarchical structure while at other times it's more flat, nevertheless, leadership is key to wanting productivity, reduced friction and embracing improvement. The activity of regulation is another significant factor that has an influence on the construction activity. With respect to buildings, planning restrictions, fire code, environment protection code and labor laws and other regulations both at local, regional, and national level needs to be followed for commercial as well as residential projects. While there are similarities between the general codes for both residential and commerce buildings, these codes are relatively strict than in general commercial buildings due to risks involved and the fact that they are used by the public in most cases. It encompasses the aspect of documentation, inspection, as well as timely interacting with the authorities. Despite these regulations, one-party residential project experiences relative deregulation in comparison to commercial initiatives. However, there are negative effects that come with lack of compliance in line with the regulations which affects both sectors, where negative impacts range from delays, fines among others.

In the next sections, it becomes clear that nowadays the construction industry prepared for further evolution. New generation technologies like Artificial intelligence and robotics and advance data analytics will only enhance the construction processes in the near future. The next phase of develop of the smart systems and constructions and sustainable systems for buildings will form the basis of how buildings are constructed and used. Such a shift requires not only skilled employees with years of experience in construction, but people who are proficient in using modern technologies and are able to think beyond the projects in front of them. For the future years, people will require to engage themselves in continuous learning, professional development, and collaboration with industries. The implications of this study are far-reaching for any construction professional. Maintaining close relations with other functional disciplines, being aware of the tendencies in technology, and having a client-oriented approach are the critical factors for managing reality in construction today. It is for this reason that professionals require mastery in technical competency and professional competencies such as leadership, team work, risk management skills and bringing value on the project. They also should agree with the idea of continuous learning and continuing to develop ones' skills through training, certification, and industry participation. In general, the research implies that there is a need to create proper conditions that would promote innovativeness, sustainability and the development of the personnel. This comprises funding of education and skill development initiatives, cutting on bureaucracy in the green sector and encouraging the use of green technologies. It can be noted that the primary function of the policymakers is to steer the course of the construction business as well as facilitate conditions for its growth, stability, and fair

operations. Through the process of insisting on policy changes within their organizations, they can facilitate the opening of new opportunities as well as the creation of positive change.

From the analytical perspective, this research has provided ideas for further research to the researchers. Comparing between different regions, between different market segments, and across different cultures shed light on how the construction management practices may develop in the given environment. Such studies that were able to follow through with project development over a period of time would reveal trends and practices that are most effective. Ironically, more than ever there is a requirement for more cross disciplinary research to close the gap between the engineering and management discipline and the social sciences to solve the multifaceted problems within the industry. Therefore, the construction industry is currently sitting on the precipice of significant opportunity. The demands of technology advancement, natural constraints and changes in the society have forced the construction industry to pursue cooperation management. This study also helps in that endeavor because it also points at best practices, discusses the role of technology, and stresses on the dynamic nature of the approach. Whether it is a house or a business premise, the aim in construction is not only to put up structures but to put up places that are safe, efficient, and fit for use in the rapidly growing society. To move ahead, the Clinton administration has to work with other branches of the government, come up with new approaches to American foreign policy, and have equal cooperation from the president.

From the research undertaken, it can be noted that while both residential and commercial construction are founded on common principles of managing construction and construction projects, they are differentiated based on the scale, level of complexity, expectations of the stakeholders and long terms goals of the construction projects. The said variances emphasize on need to ensure that the construction management strategies used for various construction projects reflect the kind of nature as well as challanges that are inherent in each type of project. However, there are basic concepts such as communication, planning, use of technology, the ethos of quality, and assessment and accreditation, which do not differ from one another between both domains. Nonetheless, what can be seen from the present research is the way these principles are applied and modified to configure success in a vast array of construction projects.

Altogether, it is completely comprehensible that there are remarkable and significant effects of the project's size and its complexity on the management of construction projects as determined in the current study. As is the case with many construction initiatives involving buildings, significant structures such as business undertakings such as business premises, commercial marts, and industrial establishments require elaborate project plans. Most of these projects implented include a large number of layers which especially comprises of corporate entities, municipal authorities, regulatory agencies and other contractors. This implies that managing such relationships as well as the facilitating activities imply rather complex stakeholder management and effective communication. On the other hand, residential building projects take less time and the problems in the construction process are simple and there are few people involved in the project hence the process in the construction of residential buildings is mechanical. But they also derive relatively

large benefits from such realistic frameworks that minimise time overruns, control costs and focus on customers. Based on this research, two more important themes are evident; that of engagement of key stakeholders. Although both types of construction projects demand cooperation with internal and external partners, the degree and kind of interactions are dissimilar. In commercial projects, stakeholders are engaged and involved in the current project process throughout the project life cycle and there are proper channels of communicating with them. This involves the processes of reaching out to investors, obtaining necessary permits from the local authorities on zoning and safety, and engineering the architectural design and construction in a way that would be in line with the business vision. In residential developments identification and involvement of stakeholders may appear more unproblematic, but the attitude of single homeowners, members of the community, as well as developers, may differ greatly. This is in relation to the earlier discussed components of making sure that at a personal level clients are satisfied by ensuring that there is empathy in their communication, clear communication of the expected changes and timelines.

The cross-sectional study identified information technology as the common factor that is currently affecting construction management in the two sectors. Techniques such as Building Information Modeling (BIM) administration tools, project management software, automated scheduling tools and many more have changed the traditional ways. In the course of contracts, technology assists to monitor the complex structures, monitor productivity, and assists in organization of a large number of employees working in different locations. Technology can be used to enhance the degree of precision in designing, to be able to tailor the projects according to the clients' requirements, and in order for the construction to be more responsive to the clients' needs. Technology also facilitates better tracking of time, estimates, and quality which reduces chances of having risks and delays.

Sustainability and environmental responsibility have become almost a fundamental concept to be realized in the construction management following improvement in concern for climate change and improved pressure by the regulating authority and the society. Both residential and commercial construction work have now realized the importance of being environmentally friendly in different works, for instance, the kind of designs and materials to be used. Due to the higher levels of regulation and possibly visibility that commercial development projects have, many of them work on implementing strong and ambitious sustainability frameworks. Despite the fact that residential buildings may be smaller in terms of their occupancy and surfaces, there is a great potential to work on appropriate measures in some spheres, for example, the internal environment quality, the degree of energy efficiency of individuals, lighting, etc. In both cases, sustainability in the construction plan helps in meeting global policy goals while also improving the economic value in the long run. Pertaining to the outline, quality assurance and control are other critical aspects of construction management. No matter what the project – a large commercial building or a house construction, the people's expectation and standard to be met are high. The research reveals that in the organization, there may be some differences regarding the approach to the quality management based on the scope of the project as well as the expectations of stakeholders.

Professionial construction projects usually implement quality control and reviews and hire outside inspectors to ensure that various contracts and building codes have been fulfilled. Residential works, on the other hand, may use builder experience, clients' feedbacks, and occasional appreciations on the quality results. Nevertheless, both sectors have to discover techniques for effective implementation of preventive measures in order to avert costs and negative customer reactions requiring reassessment and loss of much-needed time and capital, not to mention safety issues. Looking at it from a business prospective, cost control can be seen as an essential component of the construction of homes as well as business properties. Nonetheless, the role and characteristic of financial supervision is quite distinct. Commercial projects larger expected revenues, multiple financing and strict accounting and showing financial records are rigorously needed. To successfully deal with these sources of funding, cost control, cost estimation, and risk analysis are crucial in form of value engineering. Residential projects by comparison are relatively smaller in scale and budgets can be more constrained or at least managers are less able to afford over expenditures. For the owners and the small developers, the requirement, which is most important is that the expenditures and incomes should be clear and the expenses cannot be exceeded beyond their control. In any case, financial management determines the outcomes of the project and clients' satisfaction to a considerable extent.

It also shows that the ability of construction management to shift from one form of structure to another is highly significant. The occurrence of changes is always expected since they can be occasioned by issues such as changing weathers, failure to secure some materials, or changes in the clients' directions. These changes have to be managed and addressed quickly and sufficiently by the managers without straining the project. In commercial construction, adaptive management usually can be translated as the change of schedule, contracts or resources. In the context of housing, flexibility might refer to variations in requirement specification or deviation in physical conditions of the site. Again, it is crucial to have the capacity to prepare for, and manage change in order to keep up with the pace and produce results that are expected in an ever-changing environment.

Leadership and team coordination are the other factors that determine the project success. Leadership is response, responsibility and determination of ways groups should work, solve issues and address problems. One on one leadership is common in commercial projects because of the large scale of most of the projects, and the fact that different individuals in the project will be assigned different roles and responsibilities. It becomes the duties of these managers to both plan and implement project, provide direction and supervision to a large number of workers. As for leadership, it is likely to be more of a working type demanding direct communication with the client in the case of constructing houses. No matter the kind of organizational structure, leadership, strong performance, conflict resolution, and learning are achieved.

This factor is attributed to the fact that; The regulatory environment also plays an important role in influencing construction practices. The properties, whether commercial or residential should be constructed in conformity to the state and national and/or regional laws that govern zoning, safety,

environmental as well as social legislation regarding the working and living conditions. There are specific regulatory requirements for the commercial building demand more and become stricter because it involves greater risks and usage by the public. To maintain its compliance there should be proper papers and records kept, continuous assessment and correct approach towards the authorities. While the residential projects are governed by certain laws and regulations the approval procedure is less complicated. Nonetheless, failure and returning results which do not conform to regulation standards has its cost in both sectors by way of time consumption, fines, and damage to reputation. Therefore, in the future the construction industry should be prepared for further changes. The use of applications of Artificial intelligence, Robotics, and big data analytics in construction is expected to take higher levels of efficiency in the future. The incorporation of smart systems and sustainability into buildings will change the ways of creating, constructing, and managing buildings. Such shifts require workforce that embraces neophyte construction practices coupled with the applicable digital tools and planning for the future construction. Technology update, capacity building, and partnership shall be the key factors that can help the business to stay relevant in the future.

Thus, for construction professionals, the results of this study are rather thought-provoking. To manage the challenges of the contemporary construction environment, it is possible to recommend the following strategic directions: the construction of cross-functional competencies, the focus on the innovative technologies, and the client-oriented approach. Besides, technical skills, there is the need to develop behavioral competencies, conflict management skills, problem solving abilities and good human relations skills to enable professionals to lead people, manage risks and deliver value added. Lifelong learning should be promoted by the professionals and they should aim at going back and get trained, certified, and get involved in continuance learning activities. Lastly, from the above conclusions, it can be deduced that the government should create the conditions to fuel innovation and sustainability, as well as address the issues affecting the local workforce. This could involve spending in education and training of personnel's, reduction of onerous regulations, and encouragement of the use of environment friendly equipment and systems. They help to determine priorities of the construction industry and create environment that would guarantee its sustainable development and fairness. This shows that policies when promptly implemented to reflect the industry's current status help in the unlocking of opportunities and efficient ground changes.

From the aspect of the researchers it presented several angles that can be taken in future research studies. Comparative analysis across the region and across the various classes of construction market consumers help to get more profound understanding of how construction management practices develop depending on some conditions. Studies that follow up project evolutions throughout the project lifecycle would enable the revelation of patterns in improved practice and changes in trends. There is also a need for more cross-disciplinary activities that try to unite engineering, business, and social sciences to address the issues that are current in the industry.

To conclude, the construction industry is at the crossroads as it is set face an unprecedented challenge in the years to come. Recent years witnessed increased development both in technologies, environmental concerns and social accountability that can only be met by a more enhanced and sensitive approach in construction management. This work adds to that process by defining best practices for the process, asserting the importance of professional technology in it, and remembering that change will always be necessary. No matter whether the construction is for a suburban house or big business complex, the most important indicators for the construction work are to produce not only spaces but secure, environmentally friendly, and relevant to people's needs spaces. Thus, the way forward is work, cooperation, creativity and common practice in compliance with high standards.

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