Chapter 5

5.0 CONCLUSIONS, RECOMMENDATIONS, LIMITATIONS AND PATHWAYS TO FURTHER DEVELOPMENT

5.1 Conclusions
The need for risk management in construction projects has increased with time to the increasing complexity, size, client–consumer requirements, problems associated with political and economic scenarios, and the arduous nature of such projects. Civil engineering construction projects, especially road construction projects, are more vulnerable than other projects to risks because of heavy outlays required in terms of time, money, quality assurance, construction technology and capital.

This study makes it clear that risk management is a novel concept in the Sri Lankan construction industry. Although countries in Europe and United States of America have derived considerable advantage by adopting risk management strategies, the Sri Lankan construction industry has not paid much attention to this concept in construction. Considering its growing significance in the construction industry worldwide despite its relative neglect within the local context, the present research has attempted to identify the critical risks and the strategies for handling them at each stage of the project life cycle in road construction projects in Sri Lanka.

The main focus of the study was to identify the types of risk variables associated with the different phases of a road project and to find out the factors that are the most critical in each phase and to allocate these critical risk factors among the contracting parties. A further attempt was made to identify the risk response measures used by both consultant and client/contractor, and to identify the barriers to risk management as well as solutions to those barriers.
This study adopted the Delphi method to extract data from the selected expert panel of professionals who are involved in road construction. The data was collected through a questionnaire survey conducted in three rounds.

Through the comprehensive literature survey and preliminary interviews, 21 risk factors related to road projects were identified. Based on these 21 risk factors, the Round One questionnaire was prepared. According to the data gathered in Delphi round one, 25 risk factors were identified as prevalent in the four phases of the project life cycle. This finding provided the basis to achieve the first objective, which was to identify the critical risks associated with each phase of the project life cycle of a road project. From the round one results, further analysis was done during the second round in order to fulfill the first objective, which was to identify and analyse the critical risk factors associated with each phase of the project life cycle. Through the data analysis of Delphi round two, two severe risk factors were found to be prevalent in the conceptual stage, six severe risk factors prevalent in the design stage, 15 severe risk factors prevalent in the construction stage, and 2 severe risk factors prevalent in the operation stage. It was found that errors in estimating the cost and the construction period were the most severe risk factors in the conceptual stage, followed by delays in the decision-making process by clients. Errors in estimated cost and construction period were the most severe risk factor in the design stage too. Design errors by the consultant were next in importance. In the construction stage, delays in payment by the client were the most critical risk factor followed by the contractor’s cash flow problem. Errors committed during field construction was the most critical risk factor in the operation stage. These findings reveal that risks are spread throughout the whole project life cycle and that some risks occur in more than one phase. In addition, it was found that the construction stage is the most critical phase with the most number of severe risks, followed by the design phase.

The second objective of this study was to identify how these risks are handled at each phase of the project, which was addressed in part two of the round two of the questionnaire survey. The results of the survey were used to identify the risk response measure used by the contracting parties. It was found that clients/
consultants often take responsibility for the most severe risk factors that arise in the conceptual and design stages. However, contractors often take responsibility for the most severe risk factors that arise in the construction stage. The findings indicate that allocation of contingency plans and transferring the risk to the main contractor are the commonly used response measures of the consultant while claiming for damages is the commonly used response measure of the contractor.

The third objective was to evaluate the allocation of severe risk factors among the contactor and client/consultant in each phase of a road construction project. This was achieved with the third part of the second round and the second part of the third round questionnaire surveys. The results revealed that severe risks at the conceptual stage were fully allocated to the client/consultant and at design stage were mostly apportioned to the client/consultant while at the construction stage a high percentage of severe risks was allocated to contractors. However, shared responsibility was more the norm in the operational stage although, at all stages, some portion of the risk was shared by the other party.

The fourth part of the second round and the first part of the third round questionnaire surveys were carried out in order achieve the fourth objective of this research, which was to determine the bottlenecks and to introduce alternatives to the present risk handling methods. It was found that the lack of joint risk management mechanisms, ineffective monitoring, lack of risk consciousness and the deficiencies in knowledge on risk management were the most common barriers to risk management. Further in this round, solutions to these identified bottlenecks or barriers were identified in order to improve the ability of contracting parties to manage risks as using of qualified and skilled professionals, including specific area to price for risk and education and training on risk management.

Finally, in order to fulfill the final objective of this research, which was to develop a risk management model for managing risk in the different phases of a project, a model was created based on the findings of the survey. Case studies, which aimed at verifying the content of the model, its applicability and efficiency, revealed that such
a model assists the clients in proper risk management. Further, the methods adopted in this research were validated as appropriate to achieve the objectives of the study.

Although the study identifies most of the elements of risk management, it was found that most organizations have not formally implemented risk management into their managerial systems. However, the study makes clear that there is already some awareness of the need for risk management in the industry, which is an important starting point in any attempt at introducing formal risk management into the road construction industry in Sri Lanka.

5.2 Recommendations

Taking into consideration the findings of this research, recommendations can be made to the main stakeholders of the construction industry. Based on this research it can be said that road construction projects are consistently exposed to different types of risks in different stages of the project life cycle and that these risks adversely affect the project objectives. Moreover, while these risks can be managed, they cannot be ignored. Moreover, risks should not be transferred to one party but jointly handled. Therefore, there should be a joint risk management mechanism which currently is lacking in the Sri Lankan construction industry. Further, severe risks should be identified from the perspective of a project life cycle and should identify the change of the severity of the risk factors according to the project phase. Therefore a formal risk management process, which consider the risk severity at different phases of project life cycle should be applied at all stages of the project by the contracting parties associated with project.

The study also revealed that insufficient knowledge of risk management is one of main barriers to risk management. Thus the construction industry should impart proper education and training to their professionals. Further, organizations should hire risk management consultants in order to manage risk which is not a common practice in Sri Lanka.
Since the state is one of the major stakeholders in road construction projects, the state sector organizations, both as clients and as consultants, should show more concern regarding the factors which can be controlled by them such as design errors, errors in estimated cost and construction period, delays in the decision-making process, shortcomings in the tender document, etc., which are identified as critical risk factors with regard to road construction projects in this research. Since the rehabilitation and development of the road network is undertaken with public funds at a very high cost, it is the responsibility of state sector organizations to ensure that adequate economic returns are achieved through proper risk management. The contractor should be more concerned about the factors which are controlled by him such as poor productivity, errors committed during field construction, delays in mobilization. Since there are challenges when it comes to risk management, organisations have to identify proper solutions that would help them move towards and achieve the benefits of risk management.

5.3 Limitations

Several difficulties were encountered in carrying out this research. Difficulties mainly arose in relation to the conduct of the Delphi survey and case studies. In addition, there were limitations with regard to the model development.

5.3.1 Difficulties in conducting three rounds of the Delphi survey

The following difficulties were encountered in conducting the three rounds of the Delphi survey.

The selection of a panel of experts is central to the success of the Delphi method. Panel members must be ‘willing’ and ‘able’ (Robinson, 1991). In the case of the present research, it was very difficult to find 33 experts who would take the work seriously and devote the time necessary to provide thoughtful and reasoned responses to the questions. Secondly, the successful rounds of the Delphi techniques were extremely time-consuming, as they consisted of three rounds, the completion of which took about 18 weeks. Moreover, the turn-around time for the questionnaire survey conducted among the panelists was longer than expected. It was very difficult
to get the response from industry practitioners for each round of the Delphi questionnaires as they were always busy with work. Many reminder calls and return visits to the organizations had to be made in order to mobilize the non-respondents. Although a few respondents dropped out from round two and three, that did not have a major impact on the success of the survey. The success rate at each round is recorded in Table 3.1. In addition, in this study, a lot of effort was made to make the questionnaire simple and yet sufficient to convey the objectives of the study to the panel of experts. As seen from the Table, a relative success response rate of 78.79% was achieved, which can be considered acceptable for the purposes of this research. Although there was a problem of communication with the experts since the respondents requested further verbal explanations regarding the arrangement of the questionnaire, this was achieved without too much adverse impact on the response rate.

5.3.2 Difficulties in conducting case studies

Case studies were used to verify the applicability and practical use of the model. Hence, it was important to select respondents who were a project client/consultant or a contractor with experience. The study faced some difficulty in finding project clients/consultants and contractors who was willing to reveal project details.

5.3.3 Limitations to model development

This model is subjected to the following constraints and limitations:

1. The model contents were restricted to the road rehabilitation projects (A and B class roads) which use re-measurement contracts;
2. The model assumes that the identified risk factors are mutually exclusive;
3. Although the definitions of risk encompass welcome ‘up-side’ as well as unwelcome ‘down-side’ effects, for the purposes of this research, the risk is defined as the ‘down-side’ consequences of the exposure to economic or financial loss, physical damage, or injury, or delay;
4. The model development was restricted to the contracting parties as contractor and client/consultant. Risk response measures and risk allocations were evaluated by considering the client and consultant as one party. Therefore, there were no provisions in the study to take them as two different parties.

5.4 Further Research

The following issues have been identified as areas for further development:

- It should be pointed out that the research was conducted only for road construction projects in Sri Lanka and that therefore the conclusions drawn from the study may have purely local applications valid only for Sri Lanka and may even have some biases. It is therefore recommended that a larger-scale Delphi survey, which captures a larger number of civil and infrastructure projects, could be undertaken in Sri Lanka for the purpose of enhancing the uses of this model among contracting parties that are involved in other types of civil and infrastructure projects.

- Further this research can be extended on building projects also, where it provides client/consultant and contractor to use the model for risk management.