An Exploratory Study on Causes and Effects of Miscommunication Error Among Maintenance Crew

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ABSTRACT

Verbal and written communication are both valid methods for conveying a message; communication is an extremely important factor in the process of passing on information. In both the aviation industry and the maintenance industry, poor communication is consistently a major issue. The failure of the members of the maintenance crew to communicate effectively could, without a doubt, place the lives of other people in jeopardy. Therefore, this study is conducted to investigates the factors that contributed to, and the consequences of, miscommunication error and the correlation between it. The cause depicted for miscommunication error among maintenance crew are poor language proficiency, poor documentation, lack of technical term proficiency and lack of communication meanwhile its negatively impacts maintenance organization. To identify the causes and consequences of miscommunication errors among maintenance crew, the survey data is analyzed using a bar chart, and Spearman correlation is used to investigate the relationship between causes and effects. According to the results of the Spearman correlation, there are five moderately strong correlations between causes and effects and three weak correlations. It is recommended that further research be done on engineers and technicians working in maintenance repair organizations (MRO) to gather more reliable data.

Keywords: Miscommunication error; maintenance crew; Maintenance Repair Organization (MRO); correlation

INTRODUCTION

Communication is an extremely important factor in disseminating information and messages in all fields of endeavor, including aviation. Both verbal and non-verbal communication modes can be utilized to transmit messages from sender to receiver (Shukri et al. 2017). But the maintenance team uses both written and spoken forms of communication in their daily work. It is expected for humans to make errors, and misunderstanding is one of the most common outcomes of this phenomenon.

Communication is a necessary and continuing activity that includes a wide variety of participants. Effective communication must be pursued and accomplished to fulfill its crucial function, which is to directly influence the completion of the project (Hussain et al. 2018). In the field

of aviation maintenance, having effective communication is necessary (Holtaway et al. 2017). Accurate and complete information must be supplied to guarantee that all the work will be completed without skipping any phases in the process. Knowledge and speculation about work must be distinct and not blended. Long-term studies conducted in the field of aviation have revealed that human factors are responsible for 70–80 percent of all aircraft accidents, whereas only 15–20 percent of events are related to maintenance procedures.

Poor communication continues to pose a significant risk to passengers and crew. Insufficient, or unavailable information may have a negative impact on aircraft safety and efficiency (Shukri et al. 2016). In the field of aviation maintenance, effective communication is necessary. That, it is a well-known fact that communication is an essential factor in coping with critical situations to prevent any injuries and major incidents. Errors in maintenance are the primary reason for approximately 8 percent of all commercial aircraft accidents that occur around the world (Holtaway et al. 2017). Between the years 2010 and 2013, approximately 83 percent of the maintenance Aviation Safety Reports, known as ASRs, were connected to technical publications and other written company procedures (Holtaway et al. 2017). If the document possesses any of these traits, it will undoubtedly result in errors because the recipient is likely to interpret the content incorrectly.

Communication is necessary in the aviation maintenance industry in order to facilitate the sharing of information and expertise (Chatzi et al. 2019). Miscommunication is possible because people use a variety of languages and slang, both of which require the person receiving the information to process it for a few moments before acting on it. When it comes to crucial maintenance communication, vocal communication is generally more reliable than written communication, which can be more prone to errors (Shukri et al. 2017). Maintenance mistakes can be caused by misinformation, lack of information, or imprecise instructions in maintenance manuals (Holtaway et al. 2017). It is reported that failed communication is the one of factors in airworthiness events (Chatzi et al. 2019). Miscommunication among the maintenance crew members might, without a doubt, put other people's lives in danger.

English was recommended as the international aviators' working language in 1944 by the Chicago Convention on International Aviation (Kaur 2021). In addition to tools and equipment, felt pressure or hurry, environment and knowledge, skill, and knowledge, inadequate communication has even been recorded as the most frequent local think about airworthiness events (Chatzi et al. 2019). This goes to show that a failure in communication could be a real pain in the neck when it comes to maintenance, which is why individuals who work in the aviation business need to have a strong command of the English language. Aside from the technical capabilities, AMEs are required to have high reading comprehension abilities. This will help them understand specific material and follow directions in engineering courseware and manuals. When the reader is unable to get an overall sense of what the report is about, we consider written communication to be ambiguous and lacking in clarity (Terenzi, 2021). It will take the maintenance team more time to absorb the information when it is unclear, and they risk getting the meaning wrong in the process. Excellent communication is one of the most sought after and coveted qualities in the maintenance industry.

The International Civil Aviation Organization (ICAO) has been responsible for establishing Standards and Recommended Practices (SARPs) regarding requirements for dialect capability. The primary focus of ICAO language capability requirements is on improving aeronautical radiotelephony communications. There are no such guidelines that take into consideration other uses of aviation English (Terenzi 2021). The Aircraft Maintenance Manual (AMM) and the Component Maintenance Manual are two of the most common publications utilised in maintenance (CMM) (Terenzi 2021). Before beginning their tasks, all maintenance employees should have a solid understanding of all engineering concepts. It is to avoid confusion over terminology, sentence structure, unfamiliar components, the incorrect selection of components, and the limitations of time. This demonstrates how crucial it is to have a high level of technical skill in aviation maintenance.

Inadequate, incorrect, or defective maintenance can be the direct consequence of a lack of communication, which puts the entire aircraft in jeopardy. Communication between aircraft maintenance is essential, in instances where predetermined protocols must be adhered to (Hayre 1986). It is quite dangerous for there to be any misunderstandings during the shift changeover, the technicians need to be able to communicate well with one another (Key & Schroeder 2022). The communication must include specifics regarding the activities that have been completed as well as an understanding of the potential challenges that may arise (Key & Schroeder 2022).

The problem of misinterpretation has been the subject of a great deal of research in various fields, including aviation in recent years. There is a lack of research on relationship communication between maintenance personnel (Chatzi 2019b). The relevance of communication research to aviation maintenance (Chatzi 2019a). Therefore, this study focuses on investigating the causes and effects of miscommunication errors among maintenance crews and its correlation. Due to the better access because of the available contact, the researcher chose to focus on

UniKL MIAT on-the-job-training (OJT) students who work in maintenance repair organisations (MRO).

METHODOLOGY

POPULATION AND SAMPLE

The target population for this study will be all of the UniKL MIAT students currently on on-job-training (OJT). Students undergo industrial training in various companies, including organizations that handle logistics, management, and maintenance and repair (MRO). Cluster sampling has been used for this study, only students doing internships in maintenance repair organizations (MRO) selected as the sample for this study as this study focusing on maintenance crew. There are a total of 35 students currently in internship at their MRO company according to Table 1.

DATA COLLECTION METHOD

This research utilized quantitative method by using survey question. The data collection used for this study is a questionnaire. Causes of miscommunication Likert Scale Interval error among maintenance Question crew. Sections A, B, and C make up the three sections of the questionnaire instruments. Section A uses multiple-choice questions to inquire about demographic statistics using nominal data. Section B will question about miscommunication error sources, while Section C will ask about miscommunication error effects.

This questionnaire was tested for reliability and validity in a pilot study. Ten samples were gathered, and the statistical package for the social sciences (SPSS) was used to analyze the data and evaluate the reliability of the questionnaire. The reliability test result for the pilot study is 0.945, this indicates that the 18 questions from the questionnaire have a 94.5% internal consistency, which is an excellent internal consistency. This questionnaire was analyzed using a non-parametric correlation test, and it was discovered that both the cause-and-effect values of the questionnaire had a significant value of 0.029, which indicates that the questionnaire is valid (refer to Table 2).

CORRELATION ANALYSIS

Correlation analysis will be used to analyse the acquired data. The correlation coefficient is a statistical measure that is frequently used in studies to demonstrate an association between variables or to investigate the degree to which two methods are consistent with one another (Janse et al. 2021). Pearson's Product Moment Correlation Coefficient and the Spearman's Rank Correlation Coefficient are the two types of correlation coefficients that are typically used (Senthilnathan, 2019). Pearson correlation is a parametric test Spearman correlation is non-parametric test. The data must fulfil all the assumptions before using Pearson correlation; if any of the criteria are not met, non-parametric correlation should be used. The normality hypothesis must be verified before using Pearson correlation. The data is not regularly distributed if the p-value is less than 0.05.

TABLE 1. Sample population

MRO Company	Number of Students
Aerospace Technology System Corporation	4
Airfoil	1
Asia Aerotechnic	7
Batik Air	1
BHIC	1
Dviation	1
Execujet	1
Flyfirely	3
Galaxy	1
Hammock	3
Leonardo	6
MHS	1
SAE	4
SR Technic	1

TABLE 2. Pilot study reliability test

Cronbach alpha coefficient	0.945
Number of questions	18

RESULT AND DISCUSSION

THE CAUSES AND EFFECTS OF MISCOMMUNICATION ERROR

The cause and effects of a miscommunication error among the maintenance crew are determined using a bar chart. The constructed bar chart will explain the extent to which the causes affecting the effects. The bar chart indicating the different types of causes with the effect on the maintenance personnel mistake and negatively impacts maintenance organization is displayed in Figure 1 and 2.

Around 80% of respondents agreed that poor language proficiency and documentation, as well as a lack of technical terms and communication, will lead to maintenance personnel errors and have a negative impact on the maintenance organisation. As a result, based on the perspectives, it can be inferred that the factors stated are influenced by the miscommunication error.
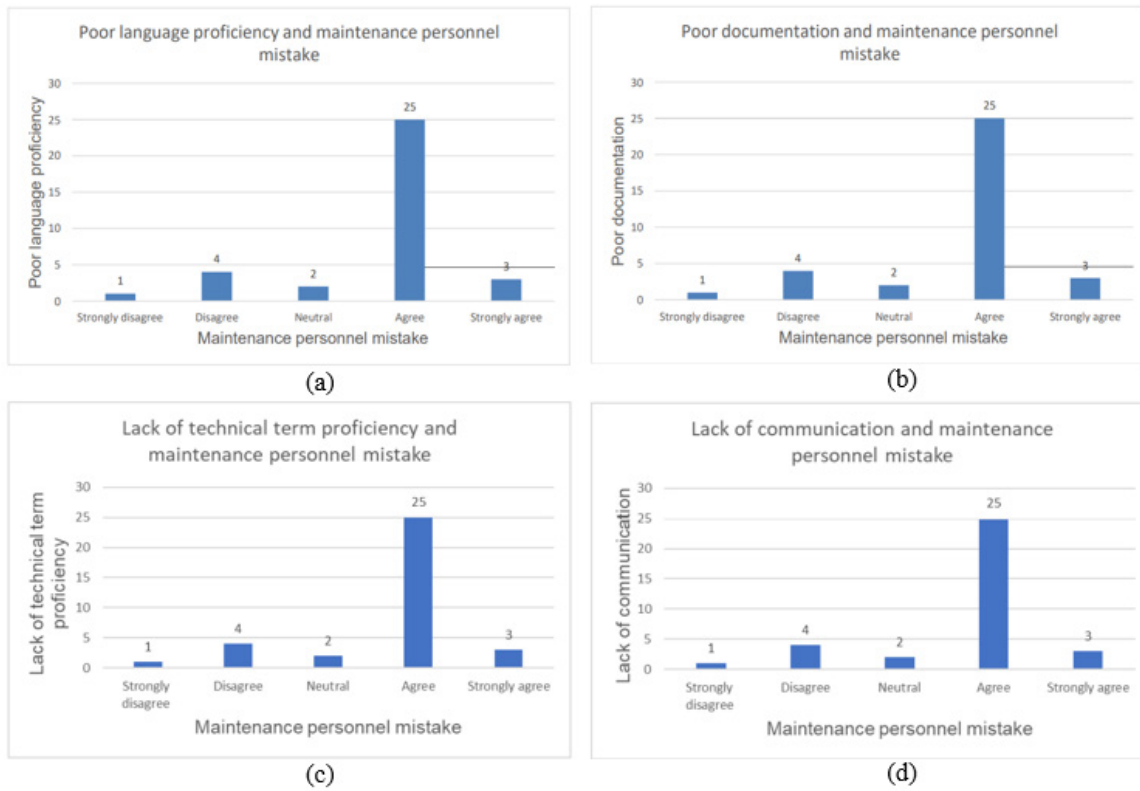
FIGURE 1. Bar Chart on different type of Causes with Effect on the Maintenance Personnel Mistake (a) Poor Language Proficiency (b) Poor Documentation (c) Lack of Technical Term (d) Lack of Communication
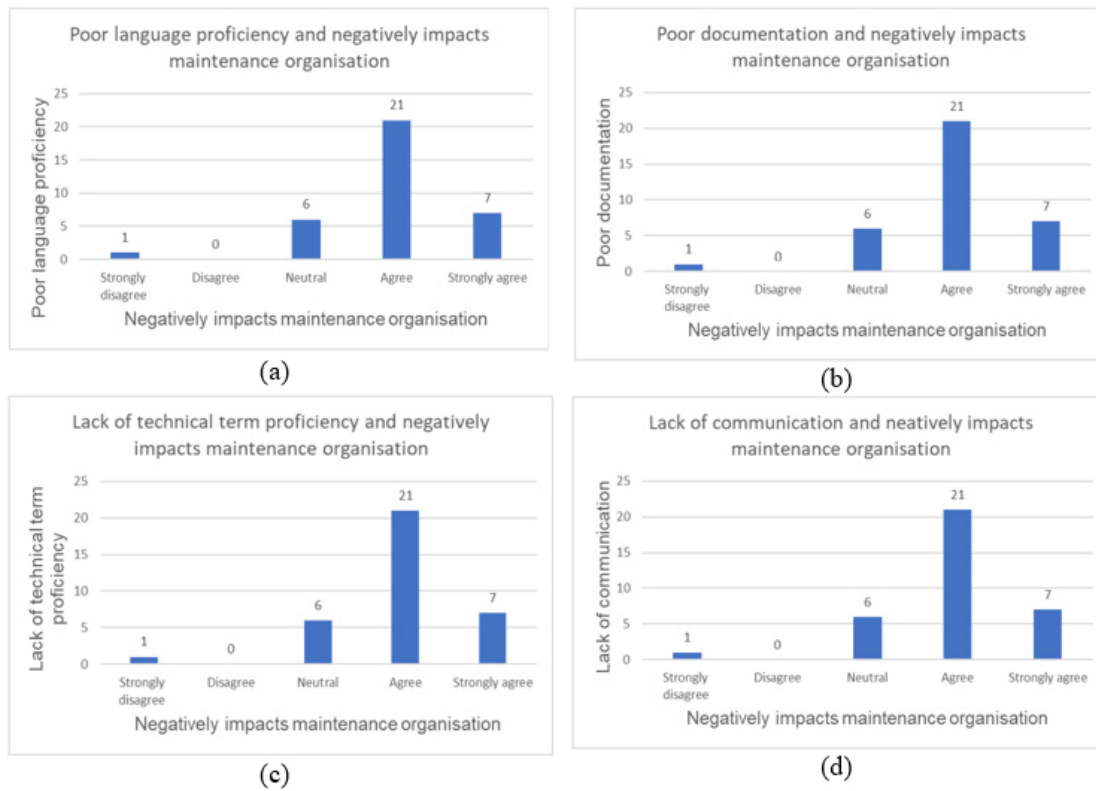

FIGURE 2. Bar Chart on different type of Causes with Effect on the Negatively Impacts Maintenance Organization (a) Poor Language Proficiency (b) Poor Documentation (c) Lack of Technical Term (d) Lack of Communication

CORRELATION ANALYSIS

Researchers have used correlation analysis to assess the strength of the link between the causes and effects of miscommunication errors in the maintenance crew. Three parametric assumptions must be confirmed before beginning the correlation analysis. There are three assumptions in conducting this analysis: (i) the data are normally distributed, (ii) there exists a linear connection between variables, and (iii) there are no outliers. The Saphiro-Wilk test is used to determine the data's normality. The test findings show that there is no significant value larger than 0.05 for any variable. It denotes that the data did not meet the assumption that they should be distributed normally. The study was unable to use a parametric test since the assumptions were not met, even though the linear connection between two variables was validated using a scatter plot, but a boxplot revealed that the data had outliers.

Spearman correlation coefficient has been used to evaluate the strength between causes and effects of miscommunication among maintenance crew. Table 3 shows a significant result with a p-value less than 0.05 has concluded that all the type of causes has a relationship with the effect of the maintenance personnel mistake and negative impact on the maintenance organisation. The effect of maintenance personnel mistakes is moderately correlated with the cause of due to poor language proficiency and the other causes are weakly correlated with the effect of the maintenance personnel mistake. However, all the types of causes are moderately correlated to the negative impact of maintenance organisations.

According to the findings, the causes of miscommunication error among maintenance crew have an impact on the consequences of miscommunication error among maintenance crew, supporting the causes and effects indicated for this study.

TABLE 3. Spearman correlation

Causes and effects	Spearman coefficient	Significance	95% confidence	
			Lower limit	Upper limit
Poor language proficiency and maintenance personnel mistake	0.536	<0.001	0.224	0.748
Poor language proficiency and negatively impacts maintenance organisation	0.590	<0.001	0.294	0.783
Poor documentation and maintenance personnel mistake	0.337	0.26	0.038	0.638
Poor documentation and negatively impacts maintenance organisation	0.557	<0.001	0.251	0.762
Lack of technical term proficiency and maintenance personnel mistake	0.334	0.050	-0.008	0.607
Lack of technical term proficiency and negatively impacts maintenance organisation	0.566	<0.001	0.263	0.768

CONCLUSION

This study has investigated the causes and effects of miscommunication errors and their relationship. The results of the bar chart revealed that the causes of a miscommunication error influenced its effects. It means that poor language proficiency, poor documentation, lack of technical term proficiency and lack of communication are the cause of miscommunication error among maintenance crew. Maintenance personnel mistakes and a negatively impacts maintenance organisations are the effects of a miscommunication errors among the maintenance crew. Spearman correlation has been used to evaluate the strength of the relationship between causes

and effects of miscommunication error through data collected from survey questions.

The findings of this study suggest that it will raise awareness of the importance of training students for careers in the aviation industry. To improve the safety and standard of the aviation industry, this study can also be applied there. It is recommended that further research should be done on the technicians and engineers with a minimum of one year of working experience at the MRO company to provide more reliable results as this study solely focused on internship students there. It is also advised that the questionnaire include a question regarding how to overcome miscommunication errors among the maintenance crew.

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