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Maritime Accident Information – Entrants' Evaluation of Dissemination Forms

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ABSTRACT: Safety is one of the most important factors taken into consideration in modern shipping industry. To reduce the number of accidents, it is crucial to deliver information about past disasters to maritime specialists. Conditions of work at sea demand to acquire the most knowledge in the shortest possible time. This paper evaluates various forms of presentation of such information in order to find how efficient they are in terms of data quality, usefulness and time required to comprehend them. Research was conducted among students of the Gdynia Maritime University. The students were presented with different material followed by a test. The best results were achieved with infographic and lecture presentation. Full reports were found too complex to be used on a daily basis despite their undeniable role in accident investigation.

1 INTRODUCTION

Accidents have always been an inevitable part of life, making safety crucial in every profession. Some of them require more precautions than others. Life at sea is often associated with high risk [1]. Therefore, the modern shipping industry puts big effort into ensuring the safety of seafarers [2]–[7]. Despite it, some disasters occur, and some of them have a profound impact on human understanding of safety. One of the examples can be the sinking of the Titanic leading to creation of the Safety Of Life At Sea convention, which dramatically changed the view on safety in the shipping industry [2], [3], [5]. Even though such vast changes are rare, some lessons can be drawn from every accident, thus leading to safety improvements [8]. Every maritime accident is thoroughly investigated by a group of specialists and results of their work are presented in reports exactly to produce such lessons learnt. Dekker suggested in his paper [8] that reports can fulfil various functions, depending on their purpose. He suggested distinguishing 4 of them [8]:

- Epistemological meant to extensively explain findings, causes, and effects. In order to fulfil presuppositions of this role creators have to go through various points of view
- Existential that resonates with the need for control and justice. Suffering without reason tends to be even worse so it is crucial to help suffering attain meaning. By doing so it tries to calm down suffering. People would rather be guilty than feel helpless.
- Preventive aimed at preventing repetition of mistakes that caused the accident. Similarly to Epistemological function, causes are explained but existential why isn't always covered.
- Moral that traces transgressions. By doing so it gives instructions on moral and regulatory boundaries.

Outcome of the investigation can be seriously influenced by the commissioning party. Two reports

based on the same facts, but ordered by different organizations are prone to favouring evidence convenient for one side. As Kurtuluş said, "information is not a copy of reality but its reconstruction by human being" [9]. In our study we want to establish to what degree maritime accident reports are covering educational function, or as Dekker specified preventative and moral ones [8].

In today's society, the flow of information is enormous and it is not easy to process all the knowledge people gain every day [9]. Additionally in the maritime industry, navigational officers have a very restricted amount of time that they can devote to learning while on the ship. Inspired by a study conducted by [10] we have learned that their results indicate a relatively low rate of utilization of original accident reports. That study was conducted regarding sharp-end operators, people working in the maritime sector with hands-on experience of operations. To draw further implications for education and training purposes, we have decided to take a look at this issue from entrants' perspective. It is important to investigate whether maritime students actually read accident reports since one of their purposes is to serve as a learning tool. If not, then what other form of post-accident learning would students prefer and which would prove the most efficient? Considering the above mentioned factors, materials covering important subjects have to be designed with regard to intended use in order to fulfil their function. Therefore, the purpose of the study undertaken was twofold: (1) to identify the optimum way to distribute information about maritime accidents and (2) to find a feasible compromise between low time consumption and high efficiency in gaining knowledge from past accidents?

To achieve the goal, we conducted a study among students of our university by dividing them in groups and requesting to finish a test after familiarizing with given study material.

The results can be found meaningful by government bureaux maritime crew training centres and all educational facilities.

2 MATERIALS AND METHODS

As a base of our study we have chosen listing, flooding, and grounding of m/v Höegh Osaka [11]. At 2109 UTC on 3 January 2015, the pure car and truck carrier (PCTC) Höegh Osaka was rounding West Bramble buoy in The Solent Strait when it developed a significant starboard list, causing some cargo shift and consequent flooding. With the list in excess of 40°, the ship lost steerage and propulsion, and subsequently drifted onto Bramble Bank, grounding at 2115 UTC. All crew were safely evacuated from the ship and surrounding waters by authorities. There was no resulting pollution, and the ship was later successfully salvaged, as of February 2023 the vessel is still in operation.

Based on the Report we have prepared Infographic, Briefing, and Summary. Along with given by MAIB Safety Flyer and Video, six different approaches to the story could be presented. For each form of dissemination, we have created a group of randomly assigned students. They were asked to familiarize themselves with given material and to fill in a survey. A group initially consisted of 8 participants, yet due to uneven return rate results are based on 4–8 responses (33 in total). When the surveys returned we have analysed them in terms of answers correctness and safety lessons understood.

2.1 *Respondents*

Demographic details of the respondents are provided in Figures 1-4

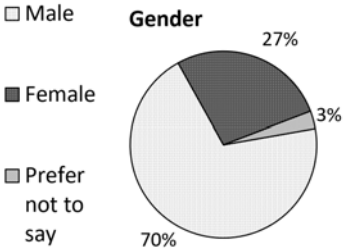

Figure 1. Respondents gender details. Own elaboration

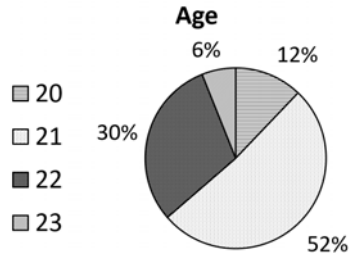

Figure 2. Respondents age details. Own elaboration

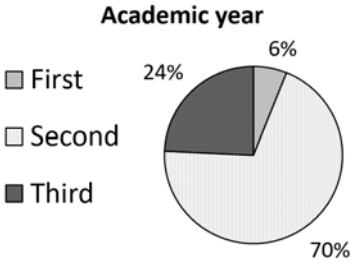

Figure 3. Respondents academic year details. Own elaboration

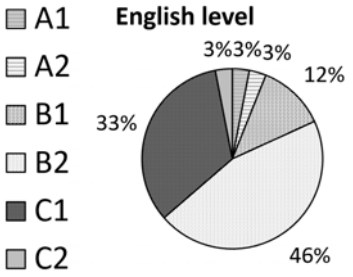

Figure 4. Respondents english level details. Own elaboration

2.2 *Presented forms*

The following sections discuss the forms of information presentation distributed to the students.

2.2.1 *Accident Report*

Reports are results of investigations led mostly by government bureaux, they are meant to improve safety and rise awareness of hazardous situations at sea. Information covered by the report range from past crew experience, narrative of accident through recommendations for improvements. What is worth mentioning, general culprit of accident is not normally pointed out by the bureau [6]. Amount of details the reports contain usually makes them long and hard to comprehend in reasonable time. Elaborated form allows investigators to include storytelling as well as facts in tabular form.

This particular Report was delivered by MAIB (Maritime Accident Investigation Branch), it contains 86 pages and 6 annexes. Main sections are: factual information, analysis, conclusions, actions taken, recommendations. All further forms are based on a given Report.

2.2.2 *Safety Flyer*

As an annex to the original Report [11], the Safety Flyer is meant to conclude all important information in the shortest possible way. This presupposition forces investigators to omit extended storytelling. Also, some not crucial, yet useful, facts may be left out making it harder to comprehend the accident. Safety Flyer is often considered as an introduction to the accident Report or a reminder.

This particular flyer was provided as an appendix for the Report by MAIB, only one photo is included. Entire text, excluding graphic, can be fitted on one A4 size page and is divided in three parts: Narrative, Findings, and Safety Lessons.

2.2.3 *Infographic*

Infographics is a form of storytelling with graphics and text, the concept is based upon Picture Superiority Effect [12], [13]. According to this phenomenon, the human brain is more likely to remember information that is presented in graphic form. They are best suited for presenting, otherwise hard to comprehend, sets of data in an accessible way [9]. Students nowadays develop so-called clip-thinking [14] as a form of coping with rapid growth of information flow. Such a way of comprehending information helps with multitasking and reduces time required for switching tasks, however linear forms are becoming progressively harder to facilitate [14]. Those facts present graphic forms as the most promising in terms of the study. Factors that should be considered in a process of design [12]

- structure,
- accuracy,
- reliability,
- depth,
- functionality,
- decoration.

Among these, aesthetics is the least important as even the most beautiful piece of art won't be useful without a data background. In order to get the most out of an infographic, its structure has to match the kind of data that is being presented. Because of that, H.Naparin and A. Nibti Saad [12] suggested the following categories:

- Comparison
- Flow Chart
- Timeline
- Process
- Image-based
- Data
- Narrative
- Metaphor
- Combination
- Other

Our Infographic was prepared for printing as an A2 poster, yet it could be also used on a screen. Pieces of information were divided into six groups:

- The vessel
- The Crew
- The accident
- Timeline
- Salvage operation
- Findings

Each section was supplemented with relevant pictures and graphics.

2.2.4 *Film*

Some bureaux create videos explaining causes of accidents in a way that fosters learning [15]. Usually, these provide visualizations and real footage from the deck. Similarly to infographics, this form combines graphics with storytelling condensed in short form. Even though it can be a great addition to other forms, video requires more time and effort to prepare, it is also limited to fewer ways of distribution.

This particular Film was published by MAIB via YouTube platform [16]. Its main content is an interview with the chief inspector of maritime accidents and footage from the salvage operation.

2.2.5 *Briefing*

Briefing is a short meeting concerning a particular topic, this form was suggested as efficient in the Norwegian study due to the storytelling opportunities [10]. Nowadays, briefings are often used by companies to increase safety and awareness. The form leaves room for different media being used including discussion, it is typically focused on graphics and statistics. During meetings, participants can ask about details that are particularly important for them, this way an opportunity to fit information to the needs of receivers is created. As a downside, we could consider the cost of organizing meetings and the amount of time that isn't always utilized in the most efficient way [17], [18].

Our Briefing used a PowerPoint presentation summarizing the most significant facts and experts' opinions. To match industry standards, time was limited to about 15 minutes with additional question time.

2.2.6 *Summary*

To find balance between accident Report and Safety Flyer, we have created a Summary. Our intention was to deliver storytelling along with factual information without unnecessary details. First part contained ship characteristics with a short narrative, whereas the second described causes and findings more deeply. Overall it consists of 7 pages including a few graphics. In order to extract most essential pieces of information we have cut out those that were not essential to understand the safety lessons. Also, factual information was condensed to give a clear overview without unnecessary details.

2.3 *Survey*

Upon familiarization with material, participants were requested to complete a test prepared via Google Form. There was no specific time limit for compilation, participants were only asked not to use any notes during the test. There were four main parts that checked different aspects: factual information knowledge, understanding of safety lessons, thoughts about presented form. Last part of the test was collecting data of respondents for statistical purposes.

Entire study was conducted in English due to the fact that original materials were delivered in this language. Even though respondents were Polish-speaking students, working at sea requires good language skills no matter the nationality. That's why after making sure of their English level we have decided that it won't influence the study in any way.

3 RESULTS

Below we present some of our findings. One of the questions referred to a preferable form of data presentation. Participants were asked to indicate their favourite form of data presentation. It was an open question to omit influencing answers and maybe find new answers that we hadn't thought about ourselves. Some of the respondents left the answer space empty, some put two options so that is why the number of answers do not match the number of participants. The results are depicted in Figures 5 and 6.

Figure 5. Answers to "What is your preferred form of gaining such information?" question. Own elaboration

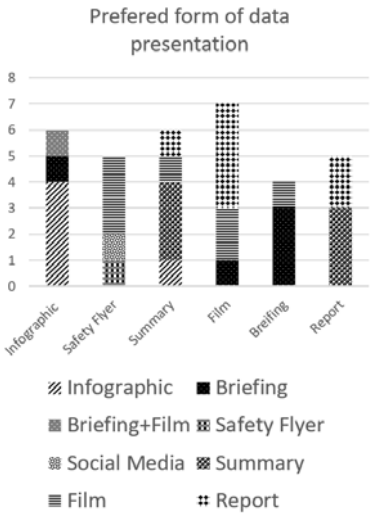

Figure 6. Preferable form of data presentation within a given group of people with the same study material. Own elaboration

Answers depicted in Figure 5 could be influenced by what form a specific participant was given in this study to familiarize with. To verify this hypothesis we broke down previous results into groups based on study materials given to participants. This was done to check if respondents have their own preferences or did they simply stick to materials they were familiarized with earlier. For example, the first bar from the left: from all the respondents who were presented with Infographic as study material nearly 70% choose Infographics as their preferable form of data presentation.

Another part of the test was short one-choice questions. Each test was the same in order to check participants' understanding of the accident after familiarization with their study materials. Figure 7 presents the percentage of correct answers among respondents in groups based on their study material.

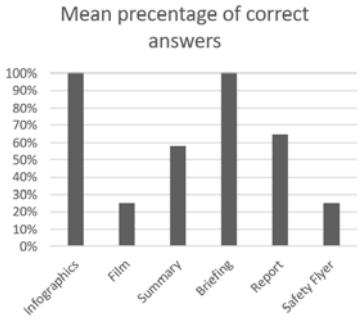

Figure 7. Percentage of correct answers to factual questions by a group of respondents given the same study material. Own elaboration

Most accurate in answering short detailed questions were respondents presented with the Briefing and Infographic. Least amount of correct answers were collected from the Safety Flyer and the Film.

In order to determine which factors increase participants' awareness of the accident and help comprehend material easier we needed to establish the level of helpfulness provided by particular elements of study materials. Considered characteristics were storytelling, graphics and

statistics. Respondents were asked to mark those aspects on each presented material on a scale from 1 to 5. Criteria was how much did certain factor help to understand the accident. Figure 8 pictures how those factors were rated within particular study materials.

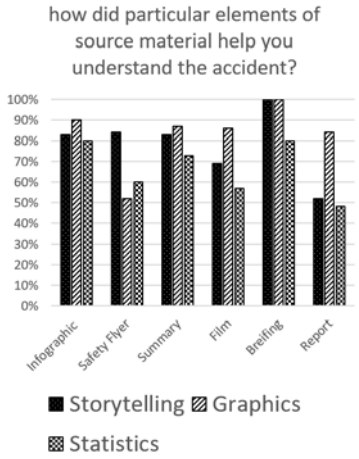

Figure 8. In what degree did particular elements of study material help you understand the accident. Own elaboration

4 DISCUSSION

Results mostly support initial assumptions: the most effective ways of information dissemination turned out to be Briefing along with Infographics. Storytelling given in graphic form was found to have the biggest chance of being memorized. Linear forms of presenting data proved to be challenging for students as they require a long attention span, thus increasing cognitive workload. Even short, purely textual, forms were considered too demanding. Ideal form should be condensed and contain graphic materials that allow the reader to follow the story. It encourages students to focus on a given material.

For better understanding, each form will be discussed separately.

4.1 *Report*

General feedback regarding the Report was negative. Due to its length, students usually limited their effort to scanning the text, thus overlooking any extensive texts. This led to significant lack of detailed knowledge, even to the point where no safety lessons could be observed. Storytelling did not help with understanding the case as it was lost in overall amount of data. In fact, the highest rating of storytelling usefulness was 60%. Although reading the report was mostly neglected by participants, one answer indicated a careful familiarisation with the study material. Level of understanding and correctness was high. A conclusion can be drawn that only laziness and lack of time is an obstacle to reports being useful.

4.1.1 *Safety Flyer*

Contrary to expectations, Safety Flyer turned out to be hard to read and comprehend. Respondents had little to none factual knowledge and presented very poor conclusions. Quite the opposite, a false feeling of understanding may be found disturbing. If a person tried to base their actions on information found in a flyer, it could lead to a potentially dangerous situation. This form shouldn't be used in separation from the report or other elaborated media, but can be a feasible addition.

4.1.2 *Film*

Even though answers based on the Film were the least correct, this form was the most popular choice globally (31% of respondents). Similarly to Safety Flyer, outcome of the questionnaire showed a lack of understanding. Topic was covered narrowly, resulting in poor conclusions. Interestingly, respondents showed confidence with answers even though they were mostly wrong. No advantage of picture effect could be caused by prioritizing aesthetics over factual information.

4.1.3 *Infographics*

Infographics, as expected, turned out to be the most effective way of information dissemination. Along with a satisfying level of topic understanding, students graded this form as pleasing to use and easy to read. Amount of data was optimal to deliver a necessary level of knowledge without overloading readers. Nearly all the answers were correct, one exception was due to lack of information given. Versatility of Infographic is very promising, it can be used in countless situations without changes.

4.1.4 *Briefing*

Briefing was a success judging by the correctness of the answers, most participants have found it useful. A lot of knowledge could be presented in a relatively short time. Most trouble was caused by reserving time of six persons, but this can be overcome by organizing the workshop during regular classes. Due to the nature of in-person meeting, participants couldn't return to the exact information given during the Briefing.

4.1.5 *Summary*

Summary wasn't as successful as expected, it was often mistaken as a full Report. A conclusion can be drawn that students do not know what a report is. Some comments stated that even such condensed text is too long to easily comprehend. Nevertheless, answers showed good knowledge and understanding of causes.

4.2 *Preferences vs results*

Correctness of the answers compared to the preferred forms show that most students are unaware of the effectiveness of the materials. Film was the most frequent choice as the preferable form picked by nine respondents, followed by Briefing - six respondents and Report - five respondents. The least amount of respondents have voted in favour of social media and

Safety Flyer, each gaining one response. The results of the "preferred form of data presentation" made us consider whether the respondents were actually familiar with all the presented forms or did they just stick to the form they were familiarized with earlier in this study or at some other occasion. Students were prone to choose the same form that they were given in the study in case of Infographic, Summary and Briefing. Although the Film was the most popular preferred form globally (nine votes) it didn't manage to become the most popular in any of the groups. In this case, the majority voted for Report as the most popular, whereas Summary was voted as preferable by participants given Reports. Some forms were mainly present within responses given by participants with this particular form. For example, Safety Flyers appear only once and Infographics can be found mainly as a response form Infographics holders. Students may be unaware of the variety of forms available and how they can be utilized. Ability to distinguish the most suitable material for a set task is even more important than the data itself.

Respondents regularly could not tell whether presented material was a full Report or a Summary. It leads to the conclusion that even maritime students don't use this kind of materials on a daily basis. It is most likely caused by unnecessary complexity of the Report.

4.3 *Limitations*

Study was conducted over the period of six months due to lack of response from some students. The initial goal of 33 participants had been met after three rounds of send-outs. Equal number of each form had been sent yet not all participants have filled in the survey. In the end, forms were evaluated based on merely four to seven answers. Surveys indicated as being based on Report had to be checked by consultation with respondents due to mix-ups of Report and Summary. Moreover, students originate from the same university and represent the same age group what makes them a homogenic group. Half of the materials have been prepared by professional investigators of MAIB whereas the other three have been created by authors of the research. In order to reduce impact of possible errors in materials, multiple Reports could be scoped.

5 CONCLUSIONS

Despite losses involved, past accidents present an opportunity to learn from mistakes made during the relevant chains of events and factors contributing to them. It is of utmost importance that a proper approach be taken in Maritime Education and Training facilities to maximize the outcome of such lessons.

The objective of the performed study was to determine the most efficient dissemination form in order to increase safety awareness at sea. It is crucial to know a way to transfer the information efficiently and effectively. It was achieved through a survey distributed among a group of students from Gdynia Maritime University who were familiarized with different study material about the same maritime accident. Their answers let us determine to what degree the given dissemination form was fitting criteria of effectiveness, correctness and efficiency. Results indicate that the most effective dissemination forms are Infographic and Briefing. Both of them achieved 100% correctness and showed a deep understanding of causes and safety lessons. They were rated by students as pleasant to work with and got overall best feedback.

Future research may involve combining couple of dissemination forms together. For example, even better results than from briefing itself may be obtained after providing respondents with infographic as a reminder later.

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REFERENCES

[1] K. Li and J. Ng, 'International maritime conventions: Seafarers' safety and human rights', J. Marit. Law Commer., vol. 33, pp. 881–404, Jul. 2002.
[2] L. Gould, 'Surviving Disaster – The Titanic and SOLAS'. Accessed: Feb. 22, 2023. [Online]. Available: https://wwwcdn.imo.org/localresources/en/OurWork/Safety/Documents/TITANIC.pdf
[3] V. Bassett, 'Causes and Effects of the Rapid Sinking of the Titanic', Nov. 1998. http://writing.engr.psu.edu/uer/bassett.html (accessed Feb. 16, 2023).
[4] Allianz Global Corporate & Specialty (AGCS), 'Safety and Shipping Review 2022', May 2022. Accessed: Feb. 22, 2023. [Online]. Available: https://www.agcs.allianz.com/news-and-insights/reports/shipping-safety.html
[5] Allianz Global Corporate & Specialty, 'Safety and Shipping 1912-2012: From Titanic to Costa Concordia', 2012. Accessed: Feb. 22, 2023. [Online]. Available: https://www.allianz.com/content/dam/onemarketing/azcom/Allianz_com/migration/media/press/document/other/agcs_safety_shipping_1912-2012.pdf
[6] International Maritime Organization (IMO), 'Adoption of the code of the international standards and recommended practices for a safety investigation into a marine casualty or marine incident (casualty investigation code) (Resolution MSC.255(84))'. 2008. Accessed: Feb. 22, 2023. [Online]. Available: https://wwwcdn.imo.org/localresources/en/OurWork/MSAS/Documents/Res.MSC.255(84)CasualtyIinvestigationCode.pdf
[7] J. Nikčević-Grdinić, 'Improving Safety at Sea Through Compliance with International Maritime Safety Codes', Trans. Marit. Sci., vol. 6, no. 2, pp. 130–139, Oct. 2017, doi: 10.7225/toms.v06.n02.005.
[8] S. W. A. Dekker, 'The psychology of accident investigation: epistemological, preventive, moral and existential meaning-making', Theor. Issues Ergon. Sci.,

vol. 16, no. 3, pp. 202–213, May 2015, doi: 10.1080/1463922X.2014.955554.
[9] T. Azzam, S. Evergreen, A. A. Germuth, and S. J. Kistler, 'Data Visualization and Evaluation', New Dir. Eval., vol. 2013, no. 139, pp. 7–32, Sep. 2013, doi: 10.1002/ev.20065.
[10] S. C. Mallam, A. Marit Wahl, and J. Aas, 'Reintroducing the sharp-end operator to organizational learning: How accident reports are used by maritime officers', Saf. Sci., vol. 147, p. 105632, Mar. 2022, doi: 10.1016/j.ssci.2021.105632.
[11] MAIB, 'Report on the investigation into the listing, flooding and grounding of Hoegh Osaka'.
[12] H. Naparin and A. Binti Saad, 'Infographics in Education : Review on Infographics Design', Int. J. Multimed. Its Appl., vol. 9, no. 4/5/6, pp. 15–24, Dec. 2017, doi: 10.5121/ijma.2017.9602.
[13] L. M. Quiroga, M. E. Crosby, and M. K. Iding, 'Reducing cognitive load', in 37th Annual Hawaii International Conference on System Sciences, 2004. Proceedings of the, Big Island, HI, USA, 2004, p. 9 pp. doi: 10.1109/HICSS.2004.1265328.
[14] A. N. Andreev, O. V. Emtseva, E. S. Babkina, V. N. Dolzhenkov, and N. V. Kudryashova, 'The effectiveness of using visualization tools and forms in distance learning', Rev. Tempos E Espaç. Em Educ., vol. 14, no. 33, p. e16053, Jul. 2021, doi: 10.20952/revtee.v14i33.16053.
[15] R. E. Mayer, L. Fiorella, and A. Stull, 'Five ways to increase the effectiveness of instructional video', Educ. Technol. Res. Dev., vol. 68, no. 3, pp. 837–852, Jun. 2020, doi: 10.1007/s11423-020-09749-6.
[16] Hoegh Osaka story in brief, (Mar. 17, 2016). Accessed: Feb. 09, 2023. [Online Video]. Available: https://www.youtube.com/watch?v=b2WJm5w2CVg
[17] S. G. Rogelberg, L. R. Shanock, and C. W. Scott, 'Wasted Time and Money in Meetings: Increasing Return on Investment', Small Group Res., vol. 43, no. 2, pp. 236–245, Apr. 2012, doi: 10.1177/1046496411429170.
[18] S. Rogelberg, C. Scott, and J. E. Kello, 'The science and fiction of meetings', MIT Sloan Manag. Rev., vol. 48, pp. 18–21, 2007.