Determinants of a Low Cost Airline Safety Management in Thailand

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Abstract
This study has objectives 1) to indicate factors influence low cost airlines safety management, 2) to analyze the significance of management framework, leadership and accountability, planning and performance, implementation, behavioral safety awareness and systems of work in connection with safety management. Research tools are Analytic Hierarchy Process (AHP), in-depth interview and questionnaire. Two groups of respondents were selected, two hundred experienced pilots and maintenance personnel and two hundred cabin crew who passed the SMS course. Results showed that the largest impact factor to a low cost airlines safety management is the management framework, which comprises of airline safety policies, company safety systems framework, organization culture and the sustainability of business.

Keywords: Determinants, Low cost airline, Safety management

Introduction
Significance of a Low Cost Airline Safety Management
Low-cost carrier (LCCs) revolution spread out worldwide in 1990. LCCs models arrived to Europe in the 1990s and Asia in the 2000s (Corbo, 2016). The LCCs was the Europe's biggest business success story these airlines make such profits when they virtually sell ticket quite cheap and this pattern is a model for future airline. Possibly the biggest question of all, are the LCCs safe (Calder, 2003). Point-to-point route concept in low cost airlines has connected each original flight and its destination simply. This concept help cost reductions by eliminating any intermediate stop at the hub, which gets rid of costs related to hub development. LCCs offer reasonable price and a discount ticket pricing is now the biggest competitive factor for airlines. Especially at the time that global economic recessions, market crashes, and pandemic of COVID-19 made the airline industry is facing massive challenges. Nearly all tourism and airline industry collapse, low-cost carriers (LCCs) were at the forefront of that movement, and in severe competition. Further revenue passenger count remains static or at a very minimal increase, whereas number of carriers flying on the same route keeps increasing and every airline are fighting for the same cake. Airlines are operating with five to seven percent margin and they are forced to earn extra revenues for saving cost as much as possible (Holloway S, 2008). As for any industry, operating profit for an airline is defined as total revenues minus total operating expenses (Belobaba, Odoni, & Barbhart, 2016). Although past COVID-19 outbreak the fear of the coronavirus among potential leisure travelers are still exist, the air travel demand may lose from the market. Passenger air transportation could decline permanently because of the growing shift to video communications services, for example Google Meet, Webex, FaceBook Live and Zoom. A safety management system (SMS) is a part of airlines strategy towards the performance-based regulatory environment in aviation. SMS is not directly related to revenue of airlines despite it increase the costs of airlines. SMS is essential and needed to be complied with authorities

(ICAO, 2012). Airline safety is supposed to become the management system, integrated with other outstanding management structures and processes, which there are many benefits to airlines such as costs reduction, holistic organizational risks reduction and profitability increasing, balance of potentially conflicting objectives and elimination of conflicting responsibilities and relationships maintained safety, including aspects of risk and performance. The integration between service quality and standard safety is truly challenges for every airline in the world (Ulfvengren & Corrigan, 2015). The SMS is clearly assisting the aviation industry; hence airlines need to manage safety system to prevent incidents and accidents (Stolzer et al. 2015). Since 2016 ICAO statistic indicated an increase in both the total number of accidents as well as the global accident rate. In 2018.the global accident rate of 2.6 accidents per million flight departures and the statistic showed it increased by 8 per cent from year 2017. The scheduled commercial passenger airline accidents resulted in 514 fatalities representing a significant increase from 50 in 2017 but in 2019 fatal accidents rate per million fights was reduced to 0.11 which was reduces from year 2018 (IACO, 2020). ICAO continues to focus on its safety priorities which include runway safety, controlled flight into terrain and loss of control during en route. The statistics show the advanced technology has helped to reduce the fatal accident rate. To further decrease in the accident rate, the airline should not only depend on high technology but also continuously improve training for all aviation professionals, and enhancement the safety culture in the organization. The International Air Transport Association (IATA) published the Release of the 2019 Safety Report and it shows continuing improvements in airline safety compared to 2018 and to the preceding five years (see table 1).

Table 1 2019 Safety performance compared to 2018 and to the average of the 2014-2018
Source: IATA Statistics (IATA, 2020)

Accidents/incidents	**2019**	**2018**	**5-YEAR AVERAGE (2014-2018)**
All accident rate (accidents per one million flights)	1.13 or 1 accident every 884,000 flights	1.36 or 1 accident every 733,000 flights	1.56 or 1 accident every 640,000 flights
Total accidents	53	62	63.2
Fatal accidents	8 fatal accidents (4 jet and 4 turboprop) with 240 fatalities	11 fatal accidents with 523 fatalities	8.2 fatal accidents/year with an average of 303.4 fatalities each year
Fatality risk	0.09	0.17	0.17
Jet hull losses (per one million flights)	0.15 which is equal to 1 major accident for every 6.6 million flights	0.18 (one major accident for every 5.5 million flights)	0.24 (one major accident for every 4.1 million flights)
Turboprop hull losses (per one million flights)	0.69 (1 hull loss for every 1.45 million flights)	0.70 (1 hull loss for every 1.42 million flights)	1.40 (1 hull loss for every 714,000 flights)

The safety and wellbeing of all passengers and crew is aviation's highest priority. The release of IATA safety report based on the 2019 fatality risk, on average a passenger could take a flight every day for 535 years before experiencing an accident with one fatality on board. Even though the accident rate has decreased while the number of flight has potentially increased, only one accident is too many. Every fatality is a tragedy and it is vital that aviation organization have learned the correct lessons to make aviation even safer. Aviation faces its deepest crisis and IATA forecasts in 2021 the demand for traffic to return to half of

2019 because world will not be free from COVID-19 in the near future. To answer the question that the fatal rate decreased and why do aviation need to do more, because fast pace of technological change, new business models and nature of accidents has changed. Furthermore, there are new types of hazards, emergence of organizational accidents, increasing complexity and coupling of system components and also more complex relationships between humans and automation, role of software and the perspective of regulator and public have changed (EASA, 2012). Airlines need to make customers reassure that the risk of their lives including travel is tolerable (A. de Juniac, 2021).The framework for SMS includes four main components and twelve elements, representing the minimum requirements to meet ICAO standard. SMS includes three elements that are the SMS implementation plan, third party interface (contractors and service providers) and internal safety investigation. safety policy and objectives is combined with management commitment and responsibility, safety accountabilities, appointment of key safety personnel, SMS implementation, coordination of emergency response planning, SMS documentation, safety risk management, hazard identification, risk assessment and mitigation, safety assurance, safety performance monitoring and measurement, internal safety investigation, the management of change, continuous improvement of the SMS, safety promotion, training and education, and safety communication (Chacin, 2012; Paethrangsi, 2019)

Research Questions

The low cost airline model focus on minimal their operational costs by .flying to secondary airports, adopting a point-to point model, using one type fleet, avoiding the use of frequent flyer programs, offering a mono class seats and keeping the expenses on employees efficiently. The LCCs put on the high motivation plans for personnel by giving competitive compensation, providing incentives like profit-sharing, and employing a strong corporate culture (Corbo, 2016). Because of flying shorter routes, thus the crew are only away from home for a few days, or even no stay over nights. More time at home condition can boost morale to employee. The extant safety culture in one aviation organization collecting data from flight operations and maintenance personnel and other employees to measure individual attitudes regarding safety and factors contributed toward accident-free safety record. Research identified factors related to safety of organization are compliance with the Standard Operating Procedures (SPOs), collective commitment to safety, employee individual sense of responsibility toward safety, and the high level of personnel management trust (Patankar,2003)**.** For conclusion, there is only one research question that leads to two research objectives, that is what are the factors influence the success of safety management of low cost airlines in Thailand?

Research Objectives

This research has proposes; 1) to indicate factors influence low cost airlines safety management, 2) to analyze the significance of management framework, leadership and accountability, planning and performance, implementation ,behavioral safety, awareness & competence and systems of work in connection with safety management.

Research Methodology

Sample description, this study provides evidence drawn from low cost airlines operations personnel. The sample consists of 400 respondents from 5 low cost airlines in Thailand, they are Thai AirAsia company, Nok Airlines, Thai Lion Air, East Star and Thai Vietjet Airlines, whose have operation control (OPC) in Thailand. The sampling is divided into two groups as, 1) Group of 200 experienced pilots with working experience over three years, and

maintenance airline personnel who directly associate with safety of company, 2) Group of 200 cabin crew who have passed the safety management system (SMS) course. The statistic uses in this research to examine the link between factors and the success of safety management is the AHP Method, which consists to break down complex problems into a hierarchical tree structure (Hierarchy Structure) each class consists of a basis for decisions related to the issue. If there is a significant difference, important factors should be taken at least down to the floor next to it. Example chart AHP hierarchical structure with four levels as Level 1: Goal, Level 2: Main criteria, Level 3: Sub criteria, and Level 4: Alternative. In any AHP design, there is an objective at the top, and criteria and alternatives are located under the criteria respectively. A chart may expand by adding other sub-criteria between alternatives and main criteria. A group of criteria directly associated with the strategic objectives of the organization. The strategic criteria/objectives are determined by methods used to cascade corporate strategy like the balanced scorecard (Weber, 1993: Vargas, 2010) (see figure 1).

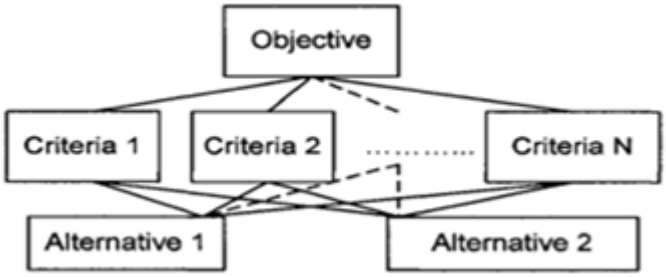

Figure 1 AHP hierarchical structures
Source: Analytical Hierarchy Process Design (Weber, 1993)

Data analyzed in the research is separated into four parts; 1) Comprehensive review of relevant literature related to safety theories, human factors, and causation of accidents. 2) Determine suitable indicators and factors of success in airline safety management in Thailand, completed survey both paperwork and online. 3) Prioritizing the determined factors by using the AHP approach orderly, develop a hierarchy model, establish a pairwise comparison matrix, check the consistencies of the judgments and combine the opinions from several respondents by using geometric mean. Sources of the data were obtained in the airlines in Thailand. The respondents were asked to sort the sixteen factors into nine levels of significance according to the perception of high relation to safety management. Nine significant levels at that the important" (9) to least important (1), with seven degrees of importance between the extremes (8 through 2). And 3) Collected, analyzed and concluded that what are the crucial factors that have high value weights in most associate with the effective of safety management in airline. The normalized principal Eigen vector is obtained by averaging across the rows. A comparison matrix was put into expert choices software to evaluate the different result of numerical computation of Eigen value and Eigen Vectors. (see figure 2)

$$\mathbf{v} = \begin{bmatrix} v_1 \\ v_2 \\ \cdots \\ v_n \end{bmatrix} \in \mathbb{R}^n \quad define \quad T(\mathbf{v}) = A\mathbf{v} = A \begin{bmatrix} v_1 \\ v_2 \\ \cdots \\ v_n \end{bmatrix}$$

Figure 2 Matrixes used to analyze factors (Patel, 2019).

4) At the last stage of data analysis, test the difference of decision making by two groups to confirm the different significance in the factors ranking between a group of pilots, maintenance personnel and a group of cabin crew.

Influenced factors were determined by literature review and airline management in-depth interview. The Swiss cheese model indicated that accidents involve successive breaches of multiple system defenses. These breaches can be triggered by a number of enabling factors such as equipment failures or operational errors. The basic concept compare complex systems in work as different layers of cheese slices, and these slices are not perfect. The vulnerable work system is like slices that have holes which allow for penetration. Each slice forms a different layer in the system and they are organizational layer, supervision or training layer, layer of unsafe precondition and the layer of unsafe acting (Aviation training, 2020). Shell model is a model of human factors that explains the human factor relationships between aviation system resources including environment and the human component. The component of the SHELL model can illustrate as the Software that means the rules, procedures, and written documents etc., which are part of the standard operating procedures. Hardware, that means the air traffic control suites, their configuration, controls and surfaces, displays and functional systems. Environment means the situation in which the L-H-S system must function, the social and economic climate as well as the natural environment. Liveware represents the human beings, the controller with other controllers, flight crew, maintenance personnel, management and administration people within in the system (ICAO Skybrary, 2021; Hafidh, 2019; Kankaew, 2020).

Table 2 Influenced factors

Factors	Source	Descriptions
Management framework safety policies, safety systems framework, organization culture)	ICAO, 2017; IATA2020; ICAO Skybrary, 2021	Management framework that is the airline safety policies, safety systems framework, organization culture and sustainability
Systems of work (JSA, JHA analysis, SOPs, SWIs, QRH, checklists are used)	Govnt. of W. Australia, 2020; ICAO, 2020; ICAO Skybrary, 2021	Job safety analysis (JSA) or job hazard analysis (JHA), manual such as standard operating procedures (SOPs) and safe work instructions (SWIs) development and use.
Leadership and accountability (roles and accountabilities)	Hafidh, 2019; Kankaew, 2020	Roles and accountabilities, procedural requirements, appointments & positions and teamwork development
Behavioral safety awareness & competence	Hafidh, 2019 Govnt. of W. Australia, 2020;	Training plan, fitness for work, inductions and conflicts at work.
Implementation (licenses and permits, record control, compliance &document control)	ICAO, 2020, IATA, 2020 Govnt. of W. Australia, 2020;	Licenses and permits, record control, compliance and document control, workplace inspections.
Planning and performance (safety objectives and targets, performance measurement)	Govnt. of W. Australia, 2020; ICAO, 2017	Safety objectives and targets, performance measurement, monitoring, and rewards & punishment

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Conceptual framework presents the relationship among factors (see figure 3).

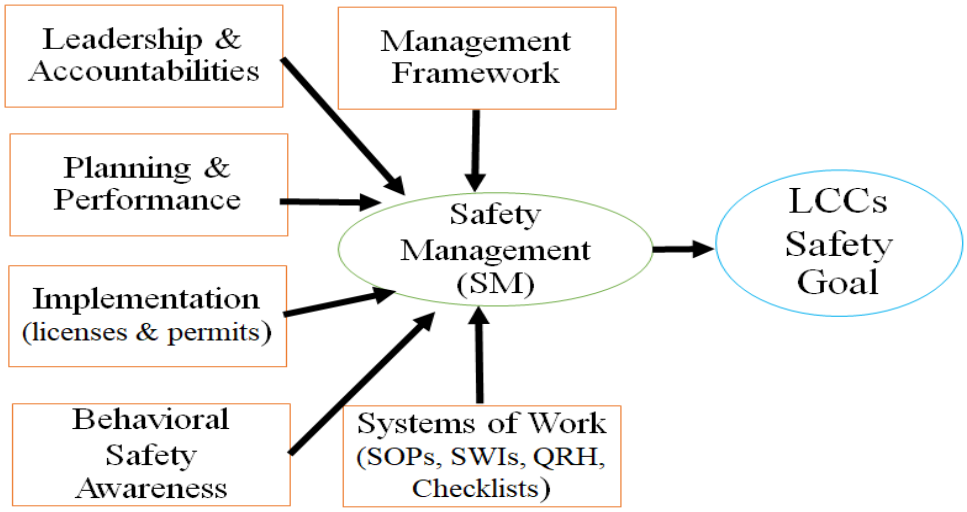

Figure 3 Conceptual framework

Research Results

To examine the proposed factors significance, all groups of factors have been done though quantitative method. The respondents rating results provide evidence that important levels of factors influence airline safety management (see table 3).

Table 3 Results of Rankings comparison between two groups of respondents

Group of factors	Pilots & maintenance staff		Cabin crew		Two groups	
	weight	ranking	weights	ranking	weight	ranking
Management framework	0.208	1	0.244	1	0.226	1
Systems of work	0.176	3	0.203	2	0.189	2
Leadership and accountability	0.202	2	0.161	3	0.181	3
Behavioral safety awareness & competence	0.155	5	0.149	4	0.152	4
Implementation	0.162	4	0.103	6	0.132	5
Planning and performance	0.097	6	0.140	5	0.120	6

A significant statistic provides evidences that pilots and maintenance personnel rated the most important factors influencing a low cost airline safety management to management framework (weight 0.208). Follow by leadership and accountability (weight 0.202), systems of work (weight 0.176), implementation (weight 0.162), behavioral safety awareness and competence (weight 0.155), and the group of the planning and performance was rated the last one (weight 0.097), while cabin crew gave the most important factors influencing a safety management to a group of the management framework (weight 0.244), the systems of work was in the second placed of six sequences (weight 0.203). Other factors are rated hierarchically as, leadership and accountability (weight 0.161), behavioral safety awareness and competence (weight 0.149), planning and performance (0140), and the implementation factors in this group are safety objectives and targets, performance measurement, monitoring, was perceived less important as in the sixth place of six sequence. There are some comments that these factors keep an airline meets the standard but not enhance the safety awareness among employees.

Discussion and Conclusion

Research concluded that factors influence low cost airlines safety management are management framework, systems of work, leadership and accountability, behavioral safety awareness & competence, implementation and planning and performance. The most significant determinants of safety management is the management framework, which they are including the airline safety policies, safety systems framework, organization culture and sustainability. The perspective of two groups is not much different. They are both gave the management framework is the most important factors. Rating scores also shown not much greater different in each factor group, should these safety factors be well integrated with other aspects business management, the organization will be resounding success. As any limitation in the research, this study provides space for further study in developing safety model for full service carriers (FSC) and air freight as well.

References

A. de Juniac. (2021). *Remarks of A. de Juniac at Media Briefing 3 February 2021*. Retrieved February, 2021 from: https://www.iata.org/en/pressroom/speeches/2021-02-03-01/

Aviation training. (2020). *Swiss Cheese Model In Aviation*. Retrieved February, 2021 from: https://aviatortraining.net/2018/07/13/swiss-cheese-model-in-aviation/

Belobaba, P., Odoni, A. & Barbhart, C. (2016), *The Global Airline Industry*, 2nd ed. MIT, USA: John Wiley & Sons.

Calder, S. (2003). *No Frills: The truth behind the low-cost revolution in the skies*. Virgin Book.

Chacin, E. (2012). *ICAO State Safety Management Program (SSP) and Safety Management Systems (SMS) perspective.* CAR/SAM Regional Workshop on the use of Aeronautical Studies in the Aerodrome Certification Process: Mexico.

Corbo, L. (2016). In search of business model configurations that work: Lessons from the hybridization of Air Berlin and JetBlue. *Journal of Air Transport Management*, 64 DOI: 10.1016/j.jairtraman.2016.09.010

EASA. (2012).ICAO *Annex 19 Safety Management*. Retrieved February, 2021 from: https://www.easa.europa.eu/sites/default/files/dfu/ICAO-annex-19.pdf

Government of Western Australia. (2020). *What is a safety management system?*. Retrieved February, 2021 from: http://www.dmp.wa.gov.au/Safety/What-is-a-safety-management-4598.aspx

Hafidh, M. (2019). Shell Model allows you to think about all different human factors influences on your performance. *Journal of Ayub Medical College Abbottabad*, 31. (2), 182-184.

Holloway, S. (2008), *Straight and Level Practical Airline Economics*. 2nd ed. USA: Ashgate Publishing,

IATA. (2020). *IATA Releases 2019 Airline Safety Report. Retrieved February*, Retrieved February, 2021 from: https://www.iata.org/en/pressroom/pr/2020-04-06-01/

ICAO Skybrary. (2021). *ICAO SHELL Model*. Retrieved February, 2021 from: https://www.skybrary.aero/index.php/ICAO_SHELL_Model

ICAO. (2017). *ICAO Doc 9859 Safety Management Manual: SMM*. 4th ed. Retrieved February, 2021 from: https://www.aex.ru/imgupl/files/ICAO

Kankaew, K. (2020). The evolution of agribusiness management values from labor to brain mechanism that shape leadership style. *E3S web of Conferences*, 175, 13033.

Kardi Teknomo. (n.d.). *Analytic Hierarchy Process (AHP) Tutoril.*

Karlene, K. P. (2019).Safety Culture, Training, Understanding, Aviation Passion: The impact on Manual Flight and Operational Performance. *Embry-Riddle Aeronautical University*.

Paethrangsi, N. (2019). Critical Success Factors Affecting B737-800 Pilot Initial Training. *Dusit Thani College Journal*. 13(2), 248-264.

Patankar, M. (2003). A Study of Safety Culture at an Organization. *International Journal of Applied Aviation Studies,* 3, 243-258.

Patel, K. (2019). *Eigenvectors and Eigenvalues. All you need to know*. Retrieved February, 2021 from: https://towardsdatascience.com/ -df92780c591f

Stolzer et al. (2015). *Safety management System in Aviation*, Ashgate Publishing.

Ulfvengren, P., Corrigan, S. (2015). Development and Implementation of a Safety Management System in a Lean Airline, *Cogn Tech Work* 17, 219–236. https://doi.org/10.1007/s10111-014-0297-8

Vargas, R. V. (2010). Using the analytic hierarchy process (ahp) to select and prioritize projects in a portfolio. *PMI® Global Congress 2010*, Washington, DC

Weber S. F. (1993), A Modified Analytic Hierarchy Process for Automated Manufacturing Decisions. *Interfaces*, 23, 75-84.