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INFORMAL PARTICIPATORY SAFETY DISCUSSION AND BENCHMARKING IN NIGERIAN AIRSPACE MANAGEMENT AGENCY

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Abstract

This study was carried out to determine the extent of relationship between informal participatory safety discussion and benchmarking in Nigerian Airspace Management Agency (NAMA). In the study, informal participatory safety discussion is identified as one of the vital indicators of safety culture, while benchmarking is one of the variants of organizational effectiveness. To the best knowledge of the researcher, previous researchers on the topic did not address managerial concerns like self-needed safety dialogue as a measure of internal benchmarking nor examine self-needed safety dialogue as key indicator of external benchmarking in Nigerian airspace management. The specific objectives of the study was to determine the extent of relationship between informal participatory safety discussion and benchmarking in NAMA using the identified indices. To realize these objectives, basic research questions were asked that led to the formulation of null hypothesis to guide the study. Descriptive survey design was adopted to suit the collection of data from the 203 employees that were judgmentally sampled in the five airports located in the South-East and South-South geo-political zones of Nigeria, with the use of structured questionnaire, based on the researcher's understanding of the Agency. The hypotheses were test with the Pearson's Product Movement Correlation to evaluate the relationship between the variables. Based on the findings in table 2, the study concluded that informal participatory safety discussion has significant positive relationship with benchmarking in NAMA. The study recommends that experienced staff members of the Agency should ensure that they share their operational knowledge on the job during informal participatory safety discussions with subordinates. Such knowledge sharing will lead to sustainable air safety, and a source of useful data for benchmarking in air transport.

Keywords: *Safety communication, Benchmarking, Informal participatory safety discussion, Self-needed safety dialogue, Internal benchmarking, External benchmarking.*

Introduction

The communication structure of a successful organization includes both formal and informal types. In aviation sector, informal participatory safety discussion is safety-related information sharing through channels outside pre-established structures of an Air Navigation

Service Provider (ANSP), and airline operators. It is a personal activity held at workplace, such as airports, en-route stations and aerodromes, with no arranged agenda. It takes the typical form as an impromptu safety conversation, based on the current exposures that may be urgent and threatening. In contrast to formal safety communication preplanned at a fixed time as pre-flight safety trainings or toolbox seminars, informal safety discussion platforms provide a more flexible channel which is not limited by time and place. This preponderance contributes to convey safety information in a timely manner.

Stressing the ease and flexibility of informal safety discussion, Hallowell (2021) writes: "When workers are caught in information ambiguity triggered by perceived risk in the process of operation, the action of seeking safety information from co-workers lead them to respond safely". Although the importance of informal communication has solicited attention from scholars in safety research, only a few attempts have been made to explore its characteristics and impact on safety performance and flight quality assurance. A comparative research by Alsamadani (2018) depicts that the organization in which workers have numerous informal safety communication links presented a lower injury rate and the closely-linked crew members have an increased capacity to manage potential errors before they lead to an incident.

Furthermore, reports from Allison and Kaminsky (2017) show that workers in mixed-gender crews relied more heavily on informal communication for their safety information.
Participatory safety discussion is an informal information exchange used to summarize communication behaviours for the purpose of interpersonal helping. Complementary to it, is self-need safety dialogue, a newly developed category, which includes communication behaviours of seeking self-protection. (Allison and Kaminsky, 2017).

These informal communication links are supposed to have an impact on organizational variables. One of such variables which is becoming increasingly important in recent times as competition increases among businesses, is benchmarking. Benchmarking has been described by Flynn, Schroede and Sakakibara (2015) as the practice by which the management of an organization compares its performance with those of its competitors. The essence of such comparison is to discover where the business needs a change in order to improve performance. Benchmarking can be internal or external (Baker and Branch, 2012).

Harper (2019) also identified practice benchmarking and performance benchmarking as prototypes. In this study internal and external typologies are used as indicial metrics of benchmarking.

Statement of the Problem

The importance of informal participatory safety discussion in achieving organizational objectives has been studied over the years; however, its core characteristics have not been well established. A lack of well-designed reliable and valid measurement for assessing multidimensional informal safety communication in NAMA is lacking. In many available studies, the existence of different channels (formal and informal), has been recognized but the needed distinction when being measured is not substantiated. For example, Pandit, Yu and Wu (2020) introduced in their study both formal and informal safety communication among construction workers, but all of these descriptions were re-classified into 'safety communication'.

This study provides solution to the ambiguity in the assessment of informal safety communication by measuring informal safety communication specifically in terms of Participatory Safety Discussion (PSD), and Self-need Safety Dialogue (SSD).

Objectives of the Study

The main objective of the study is to determine the level of influence of informal participatory safety discussion on benchmarking in Nigerian Airspace Management Agency, while the specific objectives are to:

1. examine the level of relationship between participatory safety discussion and internal benchmarking.
2. evaluate the level of influence of participatory safety discussion on external benchmarking.
3. assess the relationship between self-needed safety dialogue and internal benchmarking.
4. evaluate the relationship between self-needed safety dialogue and external benchmarking.

Research Questions.

In the course of pursuing the objectives of the study, the following questions were asked;

1. What is the level of relationship between participatory safety discussion and internal benchmarking?
2. What is the level of influence of participatory safety discussion on external benchmarking?
3. What is the relationship between self-needed safety dialogue and internal benchmarking?
4. What is the relationship between self-needed safety dialogue and external benchmarking?

Research Hypotheses

The hypotheses formulated to guide the study are stated in null form as follows:

Ho_1: There is no relationship between participatory safety discussion and internal benchmarking.

Ho_2: Participatory safety discussion has no influence on external benchmarking.

Ho_3: Self-needed safety dialogue has no significant relationship with internal benchmarking.

Ho_4: Self-needed safety dialogue has no significant relationship with external benchmarking

Review of Related Literature

Informal Safety Communication

Hallewell (2012) defines informal safety discussion or communication, as safety-related information sharing through channels outside pre-established structures of an organization. It is a personal discussion or activity held at a workplace with no arranged agenda. It takes the typical form of impromptu conversation, based on a current exposure that may be urgent or threatening.

In contrast with formal safety analogue, which is preplanned at a fixed time, such as pre-flight safety trainings and toolbox seminars, informal participatory safety discussion platforms provide a more flexible channel which is not limited to time or place. When workers are caught up in information ambiguity caused by perceived risks in the process of operation, the action of seeking safety information from coworkers could lead to safety. The importance of aviation workers informal safety communication has solicited attention from scholars in safety research areas with attempts to explore the characteristics and impact on safety performance measures (Alsamalami 2018).

Informal participatory safety communication under different interests is endowed with diverse interpretations. Due to the lack of a clear concept, the understanding of aviation workers informal participatory safety discussion remains scattered and its sub-dimensions have not been fully expanded. Yang and Wu (2019) adopted "Interpersonal Helping" and "Safety Discussion" as sub-dimensions of informal safety communication. In this study, informal participatory safety discussion and self-needed safety dialogue are adopted.

Informal Participatory Safety Discussion (IPSD)

Weiyi, Xue and Zhang (2021) introduced the concept of informal participatory safety discussion as safety communication for the purpose of sharing and exchanging safety-related information. According to them, IPSD involves listening to colleagues working experience, discussing with coworkers and sharing information during discussion, etc. The researchers recognized IPSD as the commonest sub-dimension of workers informal safety communication made up of 29 events. Notably, IPSD is labelled by its analysis-oriented function compared with solution-oriented function of citizenship safety discussion and self-needed safety dialogue.

The focus of informal participatory safety discussion is to share and exchange information with coworkers. It is about their own understanding of safety without a mixed intention for improving their own and their coworkers' safety immediately. The second characteristic of informal participatory safety discussion stresses the dynamicity of the interactive process in which the worker can act as both the sender and receiver of safety information.

Self-Needed Safety Dialogue (SSD)

Hallowell (2021) defines self-needed safety dialogue as a help–seeking information exchange, sought to ensure sponsor's own safety. The straightforward reason for taking SSD is that workers need to keep themselves safe on worksites and this reason appears to be the essential characteristic of self-needed safety dialogues. Two themes under SSD are recognized, both of which are motivated by coworker's safety need. The themes are "sending a self-protection signal" and "consulting to coworkers. The two themes represent different safety information flows. As Hallowell explains, the behaviour of sending a self-protection signal is accompanied by sending of safety messages; whereas the action of consulting to coworkers is expected to receive safety information.

Compared with the extra-role altruistic feature of citizenship safety discussion, self-needed safety dialogue is an intra-duty action that coworkers should perform to achieve their own safety. This important point of view emerged from the explanations of Weiyi, Xue & Zhang (2021), Yang and Wu (2019) and Hallewell (2012). They claim that the organization has provided workers with the necessary safety training and protective equipment; in return, workers should take up the responsibility to operate in a safe manner. They should take positive action to achieve safety goals, not only for the organization but also for them.

Benchmarking

Flynn, Schroede and Sakakibara (2015) defined benchmarking as the practice of comparing performance with that of competitors in order to identify own strengths and weaknesses. Harper (2019) defines benchmarking as the process of measuring key business metrics and comparing them within business areas, or against a competitor, industry, peers or

other organizations around the world. The aim is to understand where the business needs a change in order to improve performance. According to Harper (2019), benchmarking provides managers with a point of reference or standard of evaluating the quality and cost of the organization's activities, practices and processes. In the aviation industry, benchmarking is conceived as an effective tool to ensure continuous safety improvement towards strategic goals. Benchmarking can be internal or external, depending on the horizon of the comparison (Baker and Branch, 2012).

Internal Benchmarking

Internal benchmarking compares performance metrics and practices from different units of the organization, its product lines, departments and programmes within the organization. To carry out internal benchmarking, the organization's management needs at least two areas in the organization that have shared metrics or practices. Internal benchmarking is a good starting point to understand the current standard of business performance. Baker & Branch (2012), recommend internal benchmarking to large organization where certain areas of the business are more efficient than others. The central purpose is to provide managers with a point of reference or standard of evaluating performance of the organization.

External Benchmarking

External benchmarking compares the metrics and practices of one organization with others in the same industry. To carry out external benchmarking, Baker & Branch (2012) recommends the use of a third-party agent to collect the data. According to them, the use of an external agent increases the objectivity of the exercise. The approach can be very valuable but often requires significant time and effort. To ease the rigor often associated with comprehensive exercise, some organizations resort to engaging external benchmark professional bodies, not only to collect data but to carry out the entire process. The result of such comparative analysis provides an objective understanding of the organization's current state which allows the management to set baselines and goals for improvement. The researchers argue that humility is needed on the part of the management in order for it to admit that other organizations are doing better. This admission will enable the management to learn how to match or even surpass competitors.

Theoretical Review

Dominos Theory

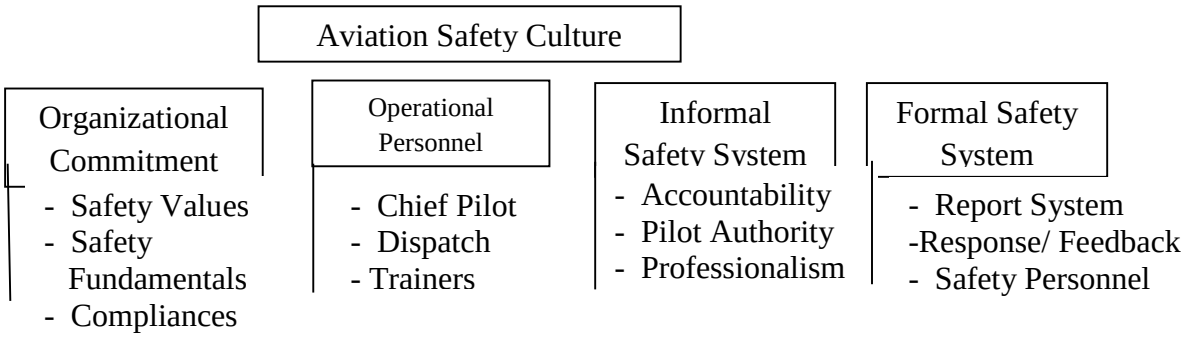
Heinrich (1932), cited by Boeing (1994) propounded a theory that an accident resulted from a sequence of chain reactions. According to Heinrich, an accident is one factor in a sequence that can lead to injury. Each of the factors is dependent on the proceeding factor. The researcher proposed this theory based on a single domino leading to an accident. The premise derivable from the theory is that human errors cause accidents. These errors are categorized broadly as work overload, inappropriate worker response and improper activities. Overload means that the work task is beyond the capability of the worker. This includes physical factors, internal factors and situation factors. Inappropriate workers response means that the worker exposes himself to hazards and unsafe conditions (worker's fault) or the work situation is incompatible (management, environmental fault). Inappropriate activities (improper activities) entail misjudgment of risk and lack of training. The implication for airline operators is that the

management should be highly committed to quality standards by regularly training and retraining their employees as well as encouraging specialization in task performance and allocation.

CASS Model

Gibbons, Thadden and Wiegmann (2006) designed a survey instrument to provide a comprehensive model for the assessment of aviation safety. The authors named the model "Commercial Aviation Safety Survey" (CASS) instrument. The CASS was designed to be comprehensive instruments to measure the safety culture of aviation organizations. Other multi-dimensional instruments such as the Zohar's Safety Climate Scale (SCS) are significantly shorter than the CASS and were designed to take a quick view on snapshot of safety climate of many types of organizations whereas the CASS was developed specifically for the aviation industry.

Fig.1 Gibbon – Thadden – Wiegmann CASS Model



(Source: Adapted from Muthuyadav, Maran and Manikandan 2015)

The CASS model presents safety in four fundamental components-Organizational Commitment, operational personnel, informal safety and formal safety. According to Gibbons et al (2006), cited by Muthuyadav et al (2015), organizational commitment reflects on the seriousness attached to safety values and safety fundamentals. This goes beyond ensuring compliance to being proactive and maintaining safety standard practices as stipulated by the aviation regulators. Operational personnel in the model are the implementers of safety rules which include the chief pilot, dispatch personnel and the instructor or trainer. Safety operations are executed by these operational personnel during and after flights.

Empirical Review

Evans & Newman (2021) examined the relationship between pilot commitment and pilot error behavior in Nigeria. The methodology of the study involved a systematic sampling of 162 airline personnel pilots and crew in sixteen airports across Nigeria, using questionnaire. The data were analysed through SPSS and the results showed that pilot commitment did not have a significant relationship with pilot error behaviours.

Zhou, Fang and Mohammed (2021) carried out a comparative analysis of safety in the construction industry in China. In the survey study, 584 construction workers including managers were sampled using probability related techniques, through structured questionnaire. Factor analysis was carried out on the data and the results revealed that safety culture had significant effects on employees' safety behavioral change.

Guldenmud (2021) conducted a study to evaluate the reliability and validity of questionnaire as safety measuring instrument in St. Louis. The study employed the Cronbach's Alpha statistic to measure the degree of consistency of questionnaire as a safety instrument. The results showed that $\propto = 0.892$, indicating that the questionnaire has a significant reliability as a safety-measuring instrument. Christian, Cabrera, Niscanen, Isla and Viela (2020) carried out a research on safety culture as a predictor of unsafe behaviours and accidents in work groups at New Delhi. Descriptive survey questionnaire was used to collect the data which were analyzed by multiple correlation. The results showed that a significant correlation exists between safety culture and safety outcomes.

Kao, Luci and Gelpa (2020) evaluated operators' safety behavior and air accidents in Massachusetts. The study involved 720 subjects drawn randomly from 12 private owned airports, using questionnaire. Analysis of variance and co-variance were employed to analyze the primary data, using statistical soft wares. The results showed that safety consciousness is a significant mediator of air accidents.

Many other studies have been conducted in the field of aviation safety and its impact on organizational variables. These include the works of Chang and Ziu (2019) – safety culture and organizational performance, O'Coner (2019) – Meta analysis of safety culture in Aviation; Silbey (2019) – validity and reliability of survey instruments on workplace safety in manufacturing; Nielsen, Rasmussen, Glasscock and Spangerben (2018)- Environmental safety issues and incidence of workers' accidents; Liu and Darklar (2018)-Track maintenance operator's safety attitude and on-hand aviation accidents; among a plethora of others. The finding of most of these depicts human error factor as a predominant cause of aviation accidents.

Research Methodology

The study is a descriptive survey in which structured questionnaire was used to sample the opinion of respondents on the subject matter of informal safety communication and benchmarking. The population of the study was made up of 413 employees of the Nigerian Airspace Management Agency at Enugu and Owerri airports in the South-East zone of Nigeria and Port-Harcourt, Calabar and Uyo airports in the South-South zone of Nigeria. The population estimate was obtained through the help of a research assistant who surveyed the five airports. The population distribution is as follows.

Table 1: Population of the Study

Study Organization	Population
NAMA Port-Harcourt	120
NAMA Calabar	90
NAMA Uyo	68
NAMA Owerri	86
NAMA Enugu	49
Total	**413**

Sample Size Determination

The Taro Yamene is statistical formula provided a guide to the determination of the sample size.

$$n = \frac{N}{1 + Ne^2}$$

n = Sample size, N = Population size, e = level of significance (5%).

$$\Longrightarrow n = \frac{413}{1+ 413\ (0.05^2)}$$

$$= 203$$

Sample size determination was carried out using the Taro Yamene formula as a guide, which yield a result of n = 203. The 203 aggregate sample size was spread across the five airports of NAMA, using proportion formula. This resulted to NAMA Port-Harcourt (59), NAMA Calabar (44), NAMA Owerri (42), NAMA Uyo (34), NAMA Enugu (24).

The questionnaire which contained five-scaled response options to each question item (SA, A, U, D, SD; meaning Strongly Agreed, Agreed, Undecided, Disagreed, Strongly Disagreed respectively was administered to the respondents in their offices at the airports. Two sampling techniques were employed in the administration of the questionnaire – judgmental sampling for managers and supervisors and simple random sampling for the rest of the employees. The judgmental technique ensured that all managers, supervisors' pilots and cabin crew workers were mandatorily included in the study; while the random sampling ensured equity among lower employees.

Prior to administration, the questionnaire was validated by professionals who studied the question items and ascertained their correctness in measuring informal safety communication and benchmarking. The reliability of the questionnaire was established with a Cronbach alpha statistic of 0.896 through a test-retest method that involved a pilot study. The data analytical tools was the version 2.0 of the SPSS for multiple correlations.

Data Analysis

Table 2 Correlations

Variables	IPSD	SSD	IB	EB
IPSD	1.000			
SSD	.661 .313	1.000		
IB	.904 -.311	.796 -.314	1.000	
EB	.706 .113	.906 .421	.845 .010	1.000

Dependent Variables: IB, EB
IPSD = Informal Participatory Safety Discussion
SSD = Self-needed Safety Dialogue
IB = Internal Benchmarking
EB = External Benchmarking

Discussion of Findings

The results in table 2 show that Informal Participatory Safety Discussion (IPSD) has a Pearson r = 0.904 with Internal Benchmarking (IB) and r = 0.706 with External Benchmarking (EB). These values of r, are significant with minimal standard error of estimates suggesting that Informal Participatory Safety Discussion has a positive relationship with internal benchmarking.

The value of Pearson r, are significant in both cases, which suggests that informal participatory safety discussion influences external benchmarking. The coefficient of determination (r^2) in each case are 0.4872 (or 48.72%) and 0.2632 (or 26.32%). This implies that about 48.72% variations in benchmarking is impacted by changes in informal participatory safety discussion in NAMA.

Secondly, Self-needed safety dialogue (SSD) has a Pearson r of 0.796 with internal benchmarking and 0.906 with external benchmarking which both show significance levels. The resulting coefficients of determination are 63.36% and 82.08% respectively. These statistics show that 63.36% changes in internal benchmarking could be caused by SSD and as high as 82.08% variations in external benchmarking could result from SSD. These results are in tandem with the findings of Chang & Liu (2019) and Nielsen, Rasmussen, Glasscock & Spangerben (2018). Chang & Liu (2019) found out a correlation of 0.746 between safety culture and organizational performance. Nielsen, Rasmussen, Glasscock & Spangerben (2018) discovered that environmental condition assert 26.0% influence on workers accidents. Jossy & Ross (2020) found out that informal discussions can reduce incidents among workers up to 63.4%.

Conclusion

Informal participatory safety discussion has significant positive effects on organization's benchmarking. Informal participatory safety discussion can account for 81.72% of activities that prompt internal benchmarking (r^2=0.8172). This leads to the rejection of the null hypothesis Ho_1 that there is no significant relationship between informal participatory safety discussion and internal benchmarking. Secondly, informal participatory safety discussion can assert a 49.84% change on external benchmarks (r^2 = 0.4984). Consequently, the null hypothesis (Ho_2) that there is no significant relationship between informal participatory safety discussion and external benchmarking is rejected since $r \neq 0$.

Furthermore, self-needed safety dialogue can account for 63.36% changes in internal benchmarks and 26.32% changes in external benchmarks. Ho_3 and Ho_4 therefore are rejected. It is therefore concluded that informal participatory safety discussion has significant positive relationship with organization benchmarking.

Recommendations

The findings of the study led to the recommendations that:

1. In time of safety challenges, employees should resort to informal safety discussion/communication to achieve safety.
2. The management of NAMA should encourage employees to participate in informal safety discussions to sustain safety of the air space, as such interactions will enhance the Agency's benchmarking level in African Regional aviation industry.
3. Experienced staff members of the Agency should ensure that they share their operational knowledge on the job during informal participatory safety discussions with subordinates. Such knowledge sharing will lead to sustainable air safety, and a source of useful data for benchmarking in air transport.
4. The management should disallow any hierarchical bottlenecks in obtaining safety information.

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