Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Accidents are not because of fate or chances always. Researches on safety has stressed upon the point that accidents are resultant of a chain of incidents, which ultimately shaped into an adverse outcomes. The first task of risk assessment is to recognize the inherent hazards. Harbor towage which is also known as routine ship towage is potentially a hazardous operation. In order to operate in an efficient manner safely, this requires a high level of understanding about role and accountabilities of persons involved in operation of their own and their teammates, proper training and equipment should in addition be provided as a prerequisite.

Recent accidents in RST operations in Indian coastal waters have stressed on potential safety concern. Preliminary researches showed a requirement of empirical scientific research with respect to the specific accidents faced during harbor towage operations.

5.2 Findings

Seven factors were found responsible to a great threat to Routine Ship Towage safety and those are Poor work process, Poor maintenance of equipment/substandard condition of Equipment, Severe weather conditions, poor or no risk assessment, occupational incompetence, the suitability of the type of tug and poor safety management system.

Expert Interview identified extra safety risk factors; fatigue, negative attitude & commercial pressure, watertight integrity, and wash/squash effect. Risk factors elements such as Fatigue, negative attitude & commercial pressure are taken in Human factor, whereas watertight integrity is basically stability element. Moreover, wash/squash effect is attributing to Navigational obstacle.
Collisions were the potential safety event in RST operations followed by grounding and Capsize / foundering. The most potential consequence was Damage followed by Injury and Pollution. There is also indication of a noticeable risk of Loss of Life.

Crew incompetency due to poor training and Human factor indicated substantial amount of risk frequency.

Although small risk factor frequency is observed because of tug type involved in Routine ship towage operation but it indicates a fair relationship with consequences, on the other hand high risk factor frequency and significant relationship with consequences is exhibited by navigational obstacle or restricted maneuvering space.

High risk factor frequency was lies with Poor work process components like speed; wrong operating procedure and poor tug handling and interaction. Poor implementation of safety culture contributed by bad work attitude and Poor risk assessment was responsible for Poor Safety Management System and therefore was the main source to threat to RST operation.

An area of equitable system of regulatory oversight for the benefit of all tugs is identified which could benefit after further analysis. A disproportionately high number of smaller uninspected tugs, involved in accidents, provided limited anecdotal evidence to support this. High frequency of insufficient Safety Management Systems and Human Factors (legislated for in International Maritime Conventions) are included in substantial Risk Factor evidence comparatively.

Changes to tug design and increased complexity were identified as factors. Expert Interviews reported that modern engine management systems can provide dead slow speeds of ten knots, equally tug power has increased to an extent where bollard strength can be insufficient.
The significance of an adequate number of appropriately qualified and experienced crew was also identified. New entrants from other maritime sectors replaced by migration might not be aware equally risk factors associated with harbour towage operations.

Many risk factors are related to training. In harbour towage operations, tow planning emphasized the significance of prerequisite of adequate information and experienced persons involved in operations; Following Operation Procedures marked the significance of effective tug crew training programs; and Tug Handling stressed upon sufficient training of tug masters.

Interviews of experts implied that training issues might also comprehended to personal attributes and attitudes; emphasizing on the importance of teamwork and effective communication in order to secure safety in harbour towage operations. A specific code, analysis of situation (whether an action was safe) was marked; whether it was related to handle tugs of new generations (with reported exceptional tug size to power ratios) or the capability to judge speed of a vessel to decide whether it was safe to close on her bow to make a tow.

5.3 Conclusions

The research presented in this thesis has contributed to the fields of maritime hazard & risk management:

- The research aims to improve worker safety by providing measures to reduce fatalities and injuries to workers in the field of towage operation.
- This research proposes hazard controls used for a past problem can be applied and/or modified for similar associated in Indian subcontinent region.
- To this end, aiding hazard identification in the RST operation has been performed.
- This presents an avenue for further study towards investigating perception and worker competence levels based on work experience.
- The study shows potential to provide continual learning in hazard identification/management along with benchmarking company/individual risk perception levels and assessing the effectiveness of targeted training initiatives.
• Lastly, proposal for Further Work in Multidiscipline / Collaborative Research Opportunities such as other avenues for future research could involve collaboration between psychology / education and engineering fields.

5.4 Lessons Learned

I have gained a vast amount of knowledge throughout the course of this study, both in regard to the research topic and myself. I have found this experience has given me additional confidence by developing communication and presentation skills. These have been further reinforced by presenting my work at seminars and conferences, interacting with people of varying disciplines, and attending appropriate training. The research was a far greater challenge than I had originally anticipated, especially the collection of questionnaire samples and conducting interview. Although not pleasant at the time, these experiences acted as a reality check as to what was achievable within the timescale.

The most important lessons I have learned from undertaking this research are:

• Time management skills are paramount and realistic time scales / planning are required.

• A good understanding of research methodology and various tools for analysis.

• Consider the resources available to you, whether it is materials, software, or people. The overseas interview from different parts of world would not have come to fruition without the media consultancy support team.

• Face-to-face contact and strategic networking is invaluable. This is demonstrated by the lack of response when in search of participants for interview very few people elected to take part.
5.5 Limitations of Study

5.5.1 Practical Limitations

The practical limitations concern the scope of this research which is just limited to Hazard identification which is first and primary stage of any risk assessment tool. The second objective which is to explore various control measures practiced worldwide in towage industry is just a representation of recommendations which is actually a final stage of risk assessment tool. This research doesn’t assess the cost-benefit analysis or doesn’t answer good or bad practice. Hence, the control measures and practices listed out in second objective are for reference purpose. Organization need to do risk assessment before adopting or implementing any control measure on case basis. Perhaps, this limitation of research also open gap for future research study.

5.5.2 Methodological limitations

The major methodological limitations concern the validity of the questionnaire and sample characteristics. The questionnaire did not show the ability to cover all aspects of the safety risk factors, which is a limitation affecting the overall validity of the study. Due to low reliability, several items and constructs were excluded from the further statistical analysis. One explanation is poor representative reliability across subpopulations or groups of people (Hair, 1998; Neuman, 2000). It may be fair to assume that some groups (e.g., top management or senior officers) are better informed about their company’s strategic and tactical management and operations and, therefore, are better placed to answer some of the questions related to the company. A second issue concerns the constructs itself. Yin (2003) focused on the fact that the items constituting a construct or dimension should share a common cause or consequence. Some of the questionnaire constructs did not meet this latter requirement. Biases could also be produced by cultural differences, languages, and response style. India is a country of many languages and cultures. In a cross-national study, Stake (1998) found that English language survey versions tended to be more homogenized, potentially obscuring cross-national differences. The sample taken from participants many
not necessary are of different nationals but there are diverse relation between their mode of communication and thought process. Taking this into consideration, cross-cultural comparisons of results are not performed in the current study. In addition, indicated differences at the organizational level (e.g., between type of tug and employment terms) should not be overestimated. As participation was voluntary on behalf of the company, it is assumed that those participating do, in general, emphasize safety in their operations; thus, the results are biased in a positive direction. Moreover, the survey data are only representative of members of the Indian National Shipowners' Association. The possibility exists that the results are subject to the common method bias (Hammersley, Martyn, and Roger, 2000) due to the data deriving from a common source (e.g., a common scale for different questions). Potential statistical remedies have been suggested. Platt (1992) is skeptical of the merits of such approaches. He argued that—given that it is not possible to know the existence or extent of any possible bias—treating it could in fact introduce more bias than what existed in the first place. He recommended using a multi-method strategy so that results do not rely exclusively on the results of one questionnaire. In the current research, Case reports, interviews, and participatory studies were used to validate the data. As with the survey data, a question of validity arises to the qualitative data. Accordingly, all results in this thesis were also presented to several people working within the industry; they expressed that they believe the results to be giving an accurate representation of the situation.

### 5.5.3 Theoretical limitations

The principal objective of this thesis has been to identify risk factors which are causing threat to RST operational safety and various control measures. Limitations also follow from the theoretical stand and research perspective. By focusing on cultural influences on safety management, other areas of equal importance give way. Research with other perspectives (e.g., professional culture, state culture, or a sociotechnical approach) would bring about different results. For example, technological changes have unquestionably left their mark on both operational safety and the organizational structure of the industry. The shipping industry has, since the early 1960s, steadily adopted the automation and integration of new technology (Hill, 1992a). Yet despite the introduction of new technology partly intended to increase safety by, for example, reducing human error, new technology may also be the
cause of new and emerging risk (Gallaspe, 2008). This could be a mismatch between ergonomic aspects and the human information processing system, overreliance in technology that may fail, loss of operational skills and experience necessary for handle critical and unexpected situations, or changes in the social and organizational system.

5.6 Future Scope of Study

This thesis has explored the hazards and safety management practices within shipping associated with Routine Ship towage Industry. The major limitations of the research along with implications for safety practitioners and researchers—previously addressed in this thesis—can be summarized as follows.

Survey: Parts of the applied questionnaire showed several deficiencies, and results may be biased due to common method, psychometric properties, language, and characteristic with the sample, which may affect the validity of the conclusions. Future research should strive to develop an instrument in order to reduce such biases.

Research model: The strengths and limitations of both qualitative and quantitative research should be acknowledged, and future research should be open to a multi-method approach.

Safety researcher: As the theories of safety management are developing overtime, safety researchers should strive to develop a better understanding of the limitations of current safety management systems and be open to research within the prevailing adaptive age. Researcher can also do assessment of each control measures with respect to hazards and develop relevant concepts or tools to provide effective control over associated safety risk.

Safety practitioners: In practical applications of safety management, one should rely less on safety through standardized measures and experience data. This includes understanding the difference between events where such measures are applicable and unexpected events where it is adequate to support competence-promoting activities so that the operators have the ability to adapt their behavior to new situations. The human inferential capacity in handling unexpected situations should not be underestimated in relation to technology.
5.7 Final Remark

This research has identified hazards associated with RST operations and listed out various hazard control measures practiced worldwide in towage industry. However, the research is by no means all-embracing, and many other areas can be further investigated. 7 areas are identified: Poor work process, poor maintenance of equipment/substandard condition of Equipment, severe weather conditions, poor or no risk assessment, occupational incompetence, the suitability of the type of tug and poor safety management system.

Examples of further research include but not limited to:

- Assessing the scalability of results with regard to larger Sample & Case Base.
- ‘Value-for-money’ comparison with safety campaigns and hazard management tools
- Complete cycle of risk assessment- Monitoring system feedback regarding control measures and general suggestions for improvements.
- Investigate links between risk perception, competence and work experience.
- Academic and industrial collaborations must be actively sought and new projects managed well to enable extended field investigation. One suggestion is to approach DG Shipping in this regard. Contact with such high profile bodies could allow a larger sample collection and wider view of industrial practice and give opportunity to be involved with high profile projects, such as the detail RST activities involved pan Indian coastal waters. Sources of funding in other industry collaborations, such as Knowledge Transfer Partnerships (KTPs) could also be investigated and their strategies assessed.

5.8 Research Contribution:

This research has made an attempt to make useful contribution in the area of primary stage of risk assessment i.e. Hazards Identification. Hazards Identification acts as the main ‘bottle neck’ and barrier to risk identification.

Primary aim of this research is just only to find the problems but also to suggest solutions. The problem was to identify hazards and solution is to present measures practiced worldwide to mitigate or control such hazards. The solution presented in just for indicative purpose, the research does not answer the effectiveness of those control measures. Hence, it is advisable the practitioners to do proper risk analysis before adopting one.