Need Analysis For Developing Aerodrome Flight Information (AFI) Procedure

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ABSTRACT

The growth of air traffic in Indonesia from year to year is increasing, at this time the Directorate General of Civil Aviation of the Ministry of Transportation began implementing flight navigation procedures in the form of Remote Aerodrome Flight Information Service (AFIS), Traffic Information Broadcasts By Aircraft (TIBA) and flight watch which is done so that there are no more blank spots in certain areas that are not reached. With the absence of material in the form of Remote AFIS, TIBA and flight watch in the Aerodrome Flight Information (AFI) Procedure course curriculum, it can be concluded to be able to develop the Aerodrome Flight Information (AFI) Procedure course curriculum learning by utilizing technological knowledge on the Aviation Polytechnic of Surabaya LMS. With the aim of supporting the readiness of cadets in carrying out on the job training, it is hoped that cadets can carry out on the job training optimally. In this study using the type of applied research using the Research and Development approach method with the ADDIE development model (Analysis, Design, Development or Production, Implementation or Delivery and Evaluations) using quantitative data analysis techniques with questionnaire testing techniques with the PIECES solution framework and Checklist which are analyzed using a Likert scale. The result of this research is an e-module using Hyzine Flipbook software which is implemented on the Aviation Polytechnic of Surabaya LMS. With the feasibility of the Material Expert 96.6% and the results of the Media Expert 95% with the meaning is "very good," and the e-module response from the 6th batch of Aeronautical Communication Diploma 3 cadets and several Aeronautical Communication Alumni obtained a percentage of 90.8% with the conclusion that the e-module was "very good".

Keywords: *E-Module, Remote AFIS (R-AFIS), TIBA, flight watch.*

1. INTRODUCTION

The growth of air traffic in Indonesia from year to year is increasing, at this time aircraft is one of the leading modes of transportation, especially in areas that cannot be reached by land or sea transportation. The increasing demand for air transportation also increases the safety, security and smoothness of flight navigation services provided. Therefore, the Directorate General of Civil Aviation of the Ministry of Transportation implementing flight navigation procedures in the form of Remote Aerodrome Flight Information Service (AFIS), Traffic Information Broadcasts By Aircraft (TIBA) and flight watch to avoid blank spots in certain unreachable areas.

There are currently 209 AFIS managed by Airnav Indonesia and many AFIS are still facing problems related to human resources [1], security issues, and other important issues. To improve flight navigation safety and efficiency at small airports. The Directorate of Aviation Navigation in collaboration with Airnav Indonesia is currently implementing the Remote Aerodrome Flight Informatin Service (AFIS). Remote Aerodrome Fight Information Service (R-AFIS) is a concept of Air Traffic Service where AFIS services are provided remotely from other location (AFIS units are not located at local airport locations). Air-ground communication service for AFIS at R-AFIS will be provided by designated Remote AFIS Center (RAC) or Flight Service Center (FSC). One RAC or FSC canserve one or more AFIS Units; The RAC or FSC is responsible to distribute the Air Traffic Service Messages on behalf of the R-AFIS. FSC provide flight information service for aircraft by radio communication which provide information necessary for the safe of aircraft operation within Aerodrome Flight Information Zone. Information provided by FSC are as follows: (1) Meteorological information; (2) Aerodrome Information; (3) Hazard information that may interrupt with flight

safety in the form of aircraft, vehicles or persons in the maneuvering area or other aircraft operating in the vicinity of aerodrome; (3) Navigation aids information (if any); (4) Any other information necessary for aviation safety. Flight Service Centre (FSC) remotely instead of the operator of the local airport tower by using camera systems and sensor information [2] [3].

Traffic information broadcasts by aircraft are intended to permit reports and relevant supplementary information of an advisory nature to be transmitted by pilots on a designated VHF radiotelephone (RTF) frequency for the information of pilots of other aircraft in the vicinity. TIBAs should be introduced only when necessary and as a temporary measure. The broadcast procedures should be applied in designated airspace where: a) there is a need to supplement collision hazard information provided by air traffic services outside controlled airspace; or b) there is a temporary disruption of normal air traffic services. Special procedures have been developed for pilot use in active contingency zones if communications are significantly degraded or unavailable. TIBA Procedures to be made as well as providing collision hazard information. When aircraft will enter designated airspace in which it is known in advance that normal communication is not available, pilots should maintain a listening watch on the TIBA frequency 10 minutes prior to entering that airspace. [4] [5].

While the flight watch procedure is part of the flight traffic service procedure applied to uncontrolled aerodromes where there is no aerodrome flight information service (AFIS) available, which is Flight watch is procedures that intend pilot to report actual time of arrival (ATA) and actual time of departure (ATD) within determined time period in unattended aerodrome in order to improve alerting services within such aerodrome. Flight watch Procedures: (1) A pilot / airline representative shall submit actual time of arrival (ATA) no later than 30 minutes after landing at designated aerodrome to the specified ATS Unit; (2) If the pilot / airline failed to submit ATA within 30 minutes after aircraft landed or 30 minutes from ETA, the ATS unit will declare uncertainty phase as part of alerting service procedures; [2]

With the increase in demand for air transportation, it also requires qualified human resources to support the needs in accordance with applicable standards, stated in the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 87 of 2021 concerning Civil Aviation Safety Regulations Section 69 concerning Licenses, Ratings, Training, and Proficiency of Flight Navigation Personnel in section 69.120 Authority of License Holders and Rating of Flight Navigation Personnel at point 2 (two) Flight Communication Guidance Personnel in letter a Flight Information (FI) Rating stated: Serve and/or supervise the provision of Air Traffic Advisory, Flight Information and Alerting Service to aircraft flying in the Aerodrome Flight Information Zone (AFIZ) and Heliport in accordance with the Rating held either in the unit located at the Aerodrome where the personnel are located or the unit provided services remotely; [6].

Regulation of the Head of the Transportation Human Resources Development Agency Number PK. 09/BPSDMP-2016 concerning the curriculum of the formation education and training program in the field of aviation, Aerodrome Flight Information (AFI) Procedure is one of the Working Expertise Courses in the second semester of the Diploma Three Program Aeronautical Communication Study Program, Aeronautical Communication is learni to responsible for the provision of aeronautical communication services Communication Centers at different locations [7], which in the learning material presented has not included remote communication service procedures, so that in the learning process it is necessary to include and implement these services in the form of Remote AFIS material, Traffic Information Broadcast by Aircraft (TIBA), and flight watch to support needs in accordance with applicable standards.

In the industrial revolution 4.0 is the application of artificial intelligence (AI) which has the potential to improve the quality of life of the world community [8] [9] [10]. With the increasingly sophisticated technology, it is also easier to make the learning process fun and interesting, to create a fun and interesting learning process which utilizes technology. e-module or electronic module is an electronic version of a module designed with the necessary software as a tool or means of learning that contains material, methods, limitations and ways of evaluating which are systematically designed and attractive to achieve an expected competency according to the level of complexity electronically. E-modules or electronic modules are modules in digital form, consisting of text, images, or both that contain digital electronic material accompanied by simulations that can and should be used in learning [11] [12] [13] [14] [15]

Based on the above problems, to meet the needs of human resources in accordance with the applicable standards in PM 87 of 2021 and the inclusion of flight navigation service material in the form of Remote Aerodrome Flight Information Service (AFIS), Traffic Infromation Broadcasts by Aircraft (TIBA) and flight watch in the Aerodrome Flight Information (AFI) Procedure course curriculum, it can be concluded that in order to develop the learning curriculum for the Aerodrome Flight Information (AFI) Procedure course by utilizing technology to create a fun and interesting learning process, the author will develop a teaching material in the form of an e-module which will later be input into the Learning Management System (LMS),

Learning Management Systems (LMS) A software application that automates the administration, tracking, and reporting of training events. An LMS should integrate with other enterprise application solutions used by HR and accounting, enabling management to measure the impact, effectiveness, and over all cost of training `initiatives. [16] [17] [18] with the material Content Management System (CMS) Content Management Systems (CMS) s an information system that allows publishing, editing, modifying content over internet through a central interface, have proven to be the best platforms for maintaining the large amount of digital content managed by Web applications [19] [20] [21] using MOODLE programming at Aviation Polytechnic of Surabaya. With the research title "*Development Of Learning Aerodrome Flight Information* (AFI) *Procedure Course With ADDIE Model On LMS At Aviation Polytechnic Of Surabaya*," the author hopes that the development of e-modules can help students to be more interested and active in conducting learning and the fulfillment of human resources in accordance with industry needs will be achieved. To fulfill the aim of this research, the questions below were asked:

1. How is the learning development of Aerodrome Flight Information (AFI) Procedure Course with ADDIE model on LMS at Aviation Polytechnic of Surabaya?
2. How to implement the learning development of Aerodrome Flight Information (AFI) Procedure with ADDIE model on LMS at Aviation Polytechnic of Surabaya?
3. How is the effectiveness of learning development for Aerodrome Flight Information (AFI) Procedure with ADDIE model on LMS at Aviation Polytechnic of Surabaya?

2. METHODS

This research uses the type of applied research using the Research and Development (R&D) approaches method with the ADDIE developing model. The ADDIE development model consists of five stages of development. The model involves development stages with five steps/phases of development including: Analysis, Design, Development or Production, Implementation or Delivery and Evaluations. [22].

a. Analysis

There is no flight navigation service material available in the form of Remote Aerodrome Flight Information Service (AFIS), Traffic Infromation Broadcast by Aircraft (TIBA) and flight watch in the Aerodrome Flight Information (AFI) Procedure course curriculum with learning that uses digitalization era technology,

b. Design

The design stage begins with the preparation of an e-module framework which includes the presentation of Remote Aerodrome Flight Information Service (AFIS), Traffic Infromation Broadcast by Aircraft (TIBA) and flight watch material, preparing reference materials in accordance with e-module material, and making e-module assessment instruments which include assessment in terms of material and media.

c. Development

The product development stage refers to what is obtained in the design stage, namely, the development of e-modules according to the results of the design stage, product validation to determine the quality of e-modules before being tested on students, and e-module improvements based on input from experts.

d. Implementation

The implementation of this research is the application of the results of the development stage in the form of e-module products Remote Aerodrome Flight Information Service (AFIS), Traffic Information Broadcast by Aircraft (TIBA) and flight watch and declared feasible by material and media experts to be used in learning at the Surabaya Aviation Polytechnic.

e. Evaluation

Evaluating the e-module development that has been carried out is a follow-up to the implementation stage.

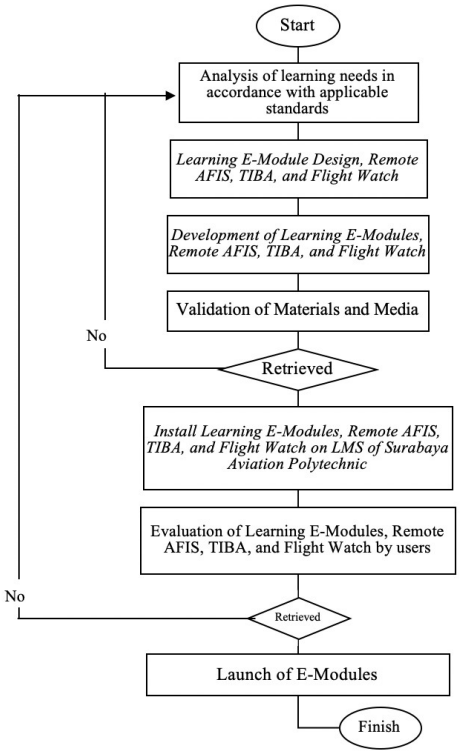

Figure 1 Flowchart of Research Methods

The testing is carried out when the e-module has been made by making instruments for e-module assessment including assessment instruments in terms of material and media.

a. Material trial

Material trials were conducted with material experts. In this case, a lecturer in the Flight Information (FI) course at the Aviation Polytechnic of Surabaya Aeronautical Communication Study Program.

b. Media trial

Media trials were conducted with someone who is a professional in the field of media expert design to determine the quality of the media produced.

The testing technique uses a questionnaire with a population of 6th generation aeronautical communication cadets and several alumni of the Aeronautical Communication Study Program, in this study using the "PIECES" problem solving framework and Cheklist. PIECES categories are Performance the need to correct or improve performance; Information the need to correct or improve information (and data); Economics the need to correct or improve economics, control costs, or increase profits; Control the need to correct or improve control or security; Effeciency the need to correct or improve the efficiency of processes and human resources; Service the need to correct or improve services to customers, suppliers, partners, employees, and so on [23].

The data analysis technique in this study uses the Likert Scale below:

Table 1 Likert scale options

Score Options	Score Options
Strongly (disagree/bad/very bad)	1
No (agree/good) or less	2
Neutral / Fair	3
(Agree/good/like)	4
Strongly (Agree/good/like)	5

In finding the Likert scale values refer to

$$\text{Likert Scale Scores} = T \times Pn \quad (1)$$

Where T is the total number of respondents who chose and Pn is the choice of Likert scale score numbers. Then all are summed up and can be found for each average value by comparing with the highest value score multiplied by the number of respondents. Then the interval value is determine by the formula:

$$\text{Index Formula \%} = \frac{\text{Likert Scale Scores}}{X} \times 100\% \quad (2)$$

With X is the total of all respondents with the highest indicator [23]. The results of the index% formula are described in Table Below:

Table 2 Likert Scale Response Index

Answer	Description
0% - 19,99%	Strongly (Disagree, Poor, Very Poor)
20% - 39,99%	Disagree or Poor
40% - 59,99%	Fair or Neutral
60% - 79,99%	Setuju, Baik atau Suka
80% - 100%	Sangat (Setuju, Baik, Suka)

3. RESULTS AND DISCUSSION

The results of the development of Aerodrome Flight Information (AFI) Procedure courses that have been carried out include potential and problems, data collection, product design, product testing functionality, and analyzing the results that have been obtained through the ADDIE model development method (Analysis, Design, Development or Production, Implementation or Delivery and Evaluations) which aims to develop Aerodrome Flight Information (AFI) Procedure course learning.

a. Analysis

The results of a survey conducted to 10 cadets in the 6th batch of D3 Aeronautical Communication study program, the results of the analysis that have been carried out are used as guidelines and considerations in the development of learning Aerodrome Flight Information (AFI) Procedure courses, the analysis carried out includes performance and requirements analysis.

Performance analysis is carried out to find out and classify the problems faced by cadets while carrying out on the job training. With this procedure, according to the survey, additional material is needed in the form of AFIS, TIBA, and Flight Watch remote material because it is needed to support the readiness of cadets in carrying out on the job training and it is hoped that cadets can carry out on the job training optimally. The requirement analysis is to determine the learning media needed by cadets to improve the quality of learning that can be accessed anywhere and anytime, according to the survey results online learning provides cadets with broad, free, and creative thoughts and insights, because online learning is considered without pressure, therefore it can be concluded that online learning can produce effective and efficient learning. Thus, the author develops online learning media in the form of e-modules which are expected to eliminate the boredom of students when studying them. According to the survey, e-modules are learning media that can be used continuously during learning because e-modules can be accessed anywhere and stored on the internet which allows the material to be presented more interestingly, e-modules will not stop and will continue to develop because at this time humans

depend on gadgets that are flexible and practical to carry anywhere.

b. Design

The design stage is a follow-up to the analysis stage, where the planning of learning development for Aerodrome Flight Information Procedure courses starts from looking at analyzing what material needs are needed in the design of learning development for Aerodrome Flight Information Procedure courses, then collecting materials related to Remote AFIS, TIBA, and Flight Watch where the material is taken from various trusted sources such as International and National Regulations, standard operating procedures, AIRAC, AIP, and other sources. Media design, e-module learning media development design using a graphic design platform and publication content in the form of Canva. Designing the format by completing the Introduction Course section which consists of 3 contents. The first content is the cover page which contains the e-module title "E-Module Remote AFIS, TIBA, and Flight Watch".

Figure 2 The Design Process

c. Development

In this development stage, there are several things that are done, including

1) E-Module Development

The steps taken in this stage are collecting and checking the material. Then the collection of video, audio, and animation to support the material in this e-module. the next step is to combine all parts of the e-module using a graphic design platform and publication content in the form of Canva and Hayzine Flipbook.

Figure 3 The Decelopment Process

2) Validation of E-Module Validity

Validators consist of material and media expert validators

a) Material Expert Validation

Material experts were validated by Flight Information lecturers. Expert validation is related to the aspect of material relevance in the e-module. Material validation in addition to conducting a feasibility assessment. The results obtained from the Material Expert are 96.6%.

b) Media Expert Validation

The aspects assessed are aspects of media display, how easy it is to use e-modules, and the feasibility of the e-module design displayed. The results given by the Media Expert are 95%.

d. Implementation

At this stage, the e-module is implemented on the Surabaya Aviation Polytechnic LMS with the LMS link as follows https://courses.poltekbangsby.ac.id . at this stage the author conducted product trials in small groups by looking at the responses of the cadets. The trial was intended to see the level of accuracy and practicality of the e-module, this trial consisted of 23 D3 Aeronautical Communication cadets and 2 Aeronautical Communication cadet alumni. The author uses the Google Form platform as a medium for distributing questionnaires.

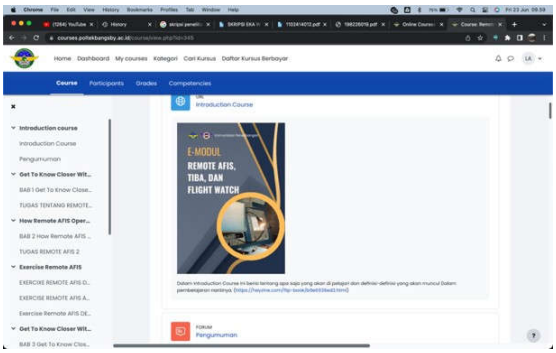

Figure 4 Results Of E-Module Implementation

The results of this study, the authors used quantitative methods to determine the results of the e-module trial, while the results of the Performance category got 92.8%, which means that for this e-module in the Performance category the respondents strongly agree that the e-module can be accessed easily and quickly and the appearance of this e-module is attractive and interactive. Furthermore, the Information category gets 90.8% with the conclusion that respondents strongly agree that the material displayed is in accordance with the needs and the material in each chapter is clear. For the Economics category, the result is 90%, which means that respondents strongly agree that the e-module is in accordance with the needs and benefits of cadets. In the Control category with 88.4% results that respondents strongly agree that the information

displayed is in accordance with applicable standards and the material presented uses sentences that are easy to understand. For the Effeciency category with 93.2% results that respondents strongly agree that this e-module can be used for self-study and facilitate the teaching and learning process. For the Service category, the result is 90% with the conclusion that the font size used is easy to read clearly and the material presented in the e-module can help support learning. The final results of the questionnaire on the e-module get a percentage of 90.8%, it can be concluded that respondents really like this e-module, and the Remote AFIS, TIBA, and flight watch learning e-modules are "very good" to use.

e. Evaluation

Evaluation is the last stage of the ADDIE development model, because in this study using a limited trial, the evaluation referred to here is an evaluation of the cadets and some alumni of the results of the e-module development. The evaluation results are obtained from the suggestions included in the online-based survey using the Google Form platform, so that from this evaluation stage, the final revision is carried out.

4. CONCLUSION

Based on the research results from data analysis, it can be concluded that:

a. Development of learning Aerodrome Flight Information (AFI) Procedure in terms of material, namely by adding material related to Remote AFIS, TIBA, and flight watch in the D3 Aeronautical Communication Study Program using online media in e-modules to produce effective and efficient learning.

b. The feasibility of e-modules after being validated by 2 validators obtained results from Material Experts, namely 96.6% and results from Media Experts, namely 95% with the meaning of "very good".

c. The response to the e-module by the D3 Aeronautical Communication Cadets and several Aeronautical Communication Alumni obtained a percentage of 90.8% which stated "very good". So, the response from the cadets and some alumni stated that the e-module of Remote AFIS, TIBA, and flight watch learning is very good, innovative, creative, and interactive to generate cadets' interest in learning Remote AFIS, TIBA, and flight watch material and it is hoped that in the future it can be developed and can help teaching and learning activities at the Surabaya Aviation Polytechnic.

Suggestions from this research are:

a. For Teachers

Teachers can apply the learning e-modules that have been developed to overcome difficulties in learning related to Remote AFIS, TIBA, and flight watch materials using online media that have been implemented on the Surabaya Aviation Polytechnic LMS.

b. For Learners

Students can utilize the learning e-modules that have been developed for independent learning.

c. For Other Researchers

Other researchers should be able to develop this learning e-module more interactively by adding various examples of implementation that are in accordance with the situation in the field, with additional animations that contain explanations of material in each chapter to make it easier for students to do learning. Should be able to develop material from every development of existing regulations, and can conduct further tests, so as to determine the effectiveness of this e-module.

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