Accident Analysis Models used in Practice: Comparison of MAIB and NSIA models

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SUMMARY

The aim of this study is to compare two accident analysis models: Casualty Analysis Diagram (CAD) used by Marine Accident Investigation Branch (MAIB) and a model developed/used by Norwegian Safety Investigation Authority (NSIA). The study explored the similarities and differences between the two models when applied to a real marine accident involving a collision of two vessels. The views of investigators working at MAIB and NSIA were collected using a questionnaire and interviews. This paper discusses various issues on usability of these models and provides insights into effective use of accident analysis models in practice.

KEYWORDS

Accident investigation models, Casualty Analysis Diagram, Norwegian Safety Investigation Authority method, Usability

Introduction

Research so far has highlighted the problems of a research-practice gap regarding human factors models/methods for accident analysis (Underwood and Waterson, 2013). Models are created, researched, and evaluated but results have not been effectively reaching practitioners who use the models daily (Underwood and Waterson, 2013). There is scarce published evidence on evaluating models' use in practice. The main aim of the study was to evaluate how usable and useful two accident analysis models (CAD and the NSIA model) are from two perspectives: a new user (one of the researchers) and experienced users (investigators). Specific factors include time requirements (Wagenaar and Van Der Schrier, 1997) and ease of learning and applying the model (Underwood and Waterson, 2013).

Method

Two models were applied to a real accident case study of a collision between two vessels. The researcher received masterclasses from experts of each model to be able to understand the models fully. Equal time was spent learning both models. We compared time required to complete the analysis using each model and reflected on the ease of learning and use. The two models were CAD and the NSIA.

Casualty Analysis Diagram (CAD) is an epidemiological marine investigation analytical tool used internally by the UK's Marine Accident Investigation Branch (MAIB) (MAIB, 2020). Used as a communication tool, CAD assists in visualising factors involved in incidents aiming to enable investigators to understand the different components and contributing factors of an investigation. There is an EasyCAD Excel template which facilitates easy inputting and automatic generation of a diagram.

The NSIA model (NSIA, 2022), is a systematic tool used by the NSIA to investigate all transport sectors. The analysis model has undergone multiple iterations (previously known as AIBN-V2). The NSIA model is used as an internal communication tool as a way to understand the different factors involved in an accident. The model includes a seven-stage process ranging from establishing the incidents timeline to considering systemic safety issues and developing safety recommendations. It combines such aspects as a barrier analysis and an Accimap.

Using both models, feedback was collected on investigators experience of learning and using the models from twenty investigators (12 from MAIB and eight from NSIA) using questionnaire survey and ten investigators (Eight from MAIB and two from NSIA) using more in-depth semi-structured interviews. Participants opted into the interviews at the end of the survey. The participants were required to have working knowledge of at least one of the models.

Results and Conclusions

The case study analysis discovered a difference in time requirements between both models. The NSIA model took longer to complete than CAD. This may have been due to CAD being completed first, CAD was found easy to learn, but the researcher found difficulties with the identification of contributory factors. The model had been described as a blank slate, therefore, is very reflective on the knowledge and experience of the inspector using it which may be a detriment to novice users or inspectors that do not yet have a wealth of experience. The NSIA model was more complex and took longer to understand but the prescriptive steps helped guide a novice through the analysis. Researcher reflections noted how the first step of the NSIA model is sequential in nature and did not lend itself to the factual timings for the chosen incident as it involved two vessels. All participants, when shown the researchers applications of the models, agreed with the interpretation of the case study accident.

Both CAD and the NSIA models were found to have good levels of usability with participants supporting the use of their organisation's choice of model. The uneven split of participants from NSIA and MAIB may have affected the results as the NSIA model had fewer participants using it as a primary model, but most respondents saw the benefits of both models and could identify strengths and weaknesses for each and how they were best used for different accident types. Respondents found CAD easy to learn and simple to use but could be thought to be oversimplistic while they found the NSIA model to have good depth of analysis and it encourages thinking across different levels. Although, the NSIA model requires more time to learn sufficiently and to apply in the field. CAD was considered to be of a tool for communication than analysis. While the NSIA model was considered to be more of an analysis tool, or both. The findings of this study are important when considering the usability of both models selected and their applicability to accident investigation.

References

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