

**EMPIRICAL INVESTIGATION ON PROFESSIONAL
NEGLIGENCE OF CONSTRUCTION
PROFESSIONALS**

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DECLARATION

I do hereby declare that this work has been originally carried out by me under the guidance of Dr. Chandanie Hadiwattge, lecturer in Building and Economics, Department of Building and Economics and this work has not been submitted elsewhere for any other Degree.

I declare that no material previously submitted for a degree or diploma at any university is included in this dissertation without proper acknowledgement. Except where appropriate reference is provided in the following, it does not contain any content that has already been published or unpublished by another individual.

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ABSTRACT

The construction industry is complex and involves several activities. The construction industry and projects are linked with time, cost, and quality constraints to ensure project performance. Although the application of complexity science to the construction sector has not received much attention for professional negligence, there is evidence that the construction process might be viewed as a complex system in and of itself. Therefore, the complexity and scale of the construction projects often leads to professional negligence. This research aims to investigate the impact of professional negligence on construction project performance while developing a framework to overcome professional negligence in the construction industry. The research utilises a mixed research approach with five expert interviewees and 249 questionnaire survey respondents obtained in the Sri Lankan context. Both the Relative Important Index (RII) and content analysis was used for the quantitative and qualitative data analysis respectively. Findings reveal that poor design with negligent supervision is the highest possible reason, while carelessness and insufficient information on documents are the second highest possible reasons for professional negligence. Furthermore, the findings reveal that four interviewees have accepted that there is a significant impact of professional negligence on project performance, while one interviewee stated that there is no such impact. A model was developed using the findings of the research, including strategical mitigation approaches for the avoidance of professional negligence, and increasing project performance in the Sri Lankan construction industry. The study recommends industry experience, minimising additional claims, zero accidents, avoiding negligence, and quality of deliverables to support the professionals in the construction industry to increase the project performance. Developing connectivity among pre- and post-contract teams, obtaining professionals with relevant educational qualifications, and use of effective communication channels are proposals for the development of project performance while minimising professional negligence. Research into a legal framework to address pre- contract and post- contract dispute resolutions, possible strategies to overcome professional negligence in the Sri Lankan context need more insight. Findings from the study can

be used by construction professionals to better understand how professional negligence impacts the construction industry.

Keywords: Construction Industry, Project Performance, Professional Negligence, Sri Lanka

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LIST OF ABBREVIATIONS

BIM	- Building Information Modelling
BOQ	- Bill of Quantities
CIDA	- Construction Industry Development Authority
GDP	- Gross Domestic Product
GNP	- Gross National Product
MEP	- Mechanical, Engineering, and Plumbing
RII	- Relative Important Index
SPSS	- Social Sciences Statistical Package

1.0 INTRODUCTION

1.1 Background

The construction industry can be known as a major contributor to the economic improvement of a country (Bielsa & Duarte, 2011). The performance of construction industry is critical to any country's socioeconomic growth and social welfare. Ordinarily, it presents a substantial portion of the Gross Domestic Product (GDP) and Gross National Product (GNP) of the economy. The construction sector alone has contributed 3.9% in 2018 to 3.0% in 2021 towards the overall GDP in Sri Lanka (Department of Census and Statistics, 2021). However, evaluating the importance of the construction sector to the economy is a complex and challenging fundamental task (Athukorala, 2019). The emphasizing of the impact of construction on economics is a critical point to ensure because it is a high superiority for government plans. Besides, it accommodates multiple backward and forward linkages such as, providing infrastructure, technology, machinery, engineering services, and professional opportunities (Han, Park, Ock, & Jang, 2014). Hence literature suggests having separate experience and expertise in projects.

Professionalism in constructions is a compound of necessary derived actions of professionals (Kakkar, et al., 2015). This is essentially reported with their work responsibilities e.g., dynamic demonstration of the traits of professionals (Simmons, McCall, & Clegorne, 2020). In addition, the level of professionalism can be estimated by how effective one is in the job, and it can decide how others view a person. Construction projects work out reputed professionals to take individual administration methods to archive project goals, present with the specialists' specialised roles. From the project professionals' viewpoint, the term "success" described, the project is completed with the lowest possible cost as quickly as possible, with the highest quality, with no accidents, etc. The term is also described as bringing the project performance indicators such as, cost, labour productivity, schedule, quality, safety, materials consumption, or waste, etc. to an optimum (Navon, 2005).

A growing discipline called building engineering tries to handle to novel challenge of growing complexity in construction projects. Hence, it is the duty of these construction industry professionals; architects, engineers and quantity surveyors to use all

reasonable skills, care and diligence and demonstrate their knowledge in accordance with the industry's current professional standards. The aspects of the professions, as currently known, are a disciplined association of individuals who adhere to excellent standards. This association places itself as occupying specialised expertise and skills in a widely accepted body of learning derived from research, education, and training at a high level. The public takes it as such. A profession is also qualified to apply this knowledge and practice these skills in the business of others (Patten & Saunders, 2018).

There is a duty of care between professionals and their employers. If the duties are breached, that is called Professional Negligence. The purpose of care is a public law method where the client imagines a level of professionalism and standards commonly held by those in the profession (Laws, 2019). Moreover, "negligence", as that word is generally recognised by professional negligence, and as is usually guided in the records of professional bodies, does not mean simple carelessness. It provides a more definite meaning. "Negligence" is a failure to act within the band of qualified actions open to a hypothetical eligible member of that profession in those circumstances.

Even though the construction contracts have legally binding contracts between parties, by general law, they are liable to tort/delict if any wrongful action occurs. The most common wrongful actions in construction are professional negligence (Ferorelli, et al., 2020). Under the law of delict even without proof of fault action, the defendant is liable under strict liability concept which is mostly applied in the situation of vibration effect during the construction stage. Further, there is an occupier's liability which is frequently applied in the construction sites (O'Farrell, 2019). A tort is an accumulation of civil law assistance restraining an individual for recuperating harms/damage for discomfort and difficulty, which have been caused by the activities. In Dutch Roman law, a tort is called a Delict. Delict and Tort cover the law of negligence and personal injury. Negligent Tort means a tort performed by failure to act as a reasonable person to someone to whom she/he owes a duty (US Legal, 2019), as expected by law under the conditions. It permits somebody to legitimately get down on somebody about their careless conduct and make them pay up for the harm/damages. These laws apply when somebody unreasonably causes another person to endure hurt or misfortune because of their activities or absence of consideration.

Further, there is a concept called vicarious liability where the employer is liable for his employee's fault which happens within his employment course. Therefore, the contract with the employer does not cover all the obligation owns to the project and each party is having delicta liabilities to perform while executing the project.

The ones who are accountable for the damage and loss caused to their client due to the professional's carelessness are the construction experts along with other experts. Even though the starting point in any expert negligence claim is to weigh whether the injuries in the contract are recoverable, the liability in tort becomes essential in situations where the contractual route is unavailable, one of the parties has become cleft, classification of practical transactions results in no direct contractual relationship between the parties or the limitation period of contract has expired (O'Farrell, 2019).

However, every careless act or fault on the part of a professional does not falls under liability in negligence. For a claim in negligence, a set of requirements are there to satisfy by the claimant i.e. continuation in the law of a duty of care, a practice that falls below the standard of care forced by law, a causal relationship between the defendant's conduct and the damage, and damage happening within the scope of the duty.

Professional negligence is identified as a major and an increasing area in law where many of the clients seeks advice. All professionals owe a combination of contractual, tortuous, statutory, and fiduciary duties to their clients as well as tortuous duties to third parties. Most of the construction projects face the lack of knowledge available that must be overcome with the inter-knowledge sharing method (Landaeta, 2008). However, it may result in reinvention, time overrun, and the occurrence of errors. Project performance is affected by client satisfaction, financial indicator, and project effectiveness (Chinowsky, Taylor, & Di Marco, 2011). Therefore, higher connectivity with the closeness and the social networks ensures the good performance of the construction projects (Castillo, Alarcón, & Pellicer Armiñana, 2018). Accordingly, public nuisance in the construction sector has not address much effective manner providing guidance for the work. Construction performance has been challenged by the different practices of the community.

1.2 Research Problem

The professionals in the construction sector are people who have completed academic training and are certified to provide guidance in the industry (Nadeem, Sohail, & Mohammad , 2009). These professionals include architects, land surveyors, estate surveyors, structural, mechanical and quantity surveyor engineers etc (Oladapo, 2006). However, negligence is the imposition of liability in the form of damages for injury brought on by fault.

Professional negligence is subset of general negligence laws that applies when the defendant has portrayed himself or herself as having above-average talents and abilities. Therefore, a professional individual is qualified to provide his service at the appropriate level of ability and knowledge when he considers himself qualified in a specific professional field in the building sector. Therefore, the public has a right to expect from him the standard level of expertise customary to the typical person performing the said profession. The professional is accountable for contract violations or negligence if his performance standards are not met, and a loss result (O'Farrell, 2019).

Sri Lanka is a country which is currently operating numerous construction projects, but it is identified they frequently experience delays and are not finished according to the schedule (Sivarajah, 2021). However, the project success mainly depend on the caliber of the product, on time completion, and working according to the budget (Sivarajah, 2021). Since the Sri Lanka's construction sector expands quickly, a shared attainable target must be reached in these projects by the stakeholders (clients, contractors, and consultants) in order to increase the customer satisfaction and meet the stated financial goals which are the results of the three main project management goals, i.e. time cost and quality (H. Doloi, 2012).

Many studies done in the past have identified the factors of construction projects which will contribute to neighbourhood social sustainability (Almahmoud & Doloi, 2020) and factors affecting the success or the failure of the project for making decisions in implementing the construction projects (Pyeon, Park, Jung, & Park, 2020). However, further researching in this area it is identified, not having a proper planning for the contractor, mistakes during the construction and weather conditions are as the reasons for time delays in construction projects in Sri Lanka. Furthermore, since there was a

lack of criteria and systemic approaches to find the effect of professional negligence on the construction industry, limited research done in past and no any recent researches done to address the causes of carelessness in construction project performance in Sri Lanka. The literatures based on other countries shows different arguments on the actions of professionals and its impact on the project performance. Hence with the boosting of construction sector in Sri Lanka, it is necessary for professionals in the building business to analyse negligence. Furthermore, through a good assessment the causes of carelessness can be determined and mentioned by allowing industry professionals to recognize numerous causes of negligence.

1.3 Aim

This main aim of this research is to investigate the impact of professional negligence on construction project performance.

1.4 Objectives

- Critically review the nature and impact of professional negligence in the construction context with special reference to its impact of project performance
- Explain the job roles of key professionals in the construction projects with special reference to the significance of act with duty of care
- Determine the instances vulnerable to professional negligence in the construction industry
- Evaluate the impact of Professionals Negligence on construction project performance
- Demonstrate the mitigation measures for Professionals Negligence by construction professionals

1.5 Scope and Limitations

The scope of the study is limited to building construction projects, which were situated in the Western province of Sri Lanka. The study will examine the impacts of professional negligence on construction professionals, but it will be limited to the Western Province of Sri Lanka.

The project will be conducted within certain geographical limitations and the survey distribution will be limited only to a sample size which is based on a quota sampling technique. Another major limitation is the limited time availability of construction professionals, which means it limits the data collection on an interview basis. It is a challenge to collect necessary data relying upon the negligence of professionals in the Sri Lankan context since it is highly related to legal concerns.

1.6 Research Methodology

This research is consisting of the literature review chapter and the research methodology followed with the analysis and the concluding chapter demonstrating the research findings related to professional negligence in the construction sector. All the chapters of the research are consisting of the interconnectivity to the research problem.

A mixed method approach is used in performing the research, including quantitative and qualitative approaches. Data was collected using a structured questionnaire distributed to engineers, architects, and quantity surveyors. Semi- structured interviews were conducted with contract experts for primary data collection. Secondary sources such as publications, books, articles, reports, and conference proceedings were used for a better understanding of the theoretical background.

The study uses a judgmental sampling technique for the selection of expert interviewees and simple random sampling for obtaining responses to the questionnaire.

The Relative Important Index (RII) is used as a tool for quantitative analysis and further used the Social Sciences Statical Package (SPSS). Quantitative data analysis was done using manual content analysis.

1.6.1 Literature Review

To identify the research gap, and the theoretical aspects of the project performance and the professional negligence, a comprehensive literature survey was carried by referring to journals, books, articles, conference proceedings, and reports and addresses the first objective of the research.

1.6.2 Preliminary Interviews

Semi-structured interviews will be conducted with professionals (Quantity Surveyors/Engineers) to compare the literature findings and to find out additional information regards with professional negligence. These findings will be used to conduct the questionnaire survey thereafter.

1.6.3 Questionnaire surveys

A comprehensive questionnaire survey will be conducted to analyse the impact of Professional Negligence on construction project performance and through the findings, develop a framework consisting of mitigation measures of professional negligence.

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter is developed with the problem identification, aim, and objectives of the research presented in the previous chapter with the background survey. This chapter discusses the importance of professionalism and the impact of professional negligence towards project performance in the construction industry focusing on the local context. Furthermore, key stakeholders and the impact are discussed to obtain a critical discussion on the major aspects that are affecting the project performance. This chapter is developed with the secondary data collected from books, journals, research papers, conference proceedings, and unpublished dissertations. The literature review chapter provides the foundation for the research problem to develop and identify the key variables affecting professional negligence and project performance.

2.2 Construction Industry

In a general context, the term ‘construction’ can be defined as the activity of fabricating physical infrastructure, superstructure along with other related facilities (Ibrahim, Roy, Ahmed, & Imtiaz, 2010). Accordingly, Onat and Kucukvar (2020) stated that the construction industry could be considered as the upcoming and most dynamic industry that can influence the global economic growth and evolution of societies considerably in the future. On a similar argument, Kuragu, et al. (2016) elaborates that the construction industry has a high potential to affect the economy of all nations in the world. Besides, the global construction market has demonstrated steady growth despite the global economic crisis (Han, Park, Ock, & Jang, 2014). According to Oxford Economics (2015), the construction markets in Asia and other emerging economies will demonstrate a fast growth rate due to factors e.g., rising population, fast-growing urbanisation, and steady economic growth in these economies. The Ibrahim, et al. (2010) further stated that the construction industry is highly influencing the move towards increasing the living standards of economies by implementing infrastructure projects e.g. roads, and irrigation works along with housing schemes, schools,

hospitals, ports, railways, airports, and other related construction facilities that are empowering the development of a nation.

Construction projects can be mainly categorised under two areas i.e. (I) engineering and (ii) building where most of the research has been carried out based on this classification focusing on the improvement of construction projects in these two areas (Gurmu & Aibinu, 2017). According to Ijigah, et al. (2013), the construction industry caters to the erection of permanent or temporary structures to provide shelter, which is identified as the second main necessity of life while addressing the dynamism of livelihood in every type of economy. However, as illustrated by Ijigah, et al. (2013), the high growth of urbanisation and the related quest for housing needs have resulted in increased activity levels in the built environment leading to numerous environmental impacts that can be directly linked with the human activities involved with construction projects.

Accordingly, Bambang, et al. (2016) stated that a defined set of teams need to work in conjunction to coordinate and cooperate throughout the entire lifecycle of a construction project in large building projects to achieve the end objective of successful completion of the project. Bambang, et al. (2016) further stated that these teams can be comprised of the client, design team including architects, the contractor responsible for the physical construction, and subcontractors along with contractors specialised in maintenance work. Similarly, Gurmu and Aibinu (2017) highlighted that multi-storey building projects require large teams compared to typical construction projects due to the complexities associated with multi-storey building projects. However, a clear comparison between different types of building projects cannot be conducted properly since different projects have varying qualifications that distinguish them from each other (Gurcanli, Bilir, & Sevim, 2015). Accordingly, the use of several subcontractors by a single principal contractor to complete complex projects can be identified throughout the world due to difficult engineering service requirements (Gurmu & Aibinu, 2017). According to Ming, et al. (2017) in multi-storey construction projects, special design factors including the envelope of the building, space orientation, and the selection of building materials need to be considered

comprehensively. Furthermore, a narrow research area will benefit the readers and future researchers for better conclusions.

The infrastructure sector is involved with physical structures that are related to roads, bridges, harbours, railways, bridges, and facilities intended for waste management, energy generation, extraction of minerals, and telecommunication needs (Manley & Chen, 2015). Accordingly, Zhang, et al. (2020) identified infrastructure construction as the main component in the construction industry that impacts the outputs and processes of manufacturing and other industries by providing required facilities to provide connectivity, logistics, and means of transportation. Further, Zhang, et al. (2020) stated that the services provided by the infrastructure projects are vital for the output generation of tourism and commercial industries alike. In a different context, Pawar, et al. (2015) highlighted that infrastructure projects can rarely be standardised due to the unique characteristics of different projects. However, this unique nature of infrastructure projects provides different advantages for other industries leading to improved quality of social and economic aspects while the infrastructure development directly contributes towards GDP (Manley & Chen, 2015). The authors further emphasised that this factor has resulted in significant involvement and investments by the government and the private sector for infrastructure development. Therefore, each construction project must be handled with special care and consideration to specific details (Pawar, Jain, & Patil, 2015). Similarly, Manley and Chen (2015) stated that due to the complex nature and uncertainty associated with infrastructure projects compared to building projects, a proper collaboration between stakeholders is highly essential for project delivery to be successful. The civil engineering construction sector is a combination of a vast number of professionals and stakeholders with higher vulnerability. Hence, the research problem has excluded the civil engineering sector by only focusing on the building sector in Sri Lanka given the time constraints.

According to Silva, et al. (2018) in times of economic booms and growth stages, the construction industry performs a crucial role in the economy by its contribution towards total output generation as well as the job opportunities created for the construction workers, especially in the developing countries like Sri Lanka. The GDP

of Sri Lanka is highly influenced by the construction industry due to the high capital involvement and the construction output (Ramachandra, Rotimi, & Rameezdeen, 2013). Therefore, Sri Lankan government needs to undertake necessary measures to prioritise the investments in the construction industry to facilitate the economic growth of the country along with the optimum usage of the construction sector aspects (Ramachandra, Rotimi, & Rameezdeen, 2013). Further, Jayasena, et al. (2013) emphasised the need for the government of Sri Lanka to address the issues in the construction industry to optimise the industry in the face of rising pressures from the global economic conditions. However, the impact of political pressure on construction projects can be identified as one of the main factors influencing the development of the Sri Lankan construction industry (Halwatura & Ranasinghe, 2013). Despite the lack of technology and political intervention, the value-added component of the Sri Lankan construction industry has increased by 3.1% in the year 2017 due to the contribution of many residential and mixed development projects along with infrastructure development (Liyanage, Waidyasekara, Mallawaarachchi, & Pandithawatta, 2019). Athapaththu and Karunasena (2018) showed that the trend of using technology can be used to address the rising demand for sustainable buildings within Sri Lanka, despite the lack of sufficient sustainable construction practices in the present context to address the demand. Furthermore, Madushika, et al. (2018) elaborated on the importance of gathering all the relevant stakeholders together before the construction phase commencement. Adding to a similar note, Athapaththu and Karunasena (2018) stated that all the employees engaged with the industry must be provided with the necessary education and training to be familiar with practices that are relatively new to the Sri Lankan construction industry. The construction industry is a collaboration of teams known as stakeholders supporting the outcome. The inputs of the stakeholders and the professional inspiration have a great impact on the betterment of the industry.

2.3 Stakeholders of the Construction Sector

Generally, a construction project is revolved around different stakeholders from numerous sectors who are bound on a contractual level to perform stipulated roles and responsibilities within the contract period (Rosayuru, Waidyasekara, & Wijewickrama, 2019). According to Perera, et al. (2016), a multi-stakeholder engagement procedure is followed in the Sri Lankan construction industry. Therefore, a common platform can be developed to integrate ideas, improve communications and relationships among different stakeholder groups with different interests in a construction project (Goh & Rowlinson, 2015). Similarly, Prabhu (2016) stated that proper communication and interactions between different stakeholders are largely responsible for the achievement of objectives in a construction project. Moreover, most of the ongoing construction projects in Sri Lanka at present have involvements with numerous foreign contractors as well as investors as major stakeholders (Illankoon, Tam, Le, & Ranadewa, 2019). Accordingly, the main stakeholders involved in a construction project can be identified under internal and external stakeholder categories where the internal stakeholders e.g., clients, contractors, and consultants are highly involved with the decision-making process in a construction project (Prabhu, 2016).

2.3.1 Client

One of the main objectives specified in every construction project is to meet the expectations and varying demands of clients in terms of quality and function while ensuring the project is delivered at an affordable cost to the client (Oke & Aghimien, 2018). Accordingly, Praveen, et al. (2011) identified that meeting the requirements of the client within the time, cost, and quality parameters depends on the collaborative performance of skilled labourers and their skills and training. Moreover, the client has numerous procurement types to consider for the project where the proper selection can facilitate the achievement of project objectives (Rubasinghe, Disaratne, & Mahinkanda, 2019). Accordingly, the government, as the largest client within the construction sector of Sri Lanka, uses a separate procurement method based on the advantages e.g., high accountability and transparency (Rosayuru, Waidyasekara, &

Wijewickrama, 2019). Moreover, the clients in the construction industry are mostly involved with numerous claims and conflicts with other professionals in the industry based on delays in payments, failure to respond promptly, application of cost overruns and extensions of time, and issues related to improper project scheduling (Jaffar, Tharim, & Shuib, 2011). Therefore, Dissanayake, et al. (2012) emphasised the need for contract documents in the construction industry since clients gain the power to partake in necessary legal actions against other professionals for poor work performance during the contract period. Accordingly, Jaffar, et al. (2011) identified the common sources leading to disputes in the construction industry e.g., variations, time extensions, payment, quality-related issues, technical specifications, availability of information along with unrealistic client expectations and administration.

2.3.2 Contractor

Tendering can be considered as the process undertaken in the construction industry to choose a suitable contractor to conduct the physical construction work of a project (Wimalasena & Gunatilake, 2018). Accordingly, most of the clients in the construction industry tend to select the contractor requesting the lowest contract sum as the main contractor for a project (Senaratne & Jayarathna, 2012). However, according to Dolage and Pathmarajah (2015), the selection process must be done carefully since inadequate performance by the selected contractor can lead to delays and other issues in construction projects. However, a common practice in the construction industry followed by main contractors is delegating the works to subcontractors (Dolage & Pathmarajah, 2015). Moreover, many contractors in developing countries complete construction projects with the aid of trade credit, accrued expenses, and differed payment schedules to overcome financial complications involved with a construction project (Fernando, Hosseini, Zavadskas, Perera, & Rameezdeen, 2017). The construction industry of the Sri Lanka is following the ISO standards as the most common quality management system to ensure the quality (Senaratne & Jayarathna, 2012). In another context, Rosayuru, et al. (2019) stated that the contracting organisations must ensure the innovative growth of their companies to stay within the competition in the industry. Moreover, foreign investments are offered to many local construction projects as the government is ensuring that donor countries are

contributing towards the infrastructure development in the country while being conditioned with several contracts e.g., the selection of foreign contractors with high-profit margins (Dolage & Pathmarajah, 2015).

2.3.3 Consultant

The consultant is a professional involved with a construction project from the initiation to the post-completion stage (De Silva, 2011). Therefore, the consultant is burdened with responsibilities e.g., efficient design development and sustainably constructing and maintaining the built environment (Karunasena, Rathnayake, & Senarathne, 2016). However, Senarathne and Rasagopalasingam (2016) emphasised that the contracting party on a higher scale compared to the consultants experiences a high workload and the resulting stress levels. Accordingly, consultants are expected to provide freedom to the contractors in their work by bearing the risks (Karunasena & Gamage, 2017). Moreover, in the Sri Lankan context, consultants are also held liable for delays in a construction project due to the absence of advanced engineering design software, delays in documentation and drawings, poor communication, and coordination (Dissanayake, Gobidan, & Kesavan, 2015). Similarly, Wang, et al. (2011) stated that consultant-related delays could occur due to delays in valuation and certification of works done by the contractor based on the interim payment certificate. Therefore, consultants are expected to avoid delays in reviewing and approving documents and designs while building up knowledge of technical staff to improve interrelations between contracting parties to ensure the successful implementation of professional roles to determine the project's success (Dissanayake, Gobidan, & Kesavan, 2015).

2.4 Roles of Professionals in Construction Projects

Due to the peculiar nature of construction activities, the involvement of specialists is incorporated under several professions. Besides, Simmons, et al. (2020) claim that the competencies and attributes related to professional practices are generally considered under soft skills and direct technical roles. However, based on the team concept of a construction project, all the key professionals related to the industry have an immense impact on the primary project constraints (Mensah & Knight, 2017). Nevertheless, the

roles of different professionals mainly rely on the procurement path, which is adopted for the project (Kent & Gerber, 2010). However, Ibem, et al. (2011) mention that the role of key professionals who are the Architect, Engineer, Quantity Surveyor, and Project Manager is rather constant in every project.

2.4.1 Role of Quantity Surveyors in Construction Projects

Among the primary disciplines, which guide the construction industry, Quantity Surveying can be identified as one of the major practices in the sector (Olatunji, Sher, & Gu, 2010). According to Ameh and Odusami (2010), the major roles of Quantity Surveyors are revolved around the concept of cost management. Accordingly, Olatunji, et al. (2010) state that the key practices of a Quantity Surveyor are to conduct building measurements and BOQ preparation. After the preparation of BOQ and initiation of work followed by tenders, Quantity Surveyors should assess the ongoing work with the previously prepared estimates (Chong, Lee, & Lim, 2012). Additionally, Quantity Surveyors conduct many professional practices e.g., preliminary estimation and feasibility studies, and cost schedules concerning the project specifications (Olatunji, Sher, & Gu, 2010). Further, Wao (2015) admits the importance of quantity surveying professionals for the process of quantifying resources that are considered under the categories of materials, plants, and workers. Besides, Olanrewaju and Anahve (2015) claim that Quantity Surveyors play a key role in providing cost advice to clients and other relevant stakeholders in managing the efficiency and effectiveness of project cost management. Olanrewaju and Anahve (2015) further state that Quantity Surveyors are the primary professionals in governing the project according to the contractual obligations. However, Wao (2015) states that the professional practices relevant to Quantity Surveyors have emerged with the developments and upgrades in the construction industry. A QS's responsibilities include managing the contractual and financial administration of building projects (P, J, & Lomax, 2014). Currently, QSS provide broader tasks such loss adjustment, auditing, dispute settlement, expert witnesses, project management, and value management (Ashworth, Hogg, & Higgs, 2013).

2.4.2 Role of Engineers in Construction Projects

Engineers can be considered as a party who are essential for the implementation of a construction project (Kaewsri & Tongthong, 2013). According to Hatmaker (2012), the professional roles related to the engineering profession are highly technical and methodical. Engineers provide a significant involvement in the project designing phase to obtain a proper design that accommodates all the necessary technical requirements (Roos, Woxblom, & McCluskey, 2010). According to Shahraki, et al. (2018), the technical supervision related to the construction works is a primary responsibility of the engineers. Moreover, engineers are involved in feasibility assessments before their role in planning and designing the structural facets of a project (Kaewsri & Tongthong, 2013). Thus, Almutairi (2016) admits the necessity of engineers to guarantee the effectiveness of a project with the support of their knowledge and proficiencies.

2.4.3 Role of Architects in Construction Projects

The architect plays an important role in the industry in ensuring the successful implementation of a construction project (Manu, Poghosyan, Agyei, Mahamadu, & Dziekonski, 2018). Iwo, et al. (2018) state that the pioneer in the designing of a construction project is designed due to their contribution in procuring and designing the conceptual proposals. Specifically, Marisa and Yusof (2020) state that designs sustain the responsibility of optimising the performance of the construction processes by incorporating efficient and effective design concepts. However, architects are practising their role under a contractor or a client and if the architects are employed under a contractor, they are given the responsibility of making the construction process more efficient through architectural values while the clients' architects are employed to translate the requirements of the client into a potential design (Sebastian, 2011). However, the requirement for architects in adapting to novel technologies is rather higher compared to other construction professionals (Marisa & Yusof, 2020). Hemstrom, et al. (2017) claim that architects are more involved in incorporating new technologies into the industry through their professional practices in designing and procuring. For an instance, the architects' contribution in endorsing the concept of Building Information Modelling (BIM) can be identified (Ding, Zuo, Wu, & Wang, 2015). Accordingly, Marisa and Yusof (2020) assert that architects play a key role in

determining project success as well as ensuring the modernisation of the construction sector.

2.4.4 Role of Project Managers in Construction Projects

Attribute to the successful delivery of a construction project, the involvement of the construction project manager is essential in multiple aspects (Sunindijo & Zou, 2012). According to Jang, et al. (2003), the contribution of a project manager is incorporating the effective conduct of all the other construction professionals is necessary for the success of a construction project. Dainty, et al. (2005) emphasise the requirement for the leadership and managerial skills of a project manager in ensuring the effectiveness of a construction project. Moreover, Bentahar and Ika (2019) elaborate that the project manager's role in managing the project towards a sole target is the key inspiration for the successful implementation of the project. Thus, Sunindijo and Zou (2012) claim that project success and project failure is upon the responsibility of the project manager. Accordingly, in achieving the duty aligned with their professions, project managers are engaged in planning, organising, managing, controlling, and coordinating the project-related activities (Bezak & Nahod, 2011). Besides, Dainty, et al. (2005) state that the project managers sustain the responsibility of ensuring technical stability and proper communication among relevant stakeholders of the project. Further, project managers are involved in conducting measures related to increasing the labour productivity related to construction (Toan, Tam, Hai, & Quy, 2020). Specifically, Jang, et al. (2003) argue on the crucial role of the project managers and other professionals in assuring the satisfaction of the customers and other stakeholders while minimising the errors that might interrupt the successful delivery of a construction project. The project manager is well known for being a highly responsible professional in the construction project who ensures the quality outcome of the construction project with professional care. However, negligence in professional practice in the construction industry causes problematic incidents. That is technically known as professional negligence, which is a legally binding word in professional practice.

2.5 Professional Negligence in the Construction Industry

In a general context, negligence in professionals can be identified as the failure of an individual to adhere to and exercise the care required by a careful practitioner who is prudent under similar circumstances (Harris, Richards, & Fincham, 2006). Similarly, Kakkar, et al. (2015) stated that the word negligence has been derived from the Latin term '*Neglego*' and therefore, the term can be interpreted as the lack of the proper degree of care. Besides, Kakkar, et al. (2015) further explained that negligence could be identified as the culpable carelessness of an individual. Additionally, Hassan (2010) interpreted the term professional negligence as the malpractices conducted by a professional without demonstrating reasonable skill and care. Further, Zulkepli (2012) stated that the legal definition for negligence interprets the absence of the required degree of care that a reasonable man would display in likewise circumstances. On a similar note, Zulkepli (2012) further identified negligence as the omission of conducting a deed that a prudent individual would do in a regular human consideration or as conducting a deed that a prudent and a reasonable individual would refrain from doing.

Besides, Ho (2013) stated that professional negligence could be identified as a form of corruption in numerous disciplines. As a similar argument, professional negligence in the construction industry was considered to have been occurred when a professional fails to display the responsible care required from a prudent professional under the same conditions (Chan & Owusu, 2017). Therefore, the authors identified professional negligence by a construction professional as corrupt conduct in the industry. Similarly, Abdul-Rahman, et al. (2010) identified negligence in the professional context as unethical conduct and an ethical dilemma displayed by professionals within the industry.

Accordingly, numerous acts can be identified under the professional negligence context in the construction industry including poor supervision by the superior party, deficits in the material quality selection, and following insufficient safety precautions by the professionals (Chan & Owusu, 2017). Similarly, Abdul-Rahman, et al. (2010) identified a failure in exercising the duty of care owing to the profession by an

individual resulting in poor workmanship, inadequate safety procedures, and negligence in design development as negligence acts in the construction industry.

The terms ‘Professional negligence’ and ‘Professional incompetence’ have been misused due to similarities in their meanings, hence, Bowen, et al. (2007) illustrated the controversial meaning of these two terms. Accordingly, Bowen, et al. (2007) described that professional incompetence involves lack of efficiency in economically conducting a task, insufficiency to complete the service to the full extent, and the incapacity to undertake task while professional negligence involves the omission of proper duty of care. Further, Ho (2011) stated that most of the unethical behaviour that can be identified in the construction industry is involved in unfair conduct and professional negligence. On a similar argument, Adnan, et al. (2012) stated that the reasons behind the unethical behaviour in the construction industry could be traced back to unfair conduct and professional negligence.

Accordingly, negligence by the construction professionals can lead to numerous risks to the industry including damages to property and persons that can lead to loss of life (Hassan, 2010). Further, Omran and Hussin (2009) stated that clients could face economic losses and threats to public safety by the negligence of professionals to provide adequate advice and consultancy. Therefore, it is highly recommended for the professional institutes to inflict a higher priority on ethical disclosures including professional negligence conducted by the professionals involved with the companies (Ameh & Odusami, 2010). Similarly, Hassan (2010) stated that construction industry professionals must exercise reasonable skill and care to avoid the possibility of facing negligence claims against them in conducting their duties.

2.5.1 Fundamental Components of Professional Negligence

Negligence can be considered as the lack of proper attention or proper care shown by an individual while in professional terms, negligence can be identified as the failure to demonstrate the required degree of care and attention within a reasonable frame under the circumstances that can lead to unintended damage or injury to a third party (Bowen, Akintoye, Pearl, & Edwards, 2007). Therefore, Kakkar, et al. (2015) identified the need for defining fundamental components of negligence according to the Supreme

Court of India. Accordingly, Kakkar, et al. (2015) identified that the following components must be present for an act to be considered as a negligence action in the face of the law.

- Duty – the professionals owing a certain standard of care
- Breach – breach of the standard by the professional
- Causation – injury or damages caused due to the lack of proper care
- Damages – the resultant damage or the injury must be connected to the negligence

Additionally, Bowen, et al. (2007) stated that for an act to be considered as negligence, the professional must have had the capacity and the ability to attend to the act competently but has neglected the duty of exercising the said ability. The authors further stated that the professional must be proved to have neglected the best interests of the client by his actions to charge him with a negligence claim.

2.5.2 Reasons for the Presence of Professional Negligence in Construction Projects

For professional negligence to be proven, a duty owed by the professional, a breach of the duty, damages due to the breach, and a connection between the damage and the negligence must be present (Kardon & Gilligan, 2015). Accordingly, proven negligence can be forwarded for a negligence claim and according to Rashid, et al. (2020), numerous negligence cases committed by industry professionals have been reported including poor execution of works by the reported professionals. Adding to the above fact, Kardon and Gilligan (2015) stated that the judge determines a professional negligence lawsuit, or a jury based on the fact whether the defendant professional has met the required duty of care in conducting the work. Accordingly, in a professional negligence lawsuit, a major proportion of the blame and the responsibility fall within the involved professional due to their negligence and failure to adhere to the stipulated work processes (Hamid, Majid, & Singh, 2008). In a landmark professional negligence lawsuit in Scotland, the Court of Session in Edinburgh ruled a judgment including the set of standards required to be present in a professional negligence case (Penn, 2017). Accordingly, Penn (2017) further stated that the landmark case is originally determined for negligence in the medical

profession; however, the principles of professional negligence imposed under the judgment can be applied to other professions as well.

However, every careless act cannot be claimed under a negligence claim owing to the duty of care (San, 2015). According to O'Farrel (2009), a negotiation claim can only be initiated under the satisfaction of all the conditions required to be present in professional negligence as illustrated below:

- Existence of standard duty of care and the act falling short of the standard of care defined for the profession
- Existence of a legal relationship among the two parties; the plaintiff; client or the public and the defendant professional
- Damages arising due to the act must fall within the scope of the professional

Based on the above premise, Adnan, et al. (2012) stated that numerous acts could be considered under the scope of professional negligence e.g. late payments, fluctuations in approved quality, documents with insufficient information, failure to provide adequate supervision, lack of safety standards, incomplete and wrong documentation, and unfair and unjust treatment of other individuals in the industry.

2.5.3 Professional Negligence of Engineers and Project Managers

According to Kardon and Gilligan (2015), there are various duties owed by the engineers and project managers in the construction industry to the public and other stakeholders of a project, however, the engineer is not expected to owe a duty to warn the public and other users of a facility about the inherent risks associated with a project. Further, Kardon and Gilligan (2015) stated that a facility in compliance with relative standards and codes with no abnormal risks does not necessarily require the engineer to have a duty to warn others regarding normal risks since ordinary prudent users of such facilities are expected to be aware of inherent risks. However, the project managers can be held liable for professional negligence claims for accepting building contracts where the project manager and the construction company are incapable of delivering a project of such magnitude (Rashid, Adnan, & Yusuwan, 2020). On the same note, Rashid, et al. (2020) stated that the risk of abandonment of projects due to inadequacy, incapacity, or errors could be considered as negligence on the project

manager's part if the project manager has probable cause to believe that the project will be abandoned at the time of accepting the project.

Nevertheless, an engineer cannot be held liable for professional negligence in the event of a natural disaster damaging a structure, if the structure has been designed properly for the normal level of disasters to be expected in the location (Kardon & Gilligan, 2015). Besides, Kardon and Gilligan (2015) further stated that in such an event, if the engineer has designed the building according to the relevant standards and codes, the engineer could not claim the professional negligence aspect.

2.5.4 Professional Negligence of Architects

Professionals' designers and architects can be held liable for professional negligence claims and legal actions related to this claim if the professionals fail to adhere to the standard duty of conducting their scope of work properly (Rashid, Adnan, & Yusuwan, 2020). Rashid, Adnan, and Yusuwan (2020) further stated that poor design along with negligent supervision can be identified as the main reasons behind the negligent acts of architects and designers. Similarly, Ameh and Odusami (2010) stated that more than 50% of building failures arise due to negligence by designers and architects including carelessness and negligence of probable design factors in preparing drawings. On a similar note, Rashid, et al. (2020) stated that the architect could identify the failure of an architect to properly calculate and design for load bearing of the intended structural elements as the reason for professional negligence. Accordingly, Abdul-Rahman, et al. (2010) identified design deficiencies as one of the main reasons behind professional negligence by the architect and the design team. This factor was further identified in terms of structural engineers as well (Rashid, Adnan, & Yusuwan, 2020).

2.5.5 Professional Negligence of Quantity Surveyors

Quantity Surveyors' poor documentation is one of the major contributing factors towards professional negligence in the construction industry (Bowen, Akintoye, Pearl, & Edwards, 2007). Accordingly, a task undertaken by a Quantity Surveyor must be completed within a reasonable duty of care and failure to do hence can give rise to professional negligence, therefore, poor management of works, inaccurate and incomplete measurements and documentation can be considered as main reasons for

the presence of professional negligence in terms of Quantity Surveyors (Rashid, Adnan, & Yusuwan, 2020). Conclusively, Bowen, et al. (2007) stated that negligence in the quantity surveying profession can be mainly observed by poor documentation and poor workmanship and management of works.

2.5.6 Professional Negligence of Other Professionals

Professional negligence can arise among other professionals involved with a construction project due to numerous reasons e.g., failure to adhere to proper work procedures, disobeying safety precautions, neglecting equipment management best practices, and poor site management (Hamid, Majid, & Singh, 2008). On the same note, Hamid, et al. (2008) stated that the negligence of industry professionals could lead to construction accidents to both individuals at the site as well as to the public which can lead to losses for the client and the construction company.

Reasons for the existence of professional negligence by other professionals in the construction industry have been highlighted by many authors where Oke, et al. (2010) pointed out that errors in judgment due to disregarding duty, lack of concentration during working hours, lack of consideration on dangers in the surrounding environment and neglecting the need for safety equipment can be considered as the major reasons behind negligence cases. Besides, Oke, et al. (2010) further elaborated those professionals who are paid daily or on the workload tend to give rise to professional negligence acts since they are working hastily to complete the works bestowed upon them. Therefore, Oke, et al. (2010) stated that this factor can lead to professional negligence by industry professionals since they are encouraged to focus on the quantity of output rather than the quality, hence, they are prone to ignore safety protocols in their pursuit of work leading to accidents and damages.

Professional negligence directly affects the project performance of the construction project. That affects the time, cost, and quality, which are key concerns of the construction project to ensure the project performance.

2.6 Construction Project Performance

Multidisciplinary teams organise construction projects. For smooth workflow, the project management team should understand and integrate requirements of multi-disciplines, organisational affairs and adjust to unpredictable social, economic, and environmental conditions. However, due to the highly dynamic and varying nature of construction projects, defining project success as a universal concept remains unambiguous (Chang & Chan, 2004). Therefore, measurement of project performance and success is important in the construction industry, which improves the competitiveness and efficiency of the business in the end (Ahmad, 2018). Performance management is an incessant and continuous procedure that includes a set of objectives and repeated examination on achieving those objectives.

2.6.1 Project performance measures and indicators used in the construction industry

Traditionally, project performance measures were developed concerning two aspects within the construction industry i.e. (i) performance measures concerning the product as a facility, and (ii) concerning the product creation process (Kagioglou, Cooper, & Aouad, 2014). Performance measures related to the product creation process are given priority by investors and project teams. Often these performance measures include cost, time, and quality of the final product, which are known as three traditional performance indicators. However, Kagioglou, Cooper, and Aouad, (2014) state that although these three indicators are important aspects of deciding the success or failure of a construction project, in isolation they do not provide a full picture of the entire project process. Further to the authors, implementation in construction projects is seen at the end of the project, which classifies them as lagging indicators than leading indicators. The competitive business environment in the construction industry has forced project managers to adopt a new managerial paradigm incorporating quality management into product-oriented project management procedures (Song, Lee, & Park, 2006). During the 1990s, emerging performance management techniques e.g., Total Quality Management (TQM), Business Process Re-engineering (BPR), and benchmarking have led construction industry performance measures from 'lagging' to 'leading' indicators (Chang & Chan, 2004). These techniques discuss overall

production process quality and its after-effects rather than limiting to quality and time and cost taken by the final product.

Shenhar, Levy, and Dvir, (1997) identify four dimensions of project success i.e. (i) project efficiency, (ii) impact on customers, (iii) business success, and (iv) preparation for the future. These dimensions are time dependent. Project efficiency is measured throughout project execution and at completion. Impact on the customer can be identified shortly afterward when the final product will be handed to the customer. The business success of the final product will be known sometime after the project is completed and the last dimension requires a larger time to understand how the final project outcome lasts against challenges. Atkinson (1999) divided project success into three stages i.e. (i) delivery stage: doing right, (ii) post-delivery stage: getting the system correctly, and (iii) post-delivery stage: getting the benefits correctly. All these classifications of project success contain one message. That is, project success is beyond constructing a product with the correct management of time, cost, and quality of the product. It is about the entire process and after effect and benefit or harms, it causes to every stakeholder.

2.6.2 Cost performance indicators

The cost incurred during a project includes not only the initial estimation. It includes other unexpected costs incurred during the project e.g., price increments of raw material, costs due to unexpected environmental or socioeconomic conditions, and costs due to legal issues. Cost variance is an important factor in determining whether the project is running over or under the budget (Ali & Rahmat, 2010). Cha and Kim (2011) identified cost-based performance indicators i.e., cost efficiency, cost rate, cost-effectiveness, design cost predictability, financial cost ratio, construction cost predictability and budget reduction rate.

2.6.3 Time performance indicators

Construction time and time predictability of project, design, and construction are the main performance measures related to time (Sibiya, Aigbavboa, & Thwala, 2015). Cha and Kim (2011) have identified time-based indicators in a more organised manner i.e.,

schedule efficiency, design schedule predictability, schedule effectiveness, overtime work rate, construction schedule predictability and schedule reduction rate.

2.6.4 Quality performance indicators

Defect frequency, non- conformance rate and rework rate is identified as product quality-based performance indicators (Cha & Kim, 2011). Quality-based indicators depend on the outcome of the construction project. Therefore, universal indicators cannot be found.

2.6.5 Other performance indicators

Apart from preliminary performance measures based on cost, time, and product quality, scholars and practitioners have identified many other performance criteria within construction projects. Safety is one such key performance area. Cha and Kim (2011) identify quantitative measures for safety i.e., accident rate, safety cost ratio, and safety education. The use of defective personal protective equipment and priority is given to productivity are seen as leading indicators of safety-based performance (Masood, et al., 2014). However, most of these performance indicators are lagging indicators that do not provide a futuristic view. Zhang, Wu, Skibniewski, Zhong, and Lu (2014) proposed a Bayesian network-based safety risk analysis method to assess safety risks in construction projects.

Environmental impact is another concern for the performance of the construction projects. The measurement of environmental impact of the construction projects is impossible and hence the construction industry is identified as one of the main sources of pollution (Enshassi, Kochendoerfer, & E Risq, 2014). However, these environmental impacts vary according to the associated locality and nature of the associated construction project. Ijigah, Jimoh, Aruleba, and Ade (2013) suggest building construction projects in Nigeria cause resource degradation, loss of natural habitats, soil erosion, and desertification. Measures used in environmental sciences to measure these phenomena can be applied in such cases along with the progress of the project. However, these will be lagging indicators and harm is done by the end of the project. Therefore, futuristic indicators need to be developed to assess the impact on the environment by construction projects.

A construction project comprises of various raw materials, stakeholders are set up to , designs, equipment, and socioeconomic and environmental factors surrounding it. Apart from the above-discussed universal performance measures and indicators, unique project performance measures can exist for each project. Few such categories of project performance measures are risk containment, management productivity, labour productivity, and security within the premises (Cha & Kim, 2011). It can be concluded that the development of project performance measures, especially leading measures compared to lagging ones, is a highly challenging and creative task. It requires a thorough understanding of the project by all parties involved.

2.7 Impact of Professional Negligence on Construction Project Performance

Professionals are expected to work in a way in their related fields better and more concerned than an average person would do the same work. Regulating authorities require them to work with care and consideration binding them in fiduciary duties. There could be many reasons behind it, but safety comes as the first. Safety is the behind-hand intention of all the legal frameworks and regulations on construction negligence. If any project were a threat to anyone's health because of the carelessness of work then the after-effects of that would consume time, money, and many more. However, that exact requirement is just a secondary concern where all the parties involved initially focus on the market value and the ways to gain more with fewer expenses. Safety requirements only have a say when an accident happens. The roots of these accidents could be identified i.e., Carelessness, Ignorance, Lack of training, Distraction, Poor communication, and Lack of discipline.

In countries e.g., Sri Lanka, since it is a developing country as Priyadarshani, et al., (2013) identified, most of the reasons why these issues cannot be eradicated drive back to the lack of financial stability in the country. The management process and the lack of its accuracy are the main reasons why these kinds of accidents take place in the local industry. The delivery of safety details and the awareness of safety at the site do not

properly happen rather than a brief introduction. Scholars will not bother to go a step forward to stop it effectively because of the financial instability of the organisation to adopt themselves to something costly. Most of the accidents happen with the lack of training on heavy equipment and other types of machinery, but since their main target is more gains rather than safety and quality, the contractors tend to hire non-professionals for work which costs them less but opens access to numerous accidents (Mohammed & Abdulateef, 2015).

This makes it clear that the loophole in the financial sector and the aim of gaining more from fewer expenses has caused the roots of professional negligence in the local construction field. This leads to more accidents and financial losses where the legal framework will always keep its standards high to adjudicate such issues. Professional negligence leads to various other disadvantages, and it has high impacts on construction project performances (Cohen, 2009). The next paragraphs would be explaining some of the main impacts of professional negligence.

2.7.1 Health and safety cost

As mentioned in the previous paragraph, the focus behind all the laws regulating professional negligence is to avoid challenges regarding health and safety. Mohammed and Abdulateef (2015) explain that the main impact of professional negligence on construction projects is the extra cost the management and the professionals will have to bear because of the accidents and other injuries caused to labourers or any other kind of workers. On the other hand, the burden that a contractor will have to bear if their work risks the health and safety of the common general would cost him being abode by law. Hence the health and safety cost are a major impact on performance in a way where it challenges the wellbeing of the common general and the workers themselves, also the additional cost is an extra burden.

2.7.2 Low quality of work

The low quality of the outcome of the project is one of the main impacts of professional negligence. This would breach the bona fide agreements between a client and the contractor; on the other hand, the outcome would not be a long-lasting one either. The client will have to bear additional expenses for further repairs and the exact purpose

of the construction outcome would not be successful due to the low quality of work (Basu, 2012). The materials would fade, warp, and wash out resulting in leakages and breakdowns. It only gives the impression of an unprofessional quality, and this could affect the future career of a professional as well. This might lead to guarantee work, which influences the profitability of the professional (Chico, 2011).

2.7.3 Threats to the public

The other impact on construction project performance by negligence is the threat that it has on the public. This would be affecting the construction project in a way that the whole project could be abducted by the government or certain authoritative institutions (Gaufman, 2017). Whether it is a threat to the environment, safety, or to the fundamental rights of the citizens, it costs such an impact on the project. It could be monetary compensations or anything else, but it would affect the goals and the existence of the project in many ways. For example, if a project seems to be a threat to the public due to a negligent act by a professional, and if the local authorities take steps to exclude it, it would be a waste of money and time and good outcomes of the project. Hence, the professionals are required to work with consideration where their project would not affect the goodwill of the public (Asamoah & Decardi-Nelson, 2014).

As discussed in this section the negligence directly impacts on health and safety cost, low quality of work or becomes a threat to the public, and similarly any kind of professional negligence has both direct and indirect impacts on construction project performances (Briesemeister, 2018). Besides, the resulting consequences of this could be a burden legally and financially (Cohen, 2009). As Kenny explains to overcome this, the companies and the professionals should adopt accurate and effective policies to abduct the consequences of professional negligence.

2.8 Strategies to Mitigate Professional Negligence in Construction Projects

Due to the high rate of breach of duty of care in construction projects, mitigation of professional negligence has become a major role in the current construction industry by today. Helan, Pane-mora, and Tamaki (2007) highlighted that since one of the major characteristics of the construction industry is the high cost for dispute resolution, the project managers are seeking different ways to mitigate professional negligence in the construction project. Because of the higher rate of disruptions of the construction projects due to higher risk and the professional negligence in the construction industry, contractors have expanded their roles to mitigate that professional negligence and exposure to the harm of that negligence (McGOWAN, 2016). In addition to that, Taylor (2019) stated that all professionals must be aware of their duty to the client and their duty of care of assessing the liability of a professional negligence claim. Since there are more professionals e.g., clients, contractors, project managers, and workers involved with the construction process, all those professionals have their duty of care to mitigate professional negligence (Education, 2018). Among all of them, the leader of the project is the project manager, and he is the person who is liable to reduce the professional negligence in the construction project. Therefore, all the relevant precautions to mitigate professional negligence in the project must be taken. A small mistake of the project manager can cause the failure of the entire project (Kaineshutler, 2015). Therefore, it is important to mitigate professional negligence as much as possible. There are plenty of measures that can be taken as precautions to avoid professional negligence.

2.8.1 Providing proper supervision

According to Hasan et al. (2015), by adhering to strict supervision, contractor, subcontractors, and project managers can identify the issues of the workers and solutions can be provided for the prevailing problems or risk factors. It is also important to highlight the people who provide the supervision for the workers must have proper knowledge, skills, experience, and capabilities to administer the project team (Hasan, et al., 2016). In addition to that, Metropolitan Engineering Consultant

and Forensics Services (2020) stated that relevant parties who are responsible for site supervision and inspection are bound to use due care in the performance of such duties. The authors further noticed that if the respective parties abandoned their duty, they are liable for the cost that must be incurred for the correction of defects. Further, Yurgaytis and Shatrova (2018) discussed construction supervision as an effective tool for reducing professional negligence by reducing risk factors in the construction site. Ibbs and Razavi (2014) also agreed with this statement highlighting aspects that should be inspected and observed. Ibbs and Razavi (2014) further noticed that improper supervision and inspection of engineers, project managers, and other relevant parties is a breach of duty of care.

2.8.2 Providing adequate training and education

Many researchers argued that proper training and education minimise defects in construction projects. While it is mitigating professional negligence, will increase the productivity and quality of the project as well (Hasan, et al., 2016). In addition to that, Chim, Chum, and Wah (2018) also agreed to this statement. Further, Chim, Chum, and Wah (2018) illustrated that training must be provided by the construction companies for the staff to adequately provide information about respective knowledge and skills, progressively increase the insight of workers about health and safety measures, the technicality of working work procedure, machinery usage and create familiarity to the work environment.

2.8.3 Implementing proper communication among parties involved

Hasan, et al. (2016) discussed that proper communication between workers and supervisors is a vital requirement and should be improved hence that there should not be language barriers to communication. Therefore, training in communication skills is essential to eliminate the language gap, especially among foreign workers and local professionals. In addition to that, communication and teamwork are also important to improve communication in the construction project and to build close working relationships in the project team. Through continuous communication among the construction team, professional negligence can be reduced as much as possible (Hasan, et al., 2016). In addition to that, Jaffar, Tharim, and Shuib (2011) extensively discussed the importance of a clear explanation of client needs to contractors. Further, Tharim

and Shuib (2011) stated that all the contract terms and conditions must be communicated between contractual parties before signing the contract documents to avoid professional negligence. According to the RICS (2020), proper communication for understanding remits and limitations of professionals reduces potential exposure to make a professional negligence claim.

2.8.4 Establishing a proper risk management system

Risk management reduces the probability of an uncertain adverse event that occurs in the project during its construction period. Especially, it can identify the risk factors that cause unplanned costs and loss the profit by delaying the project or disrupting the operations of the project. Further, it reduces professional negligence between the client and the contractors when recovering liquidated damages for the losses (Kasapoglu, 2018). By adhering to systematic health and safety procedure with systematic risk, management will not only reduce the insurance premium, but preventive actions can be taken before it becomes a serious issue with a personal injury or mortality (Taylor, 2019). In addition to that, Ekhaton (2016) stated that allocating fair risk among parties to be involved with the project reduces the additional cost for recoveries of unpredictable conditions in the construction site. Risk management will provide solutions for not only professional negligence by limiting insurance premiums but provide several benefits e.g., successfully keeping the project and enhancing the reputation of the construction project (Arukala, 2015). Some of the solutions for risk management are construction insurance, surety bonds, contracts, and subcontracts (Kasapoglu, 2018).

2.8.5 Recruiting professions with relevant skills and knowledge

When a worker has a set of relevant skills with the required knowledge for a particular task, they have an insight into what they are doing. Workers are competent to conduct the task accurately. Then the risk of having professional negligence reduces, increasing the effectiveness and quality of the project (Jaffar, Tharim, & Shuib, 2011). Further, Bandara (2018) recommended recruiting competent professionals as a strategy to mitigate professional negligence in the construction industry emphasising the importance of required knowledge and skills for the task which is conducted by several types of professionals.

2.8.6 Issuing certificates for progress payment

Metropolitan Engineering consultant forensics services (2020) stated that though, the major aim of issuing payment certificates is to inform the owner that the contractor is entitled to payment, these payment certificates can use for numerous types of legal actions. Project leaders must approve certification of the progress payment and if he fails to properly approve the progress payment, he is liable to the owners for any kind of losses arising due to his fault. Porter (2015) also agreed to this highlighting importance of payment notices when paying for the actual value rather than paying for the entire sum applied.

2.9 Barriers to Eradicate Professional Negligence in the Construction Sector

Professional negligence in construction occurs in many forms i.e., financial, economic, legal, environmental, process errors, or safety issues. Vajira, Edirisinghe, Marsh, Borthwick, and Cotgrave, (2020) identify disputes of the Sri Lankan construction industry to be owner-related, contractor-related, project-related, design-related, contract-related, human behaviour related, or consultant related. The authors have further identified the reason behind such disputes as to the lack of communication between parties and lack of team spirit. Hidden sub-issues cause these two issues. Although research into these sub-issues is less.

2.9.1 Lack of education on safety measures

The number of fatal injuries within the construction industry is higher compared to other industries in Sri Lanka (Rameezdeen, Pathirage, & Weerasooriya, 2003). Further, accidents with non-fatal injuries within construction sites are more serious than in other industries. This is an indication of the vulnerability of the workforce within the construction industry. Factors behind construction site accidents are either environmental or psychological (Langford, Rowlinson, & Sawacha, 2000). Environmental characteristics involve site characteristics e.g., site condition, availability of safety techniques, coordination among groups, and work supervision.

Psychological factors are related to characteristics of workers e.g., attitude towards taking safety precautions, skill, experience, and training received on safety. All the aspects are interconnected and linked with the presence of professional involvement as guidance. Exposure to hazardous materials is another safety issue within the construction industry. Sri Lankan law does not contain stringent rules on handling hazardous material. These safety-related incidents lead to accidents and deaths creating legal concerns that are caused by the limited identification and concern on the construction practices.

2.9.2 Diversity of workforce

Sri Lankan construction industry is highly diverse with people from different social, economic, and educational strata working together. This diversity could be a challenging factor to an organisation as well as a strategic advantage. Workforce diversity can be considered a competitive necessity, which needs to be managed in the correct manner (Dahanayaka, 2020). At the executive level, employee performance is positively related to age, education, work experience, and attitudinal diversity (Dahanayaka, 2020). However, at initial levels of the employment hierarchy, e.g., labourers, this will not be the same. Pritts and Jarry (2007) state that diversity at managerial level employees is not significant in impacting organisational performance. However, increased diversity at the ground level, which includes process-oriented employees, harms organisational performance.

2.9.3 Lack of ethical standards

A lack of care can result in inadvertent harm, which is considered negligent behaviour. Since culpability is not being proved through determining purpose, a care standard must be developed to compare individual behaviour to. The first standard that one could anticipate is the population's average in its entirety. But according to the law, this is insufficient. The researcher assesses negligence based on average carefulness or sensible behaviour rather than on average general behaviour. This need has an element of "oughtness" to it; it demands that people behave better than averagely to keep others safe (Curran, 1959).

A large amount of construction projects in Sri Lanka is conducted under government. And hence the transparency of the contractor selection process is often questioned in Sri Lanka. Nepotism, bribing, and corruption are associated with assigning contracts. Due to the weak rules and regulations of the government, the quality and efficiency of projects remain ambiguous causing many incidences of professional negligence.

2.9.4 Poor communication channels

The construction process involves multiple teams. Customers contact managers and provide information on the construction design they prefer. Management involved with the design team develops technicalities related to the design (Rahman and Gamil, 2019). This design is conveyed to executives who manage ground-level staff. Ground-level staff is directly implementing practical processes in constructing the design. These communication channels involve people with different education levels and comprehension. Therefore, sometimes the requirements are not conveyed clearly. Further, employees at the top level may not understand practical difficulties at the ground level. Ground-level employees are not involved in important decision-making and may be unaware of the significance of certain information. Consequently, they will ignore such information. Even if important information is recognised, the amount and specificity of the information may not reach top management accurately. Thus, top management teams will miss important and relevant information leading to professional negligence (Sutcliffe, 1994).

2.9.5 Lack of skilled personnel especially at ground level

Martinez, Gheisari and Alarcón (2020) researched research on the skills of ground-level construction workers. More than 80% of these workers have received informal training only. Nearly half of the workers' studies are casually employed and showed concern on job security with difficulty in finding regular work. These workers will never receive formal training, as they are more into battling with regular life concerns. Professional negligence can occur by such untrained staff.

In summary, all the above-discussed causes and many more hidden ones induce the occurrence of professional negligence. Studies in this area remain less ambiguous within Sri Lanka. Further, a human-centric approach would be more suitable to study

the industry rather than an economic perspective due to the amount of employment created by the construction industry and the environmental damage it causes to its surroundings. The government of Sri Lanka is often involved in the construction industry as a customer than a regulator. However, government rules and regulations should be stringent, especially on aspects e.g., safety, insurance, worker rights, and environmental impacts of construction sites to avoid professional negligence in the industry.

2.10 Conceptual Framework

Figure 2.1 demonstrates the summary of the variables identified related to the research problem and the initial conceptual identification of the research area with the support of literature.

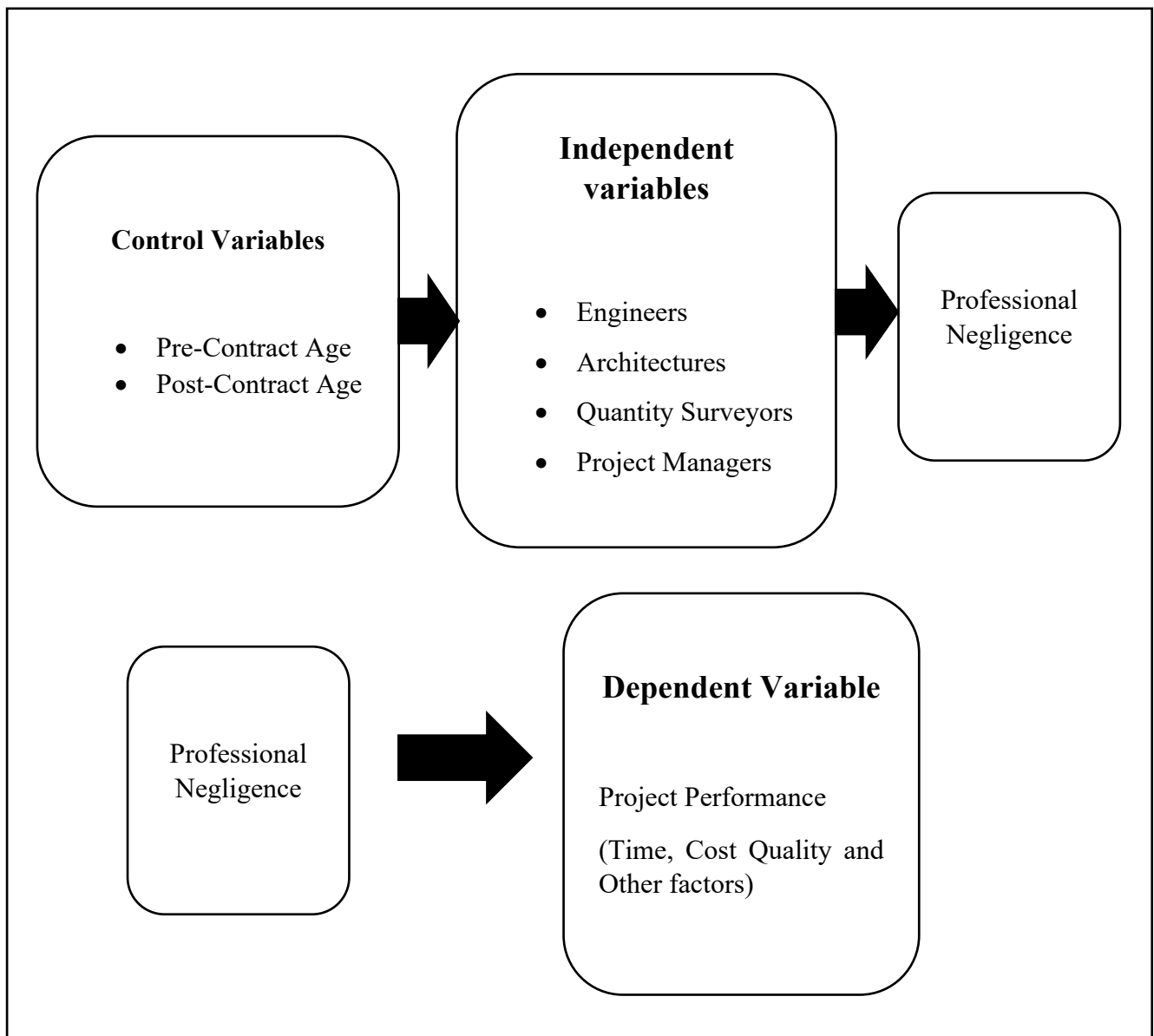


Figure 2.1: Conceptual framework

2.11 Summary

This chapter demonstrated the existing knowledge related to professionalism, professional negligence, and project performance in the construction sector. According to scholars, professional negligence affects the construction industry and causes disputes and claims in the industry. Furthermore, according to the literature review, the impact of Quantity Surveyor, Engineer, Architect, and Project Manager plays a vital role in supporting the development of the industry. The professional duties and the negligence of the above-mentioned professionals were identified with the scholar's findings. Accordingly, the first and second objectives were fulfilled with the literature review, and the underlying concepts were identified for the fourth objective of the research. According to literature, identification unable to adhere to professional duties and responsibilities causes the major reason for the occurrence of professional negligence in construction projects. The succeeding chapter demonstrates the systematic approach of the research methodology identified for data collection and data analysis according to the research design. The developed conceptual framework will be moderated with the validation of the data analysis.

As identified in the above literature, Construction industry is an essential factor for a growth of any nation. One of the vital factors identified in addressing the housing needs is residential buildings, especially in populated countries. For the success of a project delivery, a proper coordination among stakeholders is highly essential because of the complexity and uncertainty related with infrastructure projects when compared to building projects. Construction industry plays a major role in the economy as it provides employment opportunities for workers specially for a country like Sri Lanka. Based on the literature identified above, construction industry in Sri Lanka has similar characteristics like European construction sector except lack of advancements in technology in Sri Lanka. A multi-stakeholder engagement process is there in Sri Lankan construction industry. Clients, contractors, and consultants can be considered as the major stakeholders in the construction industry. Architect, engineer, quantity surveyor and project managers can be considered as the roles of key professionals in construction industry.

Negligence of the above-mentioned professionals can be recognized as the failure for construction projects. Not having proper supervision by the superior party, material quality selection in deficits, following insufficient safety precautions by these professionals can be considered as various acts under the professional negligence. To adhere with the stipulated work processes, the professionals have a major responsibility in a professional negligence lawsuit. The negligence by project managers, engineers, quantity surveyors and architects are one of the major reasons for the failures of construction industry. Not adhering to proper work procedures, failures in safety precautions, poor site management and neglecting best practices in managing equipment are some of the reasons involved with a construction project and professional negligence can arise due to those reasons.

Cost performance indicators, time performance indicators, quality performance indicators and other performance indicators such as safety are some of the measures used in assessing performance of the projects in construction industry concerning product as a facility and product creation process. Further, professional negligence is directly impacts to health and safety costs, low quality of works, and it causes various threats to the people. Provision of proper supervision, provision of adequate training and development facilities, implementation of proper communication among parties involved, establishment of a suitable risk management process, recruitment of suitable professionals which they have necessary skills and capabilities and issuing certificates for progress payments can be suggest as strategies to eliminate professional negligence in construction projects.

Construction industry in Sri Lanka is a highly diverse industry as people from different social, economic, educational backgrounds are working together. This can be considered as one of the barriers to mitigate professional negligence in the construction industry. At the same time, less consideration for safety measures, maintenance of poor communication channels to reach multiple teams, politics and different legal frameworks in the construction industry and not having adequate number of skilled employees specially at ground level can be considered as other barriers in mitigating professional negligence in the industry.

According to the literature, there are many causes for professional negligence and other hidden factors which induce professional negligence. In Sri Lankan context, there are very lesser number of studies regarding the professional negligence and therefore the construction industry should study regarding this aspect deliberately because of the massive contribution of the construction industry to the Sri Lankan economy.

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the detailed description of the study's research methodology. It consists detailed explanation of the philosophical background of the selected research method. In addition, the chapter describes the data collection method, study design, study-sampling selection, the data analysis tool that will be used to analyse the collected data.

The research has been developed for the identification of the “how the professional negligence is affecting the construction industry”, “what is the role of the professionals in the construction projects”, and “what is the impact of the professional negligence in the construction project performance”. This chapter presents the systematic approach conducted to fulfil the research objectives while collecting and analysing the primary data through questionnaire and expert interviews and literature survey for the identification of the gap and for the analysis of relationship between project performance and the professional negligence.

3.2 Research Design

The research design describes the method and the plan of achieving the research process (Polonsky & Waller, 2011). The concise research design includes the initial study, the survey of the literature, primary data collection, data analysis, and research findings. Primary data were used for the implementation of this study. Critical literature reviews were used to explain the role of professional negligence in construction projects while five industry expert interviews were conducted to collect primary data. In several different study designs, qualitative interviews are employed (Brinkmann & Kvale, 2015; Crouch & McKenzie, 2006). Unlike interview-administered surveys, they consist of a rather natural exchange of ideas between two people, or three or more in the case of group interviews (Saunders, Lewis, & Thornhill, 2016). Each interview is typically treated as a separate event involving one or more

participants in literature about the number of participants. The number of participants depends on the harmony between representativeness (in a loose sense) and quality of responses in gathering enough data (Alvesson & Ashcraft, 2012).

Further to obtain a general understanding of professional negligence and the practices to overcome the negligent instances, a questionnaire was distributed among construction professionals. A questionnaire is a carefully crafted, methodically organized, and well-written set of questions that someone is requested to complete. Although surveys that use questionnaires as data collection tools may appear simple, underestimating the complexity of surveys can lead to poor data, incorrect conclusions, and expensive errors (Mouton, 2001).

3.3 Research Process

Figure 3.1 demonstrates the research process with the initiation until the completion of the work demonstrating the achievement of research objectives.

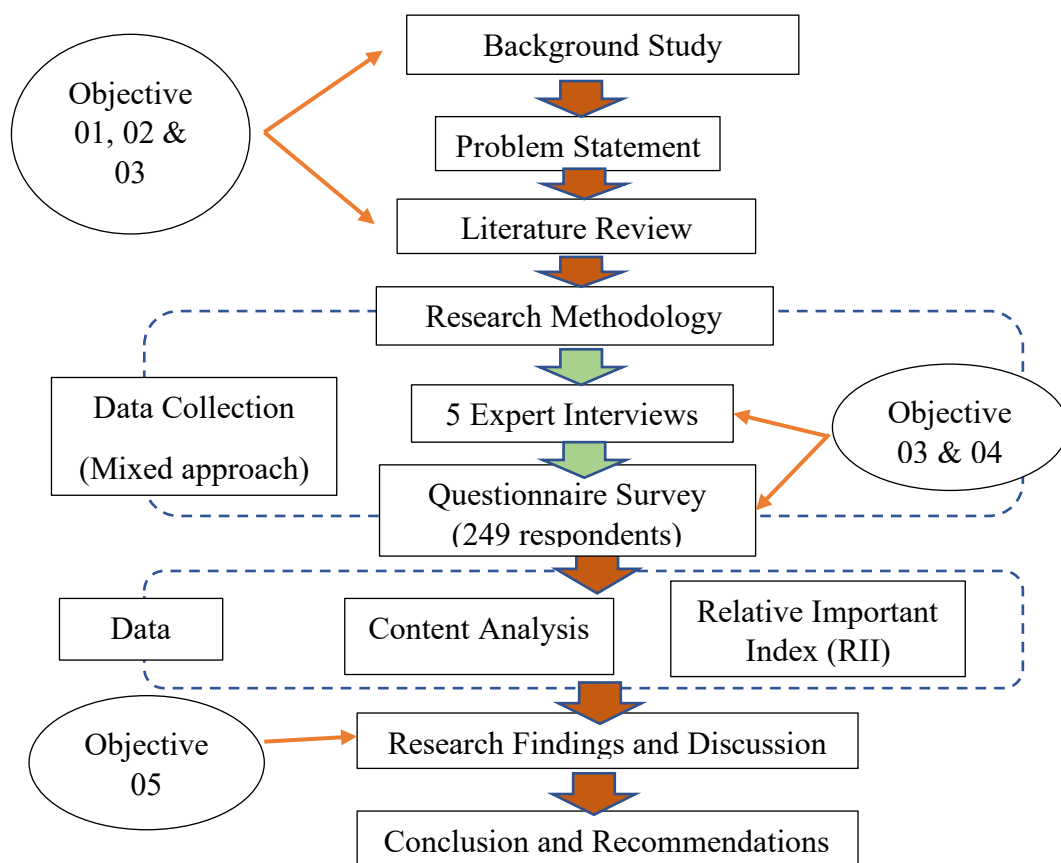


Figure 3.1: Research Process

3.4 Research Approach

The research approach is a mirror of the research activities that process satisfactorily achieves the aim of the research (Smith, Lowe, & Thorpe, 2002). Mainly three types of research approaches are practices in the primary research process i.e., (i) qualitative, (ii) quantitative, and (iii) mixed research approaches differ according to the type of the research and its intended outcome. According to Noor (2008), selection of suitable research approach depends on the secondary data availability such as the literature regarding the specific area which the researcher used for this study and the research problem.

3.4.1 Quantitative Approach

According to Amarathunga, Baldry, Sarshar, and Newton (2002) the quantitative research approach has the major advantages of comparability, reliability, allowable replication, and independence for the respondent avoiding the bias of the respondents. Furthermore, the qualitative techniques are possible to validate without major deviations. Additionally, it facilitates the research analysis easily. In contrast, the quantitative research approach is not beneficial for the researchers that study the ongoing events. Furthermore, the difficulty of obtaining adequate responses challenges the research completion and research outcome (Yin, 2011).

3.4.2 Qualitative Approach

The qualitative research approach provides in-depth information regarding the research problems. It supports in selecting the relevant topics and represents a personal overview regarding the research problem (Yin, 2013). The qualitative approach is to investigate and understand the individual, group social and human problems. Data collected from individual and group researchers making interpretations of the meaning of data.

The qualitative approach ensures the quality of the data while abolishing the barriers of a higher sample size for the analysis. Nevertheless, the qualitative research approach neglects the social and cultural aspects of the research study. This is very much effective and applicable for the identification of professional negligence in the experts'

overview. Since the application and impact of professional negligence and the lack of data, availability in research can be overcome with the corporation of qualitative data collection and analysis techniques.

3.4.3 Mixed Approach

The mixed approach is a combination of qualitative and quantitative data but not an alternative it is an extension of both types of research approaches (Johnson & Onwuegbuzie, 2004). There is a widespread belief in the research community that quantitative and qualitative research are compatible and should be used in research of all kinds (Amaratunga, Baldry, Sarshar, & Newton, 2002). On the other hand, the combination of the approaches can concentrate on their pertinent advantages. The mixed-method approach is to integrate two different forms of data that are qualitative and quantitative. This combination approach provides more insight into the research problem. This selection of the research approach depends on the type of research problem.

3.5 Justification for Mixed Approach

According to Grover (2015), the philosophical worldview arises from epistemological considerations. In summary, research design is a plan for the proposed study effort and may be seen as the "Glue" that holds all the components of a research project together (Akhtar, 2016). Mixed methods research emphasizes the integration of qualitative and quantitative components within a study (Simons & Lathlean, 2010; Maudsley, 2011). To create an integrated view of the research issue, mixed methods research combines qualitative and quantitative data collecting, building on the strengths of both while adjusting for their weaknesses (Andrew & Halcomb, 2006; Wisdom, Cavaleri, & Onwuegbuzie, 2011).

Grover (2015) stated that these three approaches appear qualitative, quantitative, and mixed, but these approaches still overlap. The quantitative approach follows the philosophical positivism and the post-positivism approach of measurements and numbers. The qualitative method relates to constructivism and the transformative approach to words and pictures. Mixed Methods follows pragmatism and approach to

measurements, numbers, words, and pictures. Figure 3.1 explains the status of a mixed research approach.

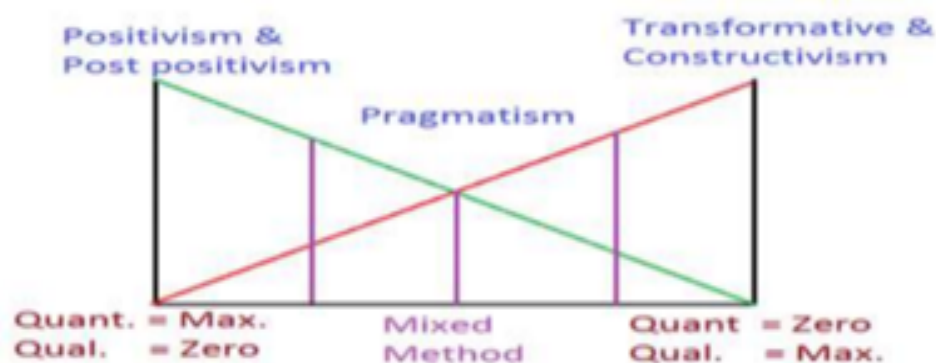


Figure 3.2: Intersection of research approaches, Source: (Creswell & Creswell, 2017)

This research is investigating the connectivity of professional negligence and project performance in the construction industry. The literatures on professional negligence and the role of the professionals in the construction projects is ascertained and evaluated with the combination of industry experts. Hence, whose experience and knowledge are incorporated in this research with a qualitative research approach conducting interviews and using content analysis technique. Moreover, the relationship between project performance and professional negligence is analysed with the data collected via literature review and the primary data collection. The primary data collection is conducted with the participation of industry professionals via a questionnaire survey. Hence, to validate the study, mixed research approach is engaged in the research process. Therefore, the combination of qualitative and quantitative research approaches justifies the selection of a mixed research approach for this research.

3.5.1 Initial Background Study

The initial background study was conducted using the literature survey to identify the research problem for the research study with the support of books, journals, conference papers, and journals. The initial study was conducted to demonstrate the available

knowledge on the optical research topic and the applicability of the effective methods to accomplish the research gap.

3.5.2 Literature Survey

The critical review of the literature was conducted with the use of journals, books, conference papers, and journals to review the concept of professional negligence in the local construction context. To understand the impact of professional negligence in the construction industry, literature survey was used.

3.5.3 Primary Interview

Expert interviews have long been used often in social research. There are several common, useful reasons for expert interviews' popularity in research, even though their precise position in each research design, their format, and the techniques used to analyse the results may differ from case to case. Experts in qualitative research contend that there is no simple answer to the question "how many" and that sample size depends on a variety of philosophical, methodological, and practical considerations (Baker & Edwards, 2012).

For this study, only five industry experts which includes quantity surveyors and engineers were interviewed to collect primary data and identify the instances vulnerable to negligence in the construction industry. As most of the professionals are busy in their schedules, it was difficult to take a time for interviews and it is a main limitation of this study. Furthermore, the similarity of the responses given by the interviewees too helped to restrict the sample size to five. All five interviewees were selected with the preliminary qualification assessment of above ten years of professional experience in the construction industry.

3.5.4 Questionnaire Survey

A questionnaire was distributed among construction professionals with a sample of 249 selected as per simple random sampling technique to obtain a general understanding of professional negligence and the practices to overcome the negligent instances. Due to the Covid 19 pandemic, it was difficult to collect more responses as most of the companies were did not work effectively because there was a severe impact of Covid 19 to Sri Lanka. Therefore, the sample size is limited to 249 questionnaire responses. Due of travel advisories and border closures, Covid-19 is a global epidemic

with serious economic and social consequences along with retail closings, local lockdowns, and social isolation techniques. Almost every nation has implemented some form of lockdown. Lockdowns can be local (inside the nation; Colombo, Kaluthara, Gampaha, Puttalam, Jaffna, and Kandy districts choose extended lockdowns) or global (across the globe). Border crossings were not permitted when the area was under lockdown. People's movement and the supply chain have both been disturbed. Construction projects require a constant flow of workers and supplies of materials at various stages of the project. When normalcy is disturbed, the project's progress is likewise disturbed (Vithana, Bandara, & Jayasooriya, 2020).

Simple random sampling was used as the construction population is readily available and the as the population is small and the estimations are easy to calculate. So, each and everyone has a chance of being chosen.

3.6 Data Collection

Data was collected through the primary data collection methods. Questionnaire and interviews were the primary method of data collection and structured questionnaires based on the objectives were prepared and distributed to the engineers, architects, and quantity surveyors. In addition, based on the research objective, semi-structured interviews were conducted with contract experts e.g., Quantity Surveyors and engineers to understand the requirement of professionalism and how the negligence of professionals affected the outcome of the project.

Secondary data was collected from different sources. Published journals, books, articles, conference progress, and reports referenced for a better understanding of the research objectives, the research gap, and theoretical background. Questionnaire survey was conducted as the first data collection process followed with the interview process.

Because the main idea of the interview was to understand the purpose regarding the professional negligence, which consists of mitigation measures for the post and pre-professionals, is discussed with the professional team.

3.7 Sampling Techniques

The main idea of sampling techniques is to assist the researcher in selecting units to include in the sample. Sampling methods are classified as either probability or non-probability (Mujere, 2016). Since many types of sampling methods are used in the probability sampling method, this current study uses a judgemental sampling method for the selection for the interviewees for the research. A simple random sampling method is considered as very basic method or a simplified method in the probability method, which is used for obtaining responses for the questionnaire survey developed based on the literature findings of the research.

3.8 Data Analysis

Qualitative and quantitative techniques were used for analysis. Quantitative techniques were predominant techniques. The Relative Important Index (RII) is used as a tool for quantitative analysis. The qualitative information collected from magazines, books, interviews, and the questionnaire, converted as a quantitative value using the content analysis. Semi-structured interviews were conducted with Senior Project Manager, Senior Project Engineer, Architect, Site Engineer, and a Senior Quantity Surveyor, to understand the special requirements of multiple construction industry professionals as they are major roles in the construction industry. Through the management abilities and values at many levels, including those at the grassroots, project managers are in the unique position of being able to considerably impact and effectively promote the development of the construction sector (Hills, Fox, Hon, Fong, & Skitmore, 2008). Therefore, the researcher studied the major roles in construction industry using above mentioned experts.

Quantitative data analysis focuses on research, statics, measurements, and existing data. The collected quantitative data summed up, compared, median, and identified the difference and relationship using the quantitative analysis tool. Social Sciences Statistical Package (SPSS) was the main quantitative analysis tool and questionnaire

survey analysed using the SPSS RII. The relative importance of various reasons contributing to the impact of professional negligence on project performance, and the methods for mitigation measures were analysed. RII values were calculated using the RII equation (Hatkar et al., 2016), three steps are used in analysing the data i.e., (i) calculating the relative importance index, (ii) ranking each factor based on its relative importance index, and (iii) determining the degree of correlation in the analysis and ranking factors. Equation 3.1 is applied to find out the relative importance of the research content.

Equation 3-1: Relative important index

$$RII = \sum W / A \times N$$

W - Weightage given to each factor by the respondents

A - Highest weight

N - Total number of respondents

The qualitative data collected from questionnaires and interviews were analysed using the content analysis. Content analysis is a research tool, which determines the concepts of qualitative data. According to Praveen (2017), content analysis is defined as a "method of analysing written, oral, or visual communication messages". The analysed data is presented as a graph, table, and accurate notation form. This representative system helps to display, explain, compare, formulate the findings, and express the idea clearly to the reader.

3.9 Summary

This chapter provides a descriptive and in-depth discussion of the methods involved in this research. Since the study is based on a mixed approach, the quantitative approach is the predominant approach. Data were collected from questionnaires and semi-structured interviews using the quota sampling method and this chapter provided analysis techniques, namely RII and content analysis.

4.0 DATA ANALYSIS AND RESEARCH FINDINGS

4.1 Introduction

This chapter discusses the research findings that were collected through the expert interviews and the questionnaire survey considering the literature review. To fulfil the objectives of this research: reviewing the nature and impact of professional negligence in the construction industry, explaining the roles of multiple professionals' contributions to construction projects, evaluating vulnerable opportunities to professional negligence, and the impact of the professional negligence for project performance, this chapter discusses the expert ideas on roles of different types of professionals in the construction industry, reasons for the professional negligence, different types of professional negligence, and impact of the professional negligence in the quantitative analysis with the use of descriptive statistics. The qualitative analysis is conducted using the manual content analysis method.

4.2 Qualitative Analysis

Qualitative analysis is consisting different phases addressed in various sections. However, the understanding of the qualitative analysis is developed based on interviewee information.

4.2.1 Interviewee's information

Table 4.1 represents the information of the interviewees providing basis for the research and the readers regarding the authentication of the interviewees who are participated in the research.

Table 4-1: Interviewee Information

Interviewee code	Profession	Years of Experience
I1	Senior Project Manager	10 years
I2	Senior Project Engineer	15 years
I3	Architect	20 years
I4	Site Engineer	17 years

I5	Senior Quantity Surveyor	13 years
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According to Table 4.1, the industry experts who participated in the expert interviews represented several types of prominent professions in the construction industry. In addition to that, all of them have professional experience of over ten years. Therefore, it is recommended that the interview findings are providing reliable data to achieve the research objectives. Especially, when developing a framework consisting of mitigation measures for the post and pre-Professionals Negligence scenario, their ideas would be more helpful to provide a more reliable framework.

4.2.2 Instances of professional negligence during pre and post contract stage

According to Table 4.2, the highest number of interviewees accepted approving low-quality material and approving inaccurate claims as instances of professional negligence during pre- and post-contract stages. The following instances have recognized during the expert interviews conducted.

Table 4-2: Professional Negligence in post and pre-contract stage

Instances of professional negligence during pre and post contract stage	I1	I2	I3	I4	I5
Poor initial estimation	✓				✓
Lack of concern on the claims		✓			✓
Arithmetical errors		✓		✓	
Poor consultation with the employer			✓		
Obtaining commission from suppliers					✓
Approving low-quality material		✓	✓		✓
Approving inaccurate claims	✓		✓	✓	

Three interviewees have accepted them. I3 reveals “*Most of the time, our industry professional approves low-quality building materials for the cost-saving. But those decisions may lead to negligence ending with quality issues.*” In addition to that, I3 stated, “*Sometimes, incorrect claims of the professionals regarding very important*

decisions may end up with professional negligence. Therefore, accurate information is very important to avoid professional negligence.” Two interviewees accepted poor initial estimation, lack of concern on the claims, and arithmetical errors. In contrast, only 1 interview have identified poor consultation with the employer and obtaining commission from suppliers as instances of professional negligence during the pre- and post-contract stage.

4.2.3 Strategies to maintain professionalism in construction projects

Industrial experts proposed some strategies to maintain professionalism in construction projects in the expert interviews. The findings are elaborated in Table 4.3 as the strategies to maintain professionalism. These findings are based on the data gathered through the expert interviews.

Table 4-3: Strategies to maintain professionalism in construction projects

Strategies to maintain professionalism	I1	I2	I3	I4	I5
Use of soft skills		✓			✓
Politely engaging with the subordinates	✓				✓
Obtain structured education			✓	✓	
Have adequate industry experience	✓		✓		
Following industry experts					✓
Adhering to ethical standards		✓	✓		✓

Three of the professionals proposed adherence to ethical standards. In addition to that, I2 claimed, “*Unethical conducts of professionals in the construction industry is a common issue and if the professionals in the construction industry adhere to the ethical standards and behave ethically with optimistic attitudes, professional negligence can be almost eliminated.*” Therefore, the ethical behaviours of the professionals must be improved to maintain professionalism in the construction industry. Two professionals accept the use of soft skills, politely engaging with the subordinates, obtaining structured education, and having an adequate education. Meanwhile, I3 stated, “*Most of the freshers who come to the industry don't have adequate experience regarding professional conduct in the construction industry even though they have excellent*

knowledge on the subject. But according to my opinion, there must be adequate industry experience before they engage with the industry.” Nevertheless, only one interviewee has accepted the following industry experts. Most of them stated that following industry experts were not a compulsory one.

4.2.4 Responsibility of the construction professional during a conflicted situation

When considering the responsibility of the construction professional during a conflicted situation, different professionals emphasise different ideas based on their experience in the construction industry. Among them, most of the professionals accepted assigning the situation in different views before concluding the issue.

Table 4-4: Responsibility of professionals during conflicted situations

Responsibility of the professional during a conflicted situation	I1	I2	I3	I4	I5
Maintaining a calm environment among the employees	✓		✓		✓
Discuss with all the parties	✓	✓		✓	
Assess the situation in different view before making the conclusion	✓	✓		✓	✓
Inform relevant authorities		✓		✓	
Obtain consent from the superiors before taking actions	✓		✓		
Avoid adversarial actions	✓				✓
Maintain discussion and try to maintain peace		✓			✓
Need to follow ethical standards	✓		✓		✓
Avoid recommendations from the parties involved in the conflict	✓	✓		✓	

All the professionals except I3 have accepted it. When discussing the responsibility of the construction professional during a conflicted situation, I1 stated, “Our staff members are looking at the conflicts on their surface without studying them deeply. Then, the result is the wrong conclusions. Therefore, this is not a good practice. We

must think about the root of the conflict before coming to conclusions.” In addition to that, maintaining a calm environment among the employees, discussing with all the parties, following ethical standards, and avoiding recommendations from the parties involved in the conflict have been accepted by three parties. The important thing is that I2 stated, *“There are some occasions in the construction industry that the wrong party is entitled to provide solutions for the issue. It’s not fair for the other parties.”* The minimum number of interviewees accepted informed relevant authorities and obtained consent from the superiors before acting. Only two interviewees have accepted them.

4.2.5 Barriers to avoid professional negligence in Quantity Surveying practice

According to Table 4.5, different interviewees have identified different barriers. Considering the following summary table, most of the interviewees have accepted lack of structured education as a barrier to avoid professional negligence in quantity surveying practices. A summary of the barriers to avoid professional negligence which has gathered from the interview findings can be stated as follows.

Table 4-5: Barriers to avoid professional negligence in Quantity surveying practice

Barriers to avoid professional negligence	I1	I2	I3	I4	I5
Lack of education on safety measures	✓		✓	✓	✓
Diversity in the workforce	✓		✓		✓
Poor ethical standards		✓			
Poor communication channels	✓				
Lack of skilled personnel	✓			✓	✓

Four interviewees accepted it. Furthermore, I3 stated, *“Even though we try to avoid professional negligence by implementing standard work practices, some workers don’t adhere to those practices. They do not even understand the importance of those practices because of their low educational levels in the construction industry including the safety measures”* therefore, lack of structured and systematic education on safety measures is one of the main barriers in avoiding professional negligence. Diversity in the workforce and the absence of skilled personnel have been identified by three

interviewees. The important thing is that I1 stated, “More *soft skills are required to deal with professional negligence in the construction industry. For example, communicational skills are very important to share ideas to avoid misunderstandings and conflicts. But our workers do not have those communicational skills to deal with others.*” Three of the interviewees have identified the shortage of soft skills such as leadership, teamwork, presentation, and communication as barriers to avoiding professional negligence. In contrast, only one interviewee has identified poor ethical standards and being biased in the profession.

4.2.6 Strategies to mitigate professional negligence in the construction industry

According to the Table 4.6, four interviewees identified the use of industry experience as a strategy to mitigate professional negligence in the construction industry.

Table 4-6: Strategies to mitigate professional negligence in the construction industry

Strategies to mitigate professional negligence	I1	I2	I3	I4	I5
Industry experience	✓	✓		✓	✓
Common sense	✓	✓			✓
Obtained higher education with core competencies		✓			
Connectivity among other professions	✓		✓	✓	
Good use of language	✓			✓	✓
Foreign exposure in the professional life		✓		✓	✓
Foreseeing the situations and possible solutions	✓		✓		✓

All of them highlighted that regular practice of the construction activities improved the quality of the professionals. It was confirmed by I4 saying, “higher *experience in the construction industry of the professional reduces the vulnerability to happen professional negligence. Therefore, when we hire someone, first we investigate his or her industrial experience. Then they know general practices in the industry.*” In addition to that, the same number of industry professionals identified common senses, connectivity among other professionals, good use of language, foreign exposure in the professional life, and foreseeing the situations and possible solutions. Among them, I3 has highlighted foreseeing the situations and possible solutions mentioning,

“Predictions for the future situations are very important in eliminating professional negligence. Nevertheless, it is no point in just foreseeing the future and neglecting the risk. After identifying the vulnerable situations, it important to provide solutions to overcome those issues.” The least number of professionals identified obtained higher education with core competencies. Only one interviewee has identified it.

4.2.7 Parameters defining the project performance in the construction sector

According to Table 4.7, of parameters identified by interviewees, the interviewees except maintaining professional relationships accepted all the strategies almost equally. According to the findings, the following parameters link with the strategies and ensure the performance of the project. This ultimately helps to avoid professional negligence in the industry.

Table 4-7: Parameters which impact professional negligence on project performance

Parameters defining project performance	I1	I2	I3	I4	I5
Deliver project on time	✓		✓	✓	
Deliver with expected quality		✓		✓	✓
Complete within cost	✓		✓	✓	
Less number of accidents	✓	✓			✓
Maintain professional relationship		✓	✓		

Delivering the project on time, delivering with expected quality, completing within cost margins, a smaller number of accidents have been identified by four experts. According to that, all of them are equally important parameters when defining project performance in the construction sector. Moreover, I4 identified the importance of the project constraints in terms of project performance. I4 stated, *“When we talk about project performance, we cannot avoid thoughts of project constraints. If we correctly manage time cost, and the quality of the project, improving the project performance is not a big deal.”* In contrast, I5 highlighted the occupational safety and health of the construction industry as a key parameter of project performance. He stated, *“If we want to succeed in our project, we must maintain a safe workplace for our workers. Through we cannot maintain a safe workplace, no point in chasing after profit, or timesaving.”*

Because the human life is the most important asset for us.” On the other hand, only two interviewees have identified maintaining professional relationships.

4.2.8 Strategies to ensure the project performance in the construction sector

When it comes to strategies to ensure project performance in the construction sector, those are directly linked with the parameters discussed above. According to Table 4.8, three interviewees identified six strategies.

Table 4-8: Strategies to ensure project performance in the construction industry

Strategies to ensure project performance	I1	I2	I3	I4	I5
Completing the project on time	✓				✓
Minimise additional claims		✓		✓	✓
Avoid disputes and use negotiation			✓	✓	
Maintain cost reduction proceedings		✓			
Ensure quality of the deliverables		✓	✓		✓
Maintain professionalism	✓			✓	✓
Avoid negligence's		✓		✓	✓
Maintain zero-project accidents	✓		✓	✓	
Maintain good relationships among external stakeholders	✓	✓			✓

Those are maintaining additional claims, ensuring the quality of the deliverables, maintaining professionalism, avoiding negligence, maintaining zero-project accidents, and maintaining good relationships among external stakeholders. The important thing is that I5 stated, *“Our project team members don't that much aware about the external stakeholders. They just think about project constraints. Nevertheless, we cannot forget them. They are playing a big role in a construction project. Therefore. It is important to maintain good relationships among external stakeholders.”* In addition to that, I2 stated *“Avoiding professional negligence is one of the easy ways to improve project performance”* on the other hand, avoiding disputes and using negotiation was

identified by two interviewees while maintaining cost-reduction proceedings have been identified only by I2.

4.2.9 Impact of professional negligence on the project performance

Table 4.9 shows the impact of professional negligence on the project performance concerning the interviews' opinions. According to Table 4.22, most of the interviewees accepted that there is a significant effect on project performance.

Table 4-9: Impact of professional negligence with project performance

Impact of professional negligence with project performance	I1	I2	I3	I4	I5
It affects the project performance	✓		✓		
There is less impact on project performance					✓
It is not affecting the project performance		✓			
There is a significant effect on project performance	✓		✓	✓	✓

Four interviewees have accepted it except I2. Further, I4 noted, *“the highest impact of the professional negligence affects to the project performance. Because when there is professional negligence, construction activities are obstructed. If the issue is serious, perhaps the project must be temporarily held until the issue is solved. It will badly affect the time and cost constraints on the project leading to project failures.”* Two interviewees stated that professional negligence affects project performance. On the other hand, I5 stated that there was less impact on project performance. Further, I2 stated that it was not affecting the project performance. I2 further elaborated, *“even though there are some professionals in the project, we can continue the project while solving the issue. So, I don't think that it would affect the project performance”*.

4.3 Measures to mitigate pre and post professional negligence

Table 4.10 illustrates the mitigation measures proposed by the Interviews in relating to the pre and post construction events of the construction projects.

Table 4-10: Measures to manage professional negligence on project performance

Measures to manage the impact of professional negligence on project performance	I1	I2	I3	I4	I5
Develop the connectivity between pre and post contract team	✓	✓			✓
Obtain professionals with relevant educational qualifications		✓	✓		✓
Support the community with frequent updates on project performance	✓		✓	✓	
Asses the professionals with monetary values and rewards			✓		
Maintain baseline for the number of professional years of experience for the projects				✓	✓
Create a communication channel among project teams	✓			✓	✓
Close supervision of the professionals through a structured mechanism	✓		✓		

When considering the proposed measures to manage the impact of professional negligence on the project performance at pre- and post-stages, different interviewees proposed different measures based on their experience knowledge, and lessons learned while dealing with professional negligence. Developing the connectivity between pre- and post-contract teams, obtaining professionals with relevant educational qualifications, supporting the community with frequent updates on project performance, and creating a communication channel among project teams were identified by three experts. Those are the highly recommended measures to manage the impact of professional negligence on the project performance at pre- and post-stages. Meanwhile, I3 stated, “*the construction industry is full of conflicts, disputes,*

and negligence matters. Always we can see some issues. Therefore, my recommendation is to have professionals who are educated on that area and the legal background of that in the project. Then we have not incurred excessive costs for hiring experts to solve matters related to professional negligence. On the other hand, they will inform others also”. In addition to that, two professionals have accepted maintaining a baseline for the number of professional years of experience for the projects and closing supervision of the professionals through a structured mechanism. In contrast, only one interviewee identified assessing the professionals with monetary values and rewards.

The following research framework was developed with the extension of the research conceptual framework elaborating the research findings. The research framework illustrates the strategic mitigation approaches for the avoidance of professional negligence and increasing project performance in the Sri Lankan construction industry.

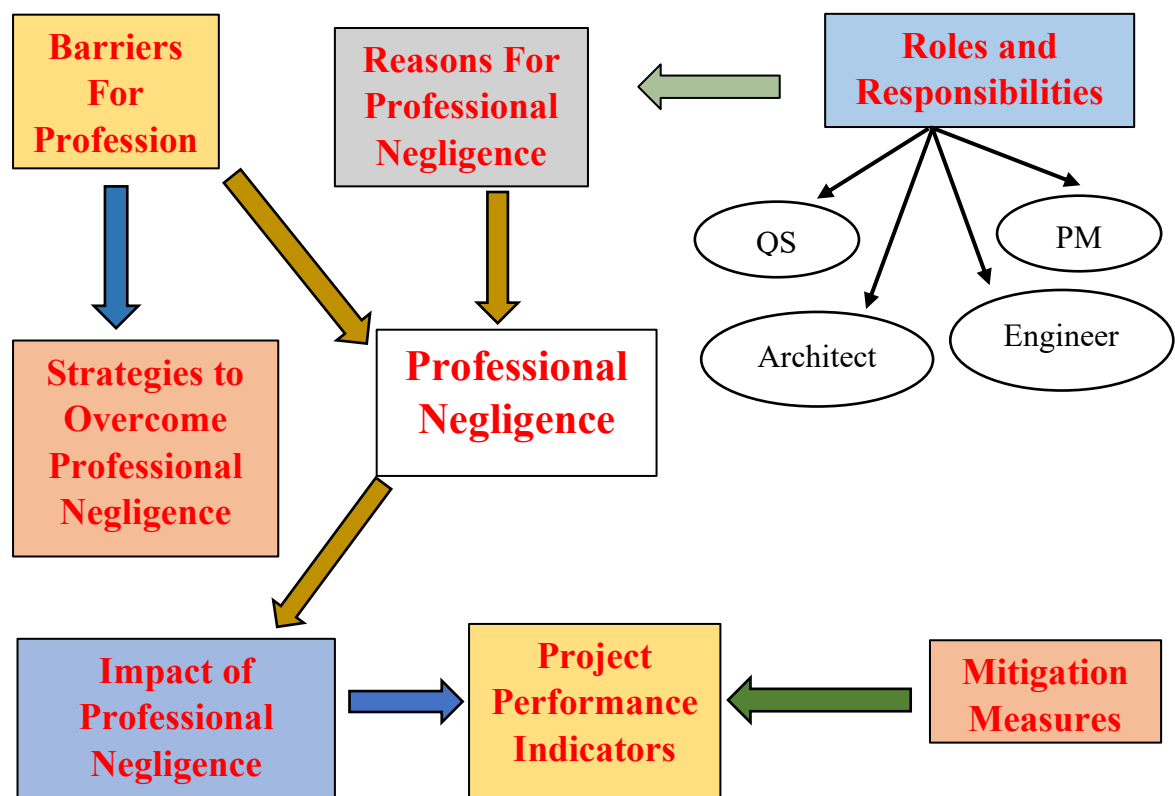


Figure 4.1: Research framework for mitigating professional negligence to achieve project performance

4.4 Quantitative Analysis

Quantitative analysis is demonstrated in the following sections followed with the identification of the demographic analysis of the questionnaire survey respondents. Quantitative analysis has been developed based on the questionnaire survey findings.

4.4.1 Demographic analysis

Demographic analysis is including different aspects and age is one of the aspect in analysing demographic factors. Demographic analysis was conducted just to take an understanding of the population investigated. Table 4.11 illustrates the age distribution of the respondents of the research participants along with percentages.

Table 4-11: Age distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21 - 30	103	41.4	41.4	41.4
	31 - 40	49	19.7	19.7	61.0
	41 - 50	49	19.7	19.7	80.7
	above 51	48	19.3	19.3	100.0
	Total	249	100.0	100.0	

Table 4.11 is referred to the age group that the questionnaire respondents belong to. The highest number of respondents belongs to the 21-30 years group which indicates most of the construction professionals are new to the construction industry. The highest frequency is 103. The second-highest number of respondents belongs to the 31-40 years group and 41-50 years group. Those two age groups have the same frequency of 49. The least number of respondents belongs to the above 51 years group. Its frequency is 48.

Table 4-12: Professional based categorization of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architect	51	20.5	20.5	20.5
	Building surveyor	16	6.4	6.4	26.9
	Draughtsman	23	9.2	9.2	36.1
	Engineer	49	19.7	19.7	55.8
	Project manager	52	20.9	20.9	76.7
	Quantity Surveyor	58	23.3	23.3	100.0
	Total	249	100.0	100.0	

This is referred to the profession of the questionnaire respondents. The above professionals have responded to the questionnaire but, the researcher was not able to conduct interviews with all the professionals because of their busy schedules. Most of the professionals did not have time to allocate for an interview as it takes a considerable time and Covid 19 was a huge barrier. The highest numbers of respondents are Quantity Surveyors. The highest frequency is 58. The second-highest number of respondents is quantity engineers having a frequency of 52. The third-highest number of respondents is engineers having a frequency of 51. The least number of respondents are project managers. Its frequency is 48. The second least number of respondents is draughtsmen. Its frequency is 23. The third least number of respondents is engineers, and its frequency is 16. Altogether, there are 249 respondents.

Table 4-13: Professional experience-based categorisation of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 – 5 years	62	24.9	24.9	39.8
	6-10 years	37	14.9	14.9	14.9
	11 – 15 years	12	4.8	4.8	44.6
	16-20 years	30	12.0	12.0	56.6
	Less than 5 years	39	15.7	15.7	81.5
	More than 21 years	46	18.5	18.5	100.0
	Total	249	100.0	100.0	

The highest number of questionnaire survey respondents is having 1-5 years of working experience. Its frequency is 62. The second-highest number of questionnaire survey respondents is having more than 21 years of working experience. Its frequency is 46. The third-highest number of questionnaire survey respondents is less than years of working experience. Its frequency is 39. The least number of questionnaire survey respondents are having 6-10 years of working experience. Its frequency is six. The second least number of questionnaire survey respondents is having 11-15 years of working experience. Its frequency is 12. The third least number of questionnaire survey respondents is having 16-20 years of working experience. Its frequency is 17. In addition to that, 30 respondents are having 11-20 years of working experience and 37 respondents are having 1-11 years of working experience. The above data were analysed to get a clear perspective on the characteristics of the population investigated.

4.4.2 Role of professionals in the construction projects: Evidence from Quantity Surveyors

Roles and responsibilities of the Quantity Surveyor is illustrated in Table 4.14 identifying the most important roles and responsibilities need to be fulfilled by the respondents. Based on the literature survey, the expert interviews were conducted, and the results can be interpreted as follows.

Table 4-14: Role of professionals in construction projects: evidence from Quantity Surveyors

	N	RII
Building measurement	249	0.890
BOQ preparation	249	0.876
Preparation of cost schedules	249	0.858
Conducting feasibility studies	249	0.852
Cost management	249	0.852
Preliminary estimation	249	0.846
Valid N (listwise)	249	

According to the descriptive statistics of the survey, the highest RII value scoring a value of 0.890 was achieved by building measurements. The second highest RII value was scored by BOQ preparation having an RII of 0.876. Preparation of cost schedules obtained an RII value of 0.858 becoming the third highest RII in the list. Therefore, the most important role of a Quantity Surveyor in construction projects is building measurements. The second important role is BOQ preparation and the third one is the preparation of cost schedules. The least important role is preliminary estimation having an RII value of 0.846. There are two-second least important roles such as cost management and conducting feasibility studies having the same RII value of 0.852.

4.4.3 The role of professionals in construction projects: Evidence from Engineers

Roles of the Engineer in construction projects and the level of acceptance of the community is constructed via Table 4.15. According to the respondents, the following three engineering roles have identified in construction projects.

Table 4-15: Role of the Engineer in construction projects

	N	RII
Planning and designing structural facets	249	0.872
Accommodates technical requirements	249	0.866
Feasibility assessments	249	0.858
Valid N (listwise)	249	

When considering the role of the engineer in a construction project, the highest important role in planning and designing structural facets obtained an RII value of 0.872. The second important role of an engineer in a construction project is to accommodate technical requirements having an RII value of 0.866. Meanwhile, the least important role is of an engineer is feasibility assessment having an RII value of 0.846.

4.4.4 Role of professionals in construction projects: Evidence from Architects

Table 4.16 is demonstrating the role of the Architect in construction projects emphasising the importance of the construction aspects and research components.

Table 4-16: Role of the Architects in construction projects

	N	RII
Designing of the construction project	249	0.876
Procuring the conceptual proposal	249	0.862
Incorporating new technology into the industry	249	0.852
Valid N (listwise)	249	

According to the descriptive statistics mentioned above, designing the construction project is the most important role of the architect having an RII value of 0.876. Procuring the conceptual proposal is the second important role of an architect because it has an RII value of 0.862. Incorporating new technology into the industry is the least important role of an architect in a construction project having an RII value of 0.852.

4.4.5 Role of the Project Manager in construction projects

Different types of rules and regulations were identified through the literature review and the summary of them were assessed based on the information provided in Table 4.17.

Table 4-17: Role of the project manager in construction projects

	N	RII
Managerial skills	249	0.878
Leadership	249	0.866
Planning, organising, managing, controlling, and coordinating project-related activities	249	0.864
Minimising errors	249	0.862
Ensure technical stability	249	0.854
Proper communication among project stakeholders	249	0.846
Increase labour productivity	249	0.844
Auguring satisfaction of the customers	249	0.840
Valid N (listwise)	249	

When considering the role of the project manager in construction projects, managerial skills have the highest importance obtaining an RII value of 0.878. Further, the second-highest important role is the leadership obtaining an RII value of 0.866. The third highest important role in planning, organizing, managing, controlling, and

coordinating project-related activities has an RII value of 0.866. Minimizing errors and ensuring technical stability have moderate importance when considering the roles of architects. Auguring satisfaction of the customers is the least important role of an architect in a construction project obtaining an RII of 0.840. Increasing labour productivity is the second least important role of an architect in a construction project obtaining an RII of 0.844.

4.4.6 Reasons for professional negligence in construction projects

Table 4.18 is demonstrating the reasons for the professional negligence in construction projects as per the findings of the literature review and primary data findings.

Table 4-18: Reasons for professional negligence in construction projects

	N	RII
Poor design with negligent supervision	249	0.864
Carelessness	249	0.862
Insufficient information on documents	249	0.862
The unfair and unjust treatment of other individuals	249	0.858
Incomplete and wrong documentation	249	0.858
Lack of safety standards	249	0.852
Failure to provide adequate supervision	249	0.848
Abandonment of project due to inadequacy, incapacity, or errors	249	0.840
Late payments	249	0.840
Fluctuations in approved quality	249	0.836
Accepting a project that the company is not capable of delivering the project	249	0.834
Poor execution of work	249	0.828
Valid N (listwise)	249	

When considering the descriptive statistics of reasons for professional negligence in construction projects, poor design with negligent supervision is the highest possible reason for professional negligence obtaining an RII value of 0.864. The second highest possible reasons are carelessness and insufficient information on documents having an RII value of 0.862. The third highest possible reasons are the unfair and unjust treatment of other individuals and incomplete and wrong documentation having an RII value of 0.858. On the other hand, the least possible reason is poor execution of work having an RII value of 0.828. The second least possible reason is accepting a project that the company is not capable of delivering project having an RII value of 0.834. The third least possible reason is fluctuations in approved quality having an RII value of 0.836. Lack of safety standards, failure to provide adequate supervision, abandonment of project due to inadequacy, incapacity or errors, and late payments are the moderately possible reasons for professional negligence in construction projects having RII values of 0.852, 0.848, 4.20, and 0.840 respectively. Similarly, Adnan, Hashim, Yusuwan, & Ahmad (2012) confirmed that the late payments are affecting the construction industry professional negligence. As per Rashid, Adnan, & Yusuwan (2020) poor execution of work is affecting the construction industry professionals and the professional negligence. Hence it confirms that the key authors and the research findings have a common basis regarding the reasons for the professional negligence in the construction industry.

4.4.7 Types of professional negligence in the construction sector

According to the literature review findings diverse types of literature review identified in relation to the professional negligence in construction sector. Table 4.19 demonstrate the respondents overview regarding the professional negligence.

Table 4-19: Types of professional negligence in construction projects

	N	RII
Misconduct is professional negligence in the construction sector	249	0.852
Financial and cost-related issues are professional negligence in the construction sector	249	0.846
Lack of performance is professional negligence in the construction sector	249	0.834
Errors in final account preparation are professional negligence in the construction sector	249	0.832
An initial estimate of the building contract is professional negligence in the construction sector	249	0.792
Valid N (listwise)	249	

When considering types of professional negligence in the construction sector, misconduct is the highly available type of negligence obtaining an RII value of 0.856. Moreover, the second highest available type of negligence is financial and cost-related issues obtaining an RII value of 0.846. The third highest available type of professional negligence in the construction sector is lack of performance having an RII value of 0.834. An initial estimate of the building contract is the least available type of professional negligence in the construction sector obtaining an RII of 0.792. Errors in final account preparation are the second least available type of professional negligence obtaining an RII of 0.832.

4.4.8 Impact of professional negligence of Construction Professionals: Evidence from Quantity Surveyors in public sector projects

Table 4.20 illustrates the relationship of professional negligence and Quantity Surveying in public sector projects. As a crucial profession in the construction sector, quantity surveying requires Quantity Surveyors (QS) who are experts in reducing construction costs while balancing the project deliverables of time, cost, and quality (Sampath, Silva, & Withanage, 2020). Findings were generated through the understanding literature survey on negligence in projects.

Table 4-20: Impact of professional negligence of Quantity Surveyors

	N	RII
Economic losses are an impact of professional negligence in public sector projects	249	0.832
Loss of professional title is an impact of professional negligence in public sector projects	249	0.828
Physical injuries are an impact of professional negligence in public sector projects	249	0.800
The presence of claims is an impact of professional negligence in public sector projects	249	0.790
Death is an impact of professional negligence in public sector projects	249	0.780
Property damages are an impact of professional negligence in public sector projects	249	0.764
Valid N (listwise)	249	

When considering the descriptive statistics of the impact of professional negligence of Quantity Surveying in public sector projects, economic losses are the highest possible impact of professional negligence of quantity surveying in public projects obtaining an RII value of 0.832. The second highest possible impact is loss of professional title having an RII value of 4.14. The third highest possible impact is physical injuries having an RII value of 0.800. Furthermore, the least possible impact is property damage having an RII value of 0.764. The second least possible impact is the death of people having an RII value of 0.780. The third least possible impact of professional negligence of Quantity Surveying in public sector projects is the presence of quality having an RII value of 0.790. the research findings confirmed the findings of Hassan, (2010); Omran & Hussin (2009) elaborating that economic lossess and the injuries are affectingt he professional negligence of the Quantity Surveyors.

4.4.9 Reasons for professional negligence: Evidence from Quantity Surveying practice

Reasons for the professional negligence is illustrated in Table 4.21 that is affected with the Quantity Surveying practice. Quantity surveyors (Qs) play a vital role as information managers in the construction sector (Schoolbred & Miller, 1988). The role of quantity surveyor is very significant, for example: “communication is a central feature of the performance of his professional role, and he is indeed the nodal point for information processing in the design and construction sphere” (Cliff, 1982). Therefore, the researcher used the practice of quantity surveyors in identifying the reasons for professional negligence. The table combines both literature review and primary data findings.

Table 4-21: Reasons for professional negligence in Quantity Surveying practice

	N	RII
Lack of consideration	249	0.844
Damages caused considered under the duty of care	249	0.840
Lack of professionalism	249	0.840
Lack of care towards the financial aspects	249	0.836
The legal relationship between the plaintiff and the defendant	249	0.824
Breach of duty of care	249	0.820
Lack of commitment	249	0.818
Breach of contract	249	0.808
Causation	249	0.784
Existence of standard duty of care	249	0.764
Valid N (listwise)	249	

When discussing the descriptive statistics of reasons for professional negligence in Quantity Surveying practice, lack of consideration is the highest possible reason for professional negligence in quantity surveying obtaining an RII value of 0.844. The second highest possible reasons are damages caused considered under the duty of care and lack of professionalism having an RII value of 0.840. The third highest possible

reason is lack of care towards the financial aspects having an RII value of 0.836. The legal relationship between the plaintiff and the defendant, breach of duty of care, and lack of commitment are the moderately possible reasons for professional negligence in quantity surveying having RII values of 0.824, 0.820, and 0.818 respectively. On the other hand, the least possible reason is the existence of a standard duty of care having an RII value of 0.764. The second least possible reason is causation having an RII value of 0.784. The third least possible reason is a breach of contract having an RII value of 0.808.

4.5 Discussion

When considering the nature and impact of professional negligence in the construction industry context, Kakkar, et al. (2015) identified some components that must be present to be considered an act as a negligence action in the face of the law. Those are a duty that refers to a certain standard of care of the professionals owing, breach that refers to a breach of the standard by the professional, causation that leads to injury or damages caused due to the lack of proper care, and damages that refers to the resultant damage or the injury must be connected to the negligence. Nevertheless, Zulkepli (2012) stated that professional negligence interpreted the absence of the required degree of care that a reasonable man would display in such circumstances. Therefore, many authors have identified professional negligence as an absence of due care that is required to perform a similar activity. Nevertheless, in interview findings, most of the interviewees stated that professional negligence was the creation of a loss to the company of the employer and misuse of the professional experience for the good of the employer. When it comes to types of professional negligence in the construction industry, in the literature survey, Ho (2013) stated that professional negligence could be identified as a form of corruption in numerous disciplines. However, in the questionnaire survey, most of the respondents stated that misconduct, financial and cost-related issues, and lack of performance are the key modes of professional negligence in construction context in Sri Lanka.

When considering the roles of multiple professionals' contributions to construction projects, different authors have identified different professionals' roles differently. Ameh and Odusami (2010) stated that the major roles of Quantity Surveyors were revolved around the concept of cost management. Many authors defined the Quantity Surveyors' role considering the cost-related aspects and BOQ preparation. Nevertheless, the questionnaire respondents accepted building measurements, BOQ preparation, and preparation of cost schedules as key roles of a Quantity Surveyor. According to Shahraki, et al. (2018), the primary responsibility of the engineers is to provide technical supervision related to the construction works. In addition to that, planning and designing of the structure can be identified as an engineer's role through

the literature survey. Furthermore, questionnaire respondents also stated that planning and designing structural facets was the key role of an engineer. Designing the construction project is the main role of an architect in a construction project according to the questionnaire survey. Nevertheless, Iwo, et al. (2018) identified architects as the pioneer in the designing of a construction project due to their contribution in procuring and designing the conceptual proposals. When considering the role of project manager, according to Jang, et al. (2003), the project manager is the person who is incorporate other professionals in the construction project to complete the project. In the questionnaire findings, managerial skills, leadership, planning, organising, managing, controlling, and coordinating project-related activities are the key roles that have been identified by the respondents.

Determination of the instances vulnerable to professional negligence in the construction industry is the third objective of this research. In that case, approving low-quality material and approving inaccurate claims are identified as the main instances vulnerable to professional negligence through the interviews. According to Chan and Owusu, (2017) poor supervision by the superior party, deficits in the material quality selection, and following insufficient safety precautions by the professionals are the major vulnerable instances for professional negligence.

The impact of professional negligence varies with the individual perspective. Hassan (2010) stated that professional negligence may lead to numerous risks to the industry including damages to property and persons that can lead to loss of life. Further, Omran and Hussin (2009) stated that clients can face economic losses and threats to public safety are the main impacts of professional negligence in the construction industry. In addition to that, Mohammed and Abdulateef, (2015) highlighted that occupational accidents are a common issue due to professional negligence and most of the accidents happen with the lack of training on heavy equipment and other types of machinery because their main target is more gains rather than safety and quality. Similarly, the highest number of questionnaire respondents also accepted that professional negligence had a considerable impact on the project performance in Sri Lankan context.

When demonstrating the mitigation measures, it is important to study mitigation measures for the pre and post Professionals Negligence scenarios. Providing proper supervision, providing adequate knowledge, and training, implementing proper communication among parties involved, implementing a risk management system, recruiting professionals with relevant skills and knowledge, and issuing certificates for progress payments are the key measures that can be identified in the literature survey. Especially, Tharim and Shuib (2011) stated that all the contract terms and conditions must be communicated between contractual parties before signing the contract documents to avoid professional negligence. Nevertheless, when it comes to measures to manage the impact of professional negligence on the project performance at pre and post stages, industry professionals provided another perspective. Interviewees stated that to avoid professional negligence, it is important to develop the connectivity between pre- and post-contract teams, obtain professionals with relevant educational qualifications, support the community with frequent updates on project performance, and create a communication channel among project teams. Those are showed as the highly recommended measures to avoid professional negligence by the selected industry professionals.

4.6 Summary

In this chapter, the primary data collected through the questionnaire survey and the expert interviews were analysed. First, the questionnaire findings were analysed using the SPSS method. RII values were used to rank the findings. Then the findings of the expert interviews were analysed using the content analysis method. Five industry professionals were interviewed to conduct the interviews. Those findings are used to demonstrate the mitigation measures to avoid professional negligence. Finally, the primary data and secondary data were compared to identify the similarities and differences of the findings to conclude the research problem.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

In this research, the research findings were gathered to achieve the objectives of the research. The first objective is to review the nature and impact of professional negligence in the construction industry context. In that case, different authors provided different perspectives on professional negligence in the construction industry. Among them, most of the authors have defined professional negligence as an absence of a duty of care in the cause of their occupation. In addition to that, it was defined as referring to a lack of reasonable care that can be expected from a person who engaged with such activity. In contrast, according to the interview findings, professional negligence was defined as the creation of a loss to the company of the employer and misuse of the professional experience for the good of the employer. When considering the opinion on professional negligence of construction professionals, they are not clear on professional negligence. They are thinking about the experience that they have faced and most of them were not educated on that. Simply, professional negligence can be considered as a lack of duty of care that can be expected from a when doing similar conduct. When reducing the expected care on the activities, many issues and mistakes happen to lead to professional negligence.

In addition to that, according to the literature findings, professional negligence may appear as corruption, misconduct, financial and cost-related issues, and lack of performance. Furthermore, according to the interview findings, the same findings were obtained for types of professional negligence related to the construction industry. Therefore, corruptions, financial issues, misconducts, and lack of performance are the types of professional negligence that can be identified in the construction industry.

When considering the roles of multiple professionals' contributions to construction projects, professional-wise roles were identified in the literature findings and the questionnaire findings as well. Cost management, building measurement, BOQ preparation, assessing ongoing work with previously prepared estimates, preliminary estimation, feasibility studies, cost schedules, and cost advice are the key roles of a

Quantity Surveyor according to the literature findings. In fact, according to the questionnaire findings, building measurement, BOQ preparation, and preparation of cost schedules are the most important roles of a Quantity Surveyor in a construction project. Therefore, as a conclusion, the Quantity Surveyor must be responsible for taking accurate measurements, BOQ preparation, and cost-related activities in the project.

According to the literature survey, engineers involve in the designing phase, accommodate all technical requirements, technical supervision, designing and planning, structural facets, and feasibility assessment. Nevertheless, the questionnaire findings if planning and designing structural facts are the most important role of an engineer. Nevertheless, accommodating technical requirements can be also identified as an important role according to questionnaire findings. According to both findings, the engineers are responsible for planning and designing structural facts in the construction project and providing technical supervision for the project. When considering the questionnaire survey findings, approving low-quality material, and approving inaccurate claims can be identified as major instances that professional negligence can exist. Those are the highly approved instances.

When considering the literature findings, project managers involved with leadership and managerial skills to ensure the effectiveness of the project, managing the project towards a sole target, planning, organizing, managing, controlling, and coordinating the project related activities, ensuring technical sustainability of the project, proper communication among stakeholders, conducting measures related to increasing labour productivity, assuring the satisfaction of customers and other stakeholders, and minimizing errors. Similarly, in questionnaire findings also, managerial skills, leadership, planning, organizing, managing, controlling, and coordinating project-related activities can be identified as important roles of a project manager. Therefore, managerial skills and leadership skills are the most required skills for a project manager according to the research findings of this research. In addition to that, planning, organizing, managing, controlling, and coordinating the project-related activities, and proper communication and coordination of all the parties are very important roles of a project manager.

Further, the literature findings include that architect are responsible to procure and designing the conceptual proposal, making the construction process effective with architectural values, potential designing, introducing technological developments to project, and modernizing the construction sector. However, when considering the questionnaire survey findings, designing the construction project is the major role of an architect in a construction project. Referring to both perspectives, as conclusion architects are more responsible for design aspects than other aspects such as cost management.

The instances vulnerable to professional negligence in the construction industry is another aspect that is focused on in this research. In addition to that, poor initial estimation, lack of concern on the claims, and arithmetic errors can be identified as instances vulnerable to professional negligence. In contrast, the literature survey explains that all the construction claims are not professional negligence. There are some requirements to be filled for a claim to be considered as a professional e.g., the existence of a standard duty of care and the act falling short of the standard of care defined for the profession, the existence of a legal relationship among the two parties; the plaintiff; client or the public and the defendant professional, and damages arising due to the act must fall within the scope of the professional. If those criteria are fulfilled it is considered professional negligence. According to that, the instances vulnerable that were identified through the questionnaire survey can be described with this explanation. Therefore, any claim that fulfils the above requirements can be considered professional negligence in the construction industry.

As the impact of Professionals Negligence on construction project performance, various adverse consequences can be identified through different sources. According to the literature findings, health and safety cost, threats to the public, and low quality of work can be identified as major impacts of professional negligence in construction projects. On the other hand, the highest number of questionnaire respondents also accepted that professional negligence had a considerable impact on the project performance. In a conclusion, professional negligence significantly affects the project performance and the health and safety cost, threats to the public, and low quality of work might be the outcome.

To achieve the final objective of this research, i.e., to demonstrate the mitigation measures for professional negligence, the mitigation measures for the pre and post Professionals Negligence scenario should be identified. In the literature survey, several mitigation methods were identified which were provided by different authors such as providing proper supervision, providing adequate training and education, implementing proper communication among parties involved, establishing a proper risk management system, recruiting professionals with relevant skills, and knowledge, and issuing certificates for progress payment. According to the questionnaire survey findings, most of the experts stated that some mitigation methods e.g., developing the connectivity between pre and post-contract teams, obtaining professionals with relevant educational qualifications, supporting the community with frequent updates on project performance, and creating a communication channel among project teams. Considering both perspectives, recommendations for mitigation methods to develop the framework can be identified as follows.

5.2 Recommendations

To address the final objective some mitigation methods are identified, and these mitigation methods can be deployed in the company to mitigate professional negligence in the construction site itself.

Providing proper supervision is the first recommended measure that must be used to mitigate negligence in the construction industry. Competent persons who have the required knowledge, skills, and experience must closely supervise all the workers. In addition to that, providing adequate training and education is another effective measure to avoid professional negligence in the construction industry. In that case, the required knowledge and skills for a particular job must be provided for all the levels of the professionals and the workers.

Implementing proper communication among parties involved is another measure recommended to avoid negligence in the construction industry. A proper communication channel must be created to continue the flow of information throughout the construction project. Thereby, most of the negligence can be avoided.

Moreover, a systematic risk management system must be established to address the hazard in the construction project. A competent person who has the required knowledge and skills must conduct it. Additionally, the risk assessment must be conducted periodically to identify the possible hazards in the rapidly changing business environment in the industry.

When recruiting new employees, competent persons who possess the required knowledge and experience must be hired. Then, the requirements of the training and development programs may be reduced. Prior criteria of qualifications must be prepared before hiring them and the candidates must be evaluated according to those criteria. On the other hand, issuing certificates for progress payments is also recommended to follow to reduce professional negligence. In addition to that, a proper coordination channel must be created within the construction project connecting pre and post negligence scenarios. Thereby, the hazard can be identified at the early stage and corrective action can be taken to avoid such situations again. Furthermore, frequent updates must be provided to the community of the project regarding the project performance. Thereby, workers are motivated and loyal to the company avoiding professional negligence. A proper framework must be developed including these mitigation methods for the pre and post Professionals Negligence scenario.

5.3 Limitations

The research was conducted during Covid 19 global pandemic and travel restriction was the major limitation that affected the research process. Moreover, limited time and the less availability of professionals limited the research interview-based data collection. Since professional negligence is highly related to legal aspects it was challenging to obtain data relied upon professional negligence in the Sri Lankan context. Considering the practical difficulties questionnaire survey was distributed among a limited sample based on the quota sampling technique. Therefore, time, cost, and limited secondary data availability affected the research mainly and caused a research outcome. Nevertheless, the project was conducted with certain geographical

limitations and the research was able to overcome the limitations with better strategical research approaches.

5.4 Further Research Area

As per the research findings, it is identified that the following research areas are reliable to continue based on this research.

- Assess the professional negligence among construction professionals in the civil engineering sector
- Develop a legal framework to address the pre-contract and post-contract dispute resolution via professionalism
- Identify the possible strategies to overcome professional negligence in the Sri Lankan construction sector

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7.0 APPENDIX

7.1 Appendix A – Preliminary Interview

COVERING LETTER

AGBT Shakthi,
M.Sc./PG Diploma in Construction Law & Dispute Resolution
Department of Building Economics,
University of Moratuwa
28/04/2022

.....
.....
.....

Dear Sir/Madam,

Interview Guideline for the Dissertation on “The Impact of Project Performance due to Negligence of Professionals in the Construction Industry”

I am a postgraduate of Department of Building economics, university of Moratuwa, who is currently engaged in research on the above-mentioned topic. That is conducted under the guidance and supervision of Dr. Chandanie Hadiwattege senior lecturer, Department of Building Economics, University of Moratuwa.

The next section in the interview guideline provides the introduction and outline of the research study for your understanding. The research is conducting for the identification and assessment of professional negligence and construction industry. Since the impact of professional negligence has caused several issues in the construction industry this research intends to identify those impact towards the project performance. This interview guideline is consisting unstructured questions that are focusing to obtain the relevant information to achieve the research objectives and fill the literature gap. This interview will be conducted approximately for 30 minutes and note taking and voice recording will be done only with your fullest consent.

I assure that none of the information collected, and the content discussed will be used for any other purposes than for research purpose. Furthermore, all the information gathered will be treated confidentially. As a means of ensuring this transcript of the interview will be shared with you. The information shared and the time dedicated despite the busy schedule is highly appreciated.

Thank You,
Yours faithfully,

.....
AGBT Shakthi
agbinara@gmail.com

INTERVIEW GUIDELINE

SECTION I – INTRODUCTION TO THE RESEARCH

Research aim:

This research aims to investigate the impact of professional negligence on construction project performance.

Research objectives:

- Critically review the nature of professional negligence in the construction industry context.
- Explain the roles of multiple professionals' contributions to construction projects.
- Evaluate the instances vulnerable to professional negligence in the construction industry.
- Analyse the impact of Professionals Negligence on construction project performance.
- Develop a framework consisting of mitigation measures for the post and pre–Professionals Negligence scenario.

SECTION II – BACKGROUND INFORMATION

1. Name :
2. Designation :
3. Professional experience (no. of years) :

SECTION III – PROFESSIONAL RESPONSIBILITIES

4. What is defined as professional negligence in the construction industry?

.....
.....

5. What are the responsibilities of a professional during pre-contract and post contract stage of the construction industry?

.....
.....

6. What are the strategies used to maintain the professionalism in construction projects?

.....
.....

7. What is the responsibility of the construction professional during a conflicted situation in a construction project?

.....
.....

8. What are the measures taken to mitigate professional negligence in construction industry?

.....
.....

SECTION IV – PROJECT PERFORMANCE

9. What are the parameters defining the project performance in construction sector?

.....
.....

10. Do you believe there is an impact of professional negligence with the project performance? Please explain your perspective.

.....
.....

11. What are the measures taken to ensure the project performance in construction sector?

.....
.....

7.2 Appendix B – Questionnaire Survey

THE IMPACT OF PROFESSIONAL NEGLIGENCE ON CONSTRUCTION PROJECT PERFORMANCE

I am a post-graduate of Department of Building Economics, University of Moratuwa currently following the MSc. /PG Diploma in Construction Law and Dispute Resolution. I am conducting this research on "the impact of professional negligence on construction project performance" in partial fulfilment of the requirements for the post-graduate diploma programme.

Research aim:

To investigate the impact of professional negligence on construction project performance

Research objectives:

- Critically review the nature of professional negligence in the construction industry context

- Explain the roles of multiple professionals' contributions to construction projects

- Evaluate the instances vulnerable to professional negligence in the construction industry

- Analyze the impact of Professionals Negligence on construction project performance

- Develop a framework consisting of mitigation measures for the post and pre Professionals Negligence scenario

This questionnaire survey consists semi-structured questions, which is designed to be completed within maximum 5 minutes. I really appreciate your active participation in this questionnaire survey for the completion of the research study. I assure that all your responses are only used for the research purposes and will not be shared with any third party and your confidentiality is assured.

Thanking you in advance for your kind collaboration.

Department of Building Economics
University of Moratuwa

* Required

SECTION A

General Information

1. 1. Age (in years) *

Mark only one oval.

- ☐ 21 - 30
☐ 31 - 40
☐ 41 - 50
☐ above 51

2. 2. Select your profession *

Mark only one oval.

- ☐ Quantity Surveyor
☐ Engineer
☐ Project manager
☐ Architect
☐ Building surveyor
☐ Draughtsman
☐ Other: _____

3. 3. Define you professional experience *

Mark only one oval.

- ☐ 1 – 10 years
- ☐ 11 – 20 years
- ☐ More than 21 years

SECTION B

Professionals in Construction

Please scale the key points using the following scale accordingly.

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Neutral
- 4 - Agree
- 5 - Strongly agree

4. 4. What are the roles of the Quantity Surveyor in construction projects? *

Mark only one oval per row.

	1	2	3	4	5
Cost management	☐	☐	☐	☐	☐
Building measurement	☐	☐	☐	☐	☐
BOQ preparation	☐	☐	☐	☐	☐
Preliminary estimation	☐	☐	☐	☐	☐
Conducting feasibility studies	☐	☐	☐	☐	☐
Preparation of cost schedules	☐	☐	☐	☐	☐

5. 5. What are the roles of the Engineer in construction projects? *

Mark only one oval per row.

	1	2	3	4	5
Accommodates technical requirements	☐	☐	☐	☐	☐
Feasibility assessments	☐	☐	☐	☐	☐
Planning and designing structural facets	☐	☐	☐	☐	☐

6. 6. What are the roles of the Architect in construction projects? *

Mark only one oval per row.

	1	2	3	4	5
Designing of the construction project	☐	☐	☐	☐	☐
Procuring the conceptual proposal	☐	☐	☐	☐	☐
Incorporating new technology into the industry	☐	☐	☐	☐	☐

7. 7. What are the roles of the Project Manager in construction projects?

Mark only one oval per row.

	1	2	3	4	5
Leadership	☐	☐	☐	☐	☐
Managerial skills	☐	☐	☐	☐	☐
Planning, organising, managing, controlling, and coordinating project related activities	☐	☐	☐	☐	☐
Ensure technical stability	☐	☐	☐	☐	☐
Proper communication among project stakeholders	☐	☐	☐	☐	☐
Auguring satisfaction of the customers	☐	☐	☐	☐	☐
Increase labour productivity	☐	☐	☐	☐	☐
Minimising errors	☐	☐	☐	☐	☐

SECTION C

Professional Negligence

Please scale the key points using the following scale accordingly.

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Neutral
- 4 - Agree
- 5 - Strongly agree

8. 8. What are the reasons for professional negligence in construction projects? *

Mark only one oval per row.

	1	2	3	4	5
Poor execution of work	☐	☐	☐	☐	☐
Late payments	☐	☐	☐	☐	☐
Fluctuations in approved quality	☐	☐	☐	☐	☐
Insufficient information on documents	☐	☐	☐	☐	☐
Failure to provide adequate supervision	☐	☐	☐	☐	☐
Lack of safety standards	☐	☐	☐	☐	☐
Incomplete and wrong documentation	☐	☐	☐	☐	☐
Unfair and unjust treatment of other individuals	☐	☐	☐	☐	☐
Accepting a project that the company is not capable	☐	☐	☐	☐	☐

of delivering the project					
Abandonment of project due to inadequacy, incapacity or errors	☐	☐	☐	☐	☐
Poor design with negligent supervision	☐	☐	☐	☐	☐
Carelessness	☐	☐	☐	☐	☐

Types of professional negligence in the construction sector

Scale the below mentioned professional negligence based on your professional experience

9. Misconduct is professional negligence on the construction sector



Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

10. 10. Lack of performance is professional negligence on the construction sector *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

11. 11. Errors in final account preparation are professional negligence on the construction sector *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

12. 12. Financial and cost-related issues are professional negligence in the construction sector *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

13. 13. An initial estimate of the building contract is professional negligence on the construction sector

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

14. 14. What is professional negligence in the construction sector? Please mention more in addition to previous.

15. 15. What is the significance of Quantity Surveyor's practice towards professional negligence?

Impact of professional negligence of Quantity Surveying in public sector projects

Scale the below mentioned professional negligence of Quantity Surveyor in public sector projects based on your professional experience

16. 16. Physical injuries are an impact of professional negligence in public sector projects *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

17. 17. Property damages are an impact of professional negligence in public sector projects *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

18. 18. Loss of professional title is an impact of professional negligence in public sector projects *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

19. 19. Economic losses are an impact of professional negligence in public sector projects *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

20. 20. Death is an impact of professional negligence in public sector projects *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

21. 21. Presence of claims is an impact of professional negligence in public sector projects *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

22. 22. Please mention the impacts of professional negligence of Quantity Surveying in the public sector projects. Please mention more in addition to previous.

23. 23. What are the reasons for professional negligence in Quantity Surveying practice? *

Mark only one oval per row.

	1	2	3	4	5
Existence of standard duty of care	☐	☐	☐	☐	☐
Breach of duty of care	☐	☐	☐	☐	☐
The legal relationship between the plaintiff and the defendant	☐	☐	☐	☐	☐
Causation	☐	☐	☐	☐	☐
Damages caused consider under the duty of care	☐	☐	☐	☐	☐
Lack of care towards the financial aspects	☐	☐	☐	☐	☐
Breach of contract	☐	☐	☐	☐	☐
Lack of professionalism	☐	☐	☐	☐	☐
Lack of consideration	☐	☐	☐	☐	☐
Lack of commitment	☐	☐	☐	☐	☐

24. 24. What are the barriers to avoid professional negligence in Quantity Surveying practice?

25. 25. What are the suggestions to avoid professional negligence in Quantity surveying practice in the construction sector?

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