

## **The Rationale of Element Requirement Developing a bilingual Multimedia Software (Im-Smartsafety) as an Alternative Information Presentation Media to the Foreign Workers During Safety Course in Malaysian Construction Industry**

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### **Abstract**

*Bilingual multimedia Software IM-SmartSAFETY which is fully conducted by course instructors is developed as an alternative information presentation media for teaching purposes as well as to help increase the understanding and interest of Myanmar foreign workers throughout the information presentation during the safety course. This software is developed with several important elements such as Safety and Health Induction Course module, bilingual (Malay and Myanmar), learning theory, teaching and learning strategy, instructional design model and the usage of multimedia technology.*

**Key words:** element, development, bilingual multimedia, safety course, foreign worker, construction industry, Malaysia

### **1. Introduction**

Based on the survey problems, the language problem issue is not a new thing in the construction industry where it has caused accident risks to happen among foreign workers. Accident risks happen because foreign workers have difficulties understanding the work order. In fact, it is also difficult to carry out safety implementation among these foreign workers including presentation of information during the Safety and Health Induction Course (SHIC). Preliminary study that has been carried out found that 85.4% (82) of the course instructors use only Malay language when presenting information to the non-Indonesian foreign workers during SHIC. In fact, 43.75% of these course instructors' states that language problem happens verbally and 77.1% (74) state that language problem occurs fully in writing among non-Indonesian foreign workers. Preliminary study that was carried out also found that 43.1% (44) of the Myanmar foreign workers, which is the second largest foreign work force in the Malaysian construction industry, after the Indonesian foreign workers especially the newly arrived in Malaysia and did not understand the information that was verbally presented in Malay language and 55.88% (57) did not understand the information presented on a written basis during the course. Preliminary study also found that 56.9% (58) of these Myanmar foreign workers did not understand the information that was presented verbally in English language and 48.03% did not understand the written form during the course.

In order to overcome these language problem issues especially during the information presentation session during the course, a bilingual multimedia Software *IM-SmartSAFETY* which is conducted fully by the course instructors is developed as an alternative information presentation media for teaching as well as to help increase the level of understanding and interest of these Myanmar foreign workers during SHIC.

Development of this software is also based on the result of learning that is achieved by the foreign workers in the course where at the end of this course, the workers will become aware of the dangers at construction site, are able to reduce damage and injury towards other construction workers, public or properties as well as obey every rule and law that are enforced. Following that, the objective of this research is:

- to design a bilingual software for the Safety and Health Induction Course (IM-SmartSAFETY).
- to develop a bilingual software for the Safety and Health Induction Course (IM-SmartSAFETY).
- to evaluate the developed bilingual software for the Safety and Health Induction Course (IM-SmartSAFETY) from the aspects of achievement, helpfulness and safety awareness of foreign workers.

## ***2. The Element for Development of Bilingual Software for the Safety and Health Induction Course (IM-SmartSAFETY)***

Based on earlier research that has been carried out, there are several important elements and the rationale for applying these elements to complete the development of the software within the course that is:

### **2.1 Safety and Health Induction Course Module**

The course content applied to this software are the SHIC module that is being used to present information regarding safety aspects during work at the work place including construction site. This module is prepared by the Construction Industry Development Board of Malaysia (CIDB) and National Institute of Safety and Health (NIOSH) to provide a guide for the course instructors to present information during the SHIC.

### **2.2 Bilingual**

Bilingual means the involvement of using two languages (Baker, 2001) where the first language and second language is applied concurrently to a media whether printed or electronic. The purpose of using two languages is to give comprehension, to increase the knowledge besides being able to command both the languages which is in-line with the purpose of using two languages. Using two languages in this research is with the hope that it could help increase the foreign workers' understanding of the information presented during the course which uses the Malay language and a foreign language in the software that is being developed.

The rationale of using a foreign language, that is Myanmar, in the *IM-SmartSAFETY* software is because the main subject involved in this research are Myanmar foreign workers who are the second largest foreign work force in the construction industry in Malaysia after the Indonesian foreign workers. Malay language is also used in the development of this software to ease the presentation of information by the course instructors to the local participants of the course. Early observation carried out found that most course instructors use the Malay language as compared to English, which is also used to present information during the course.

### **2.3 Learning Theory**

It is important to incorporate the learning theory in teaching to ensure that the learning process may be carried out effectively and can be a guide so that the learning process is not diverted from the actual purpose. This learning theory is also applied in the development of the course ware so that it can be developed in an organized and systematic way. According to Janudin (2009), the purpose of applying the learning theory in the development of this software so that the actual learning process is not contradicting with the learning objective and can be carried out effectively and fulfilling the user's need. Based on this research, several theories are applied in the development of the *IM-SmartSAFETY* software with emphasis on the andragogy or the adult learning theory as foreign workers who are involved in this research are the adult Myanmar foreign workers.

#### **2.3.1 Andragogy Theory**

The andragogy or the adult learning theory includes several well-known personalities such as Malcom Knowles (1970), Edward Lindeman (1926), Tough (1976) and many others. Nevertheless, the andragogy theory is chosen for this research based on the necessary attendance of adult Myanmar foreign workers, as the main subject, and the need for them to be involved actively throughout the course via teaching activities using the developed software. As in other industries, the construction industry held several courses or training to increase the knowledge, skill and ability of workers to carry out works at construction site.

Therefore, conducting these trainings or courses need to be based on a suitable theory that meets and smoothen the training and meets the needs of the workers. This issue is stated by Galbraith and Fouch (2007) where the appropriate andragogy and relevant implementation during safety training to reduce any self injury or damage to properties at work place. Although according to Robotham (2001) the death and injury along with loss of profit is dependent on the effectiveness of a training or course that has been carried out. Workers who did not follow the course or safety training effectively will face all kinds of high injury risks at work place.

The andragogy theory is also chosen throughout the implementation during SHIC because it linked existing knowledge and experience as a learning source to develop new knowledge from this training or course that the participant attended. This newly formed knowledge from the activities carried out where most activities are focussed on problems related with actual work situation. This theory needs active involvement from the participant to discuss how to resolve the problem from the research case that was given and displayed on the screen apart from relating it to suitable examples by the course instructors with actual work situations of the participants so that they can understand better the information presented throughout the learning process. If this matter did not happen during learning among adults, the training or course that has been carried out is said to have failed to achieve the set targets (Adams, 2000).

### **2.3.2 Cognitivism Theory**

Cognitivism theory is a theory that involves the thinking process. A few well-known personalities such as Bruner (1960), Gagne (1962), Lewin (1986), Ausubel (1963), Piaget (1970), Kohl (1976) and Koffka (1922) are of the opinion that learning based on this theory is linked with the internal process of the mind where ideas happen and could not be seen via physically movement. The rationale behind choosing the cognition theory for this research is for the Myanmar foreign workers to involve themselves and are able to use their active thinking to obtain and remember every information presented and expand the knowledge to solve problems from the research case question given apart from testing their understand via exams achievement during quiz. In this research, every information presented via this developed software uses various multimedia elements. Therefore, multimedia application in this software are more focused on using the graphic and video elements because information received via this element is easier to understand and remembered. Hamzah et al. (2010) stated that multimedia elements such as texts, graphics, animations and audios are able to help produce cognitive process apart from attracting the active attention and vision of the participants.

### **2.3.3 Constructivism Theory**

Constructivism theory is a theory that also needs active involvement of participant where their existing knowledge plays a part in building new knowledge (Chu, 2010), understanding (Nursafarina, 2010) and learning (Janudin, 2009). The theory pioneered by several well-known personalities such as Piaget, Vygotsky, Glaserfeld and Bruner explained how participant learn and think. Lesson learned during this theory requires the participant to think critically in order to build, create and develop themselves, a concept to create new source of knowledge and understanding by solving the problem that was given. The rationale of choosing the cognition theory for this research is to enable the Myanmar foreign worker to discuss actively among their group in order to solve the problems from the research case that was given. Every research case that was given is based on the actual work situation of the Myanmar foreign workers in the construction industry. Every participant is required to express their idea and view based on existing knowledge and experience to solve the problem in order to produce a new experience from the research case that was given.

### **2.3.4 Social Theory**

Social theory or neobehaviourism is a combination of behavioural reinforcement and psychology cognitive that use internal thoughts of the participant. This theory involves well-known personalities such as Bandura (1986) and Rotter (1954) where through this theory, the process modelled via 'observation' and 'copying' is emphasised during learning that is the individual will observe and copy matters that he/she observed. Therefore, the social theory rationale is chosen for this research so that Myanmar foreign workers can observe and copy all exemplary action and positive steps via graphic and video element that was shown via the software that functioned as an 'observation' and 'copying' model.

### **2.3.5 Connectivism Theory**

Connectivism theory is the digital era learning theory that is used in computer science where it gives technological effect to human live whether from the relationship and internal learning point. The theory that involves several well-known personalities such as Siemens (2004), Downers (2005), Forster and Kerr (2007) has become the basis to connect, obtain, increase and produce information source from computer system by a user in enhancing the understanding and strengthen the information during the teaching and learning process. The rationale for choosing this theory is to stabilise the developed software where every information in the designed software so that every one of these information are inter-related and is related from one teaching topic to another via linked button that was prepared for obtaining the required information. Therefore, the facility prepared enables the course instructors to conduct the software as an information presentation media and this teaching aid is free to choose teaching topic that is to be taught without following the topic arrangement.

### **2.3.6 Minimalism Theory**

Minimalism theory and the well-known personalities involved are J.M. Carroll (1990), is a theory that involves art and design especially visual arts and music. This theory's role is to determine placement of information and usage of appropriate pictures, colours and music which are organise neatly and completely on the story board of a project as well as to obtain result which are attractive and effective towards the understanding of the users. The rationale for this theory is to determine that every placement of information with its design arrangement of pictures, colours and music on software development of the story board could be arrange perfectly, orderly and neatly according to the stated procedure.

## **2.4 Teaching and Learning Strategy**

Teaching and learning strategy is among the requirement which are very important during implementation of a teaching and learning plan including development of an application. This strategy is necessary so that a topic can be taught systematically as well as achieving the teaching and learning objective. In designing a computer assisted teaching and learning software, there are many strategies that can be used by the course instructors that are suitable for achieving the learning objective. To achieve the learning objective in SHIC, the teaching and learning strategy that is applied through this developed software and it involved the active learning concept.

### **2.4.1 Active Learning**

Active learning refers to learning focussed on a student where it gives space to the student to think and to be involved actively in class for every activity carried out. Through this learning, participants not only react as a listener or watcher but are involve actively in learning and towards teaching aid such as looking for information and discussing it with friends or members of the group to solve the problem from their assignment (Esah, 2004). In this research, the discussion method is used as the active learning implementation rationale in the course to achieve the adult learning effectiveness among Myanmar foreign workers. Nevertheless, achievement exam in the form of quiz is implemented to test their level of understanding towards the information presented apart from using the lecture method to explain certain items within the topic, by the course instructors.

#### **a. Discussion Method**

Discussion method is a teaching method focused on student as explained by Nursafarina (2010) and is usually in a class orientation (Esah, 2004). This method involves interaction between members of the group regarding issues or topics and with suggestion or opinion to overcome problems that were discussed. Using the discussion method in this research is based on earlier carried out research where most of the course instructors use the discussion method during SHIC with 58.3% (56) of them conducting the discussion in the Malay language even for the non-Indonesian foreign workers. The rationale of using the discussion method in this research is to test the understanding of the Myanmar foreign workers on the topic taught which was presented in the course through problem solving. This method needed the active involvement of workers in order to achieve the effectiveness of adult learning where they need to discuss and share ideas based on existing knowledge and experience with group members, whether cooperatively or coloborately (Azizul Rahman & Mohamad Saleeh, 2010) to resolve the problems from the research case question that was given (Beavers, 2009). The way this discussion method is presented in this research is to display on the software screen, the research case question that was developed in Myanmar language. Discussion among group members will carry on according to time frame that was given by the course instructors.

According to Robotham (2001), the discussion carried out is one of the interactive learning methods where it could leave an impression towards learning and change in participants' reaction. The discussion method among group members is said to be among the most effective method throughout the learning process among adults (Galbraith & Fouch, 2007) where the participants could absorb until 70% of the information from the understanding that was received (Adams, 2000).

### **b. Achievement Test**

Achievement test in the form of quiz is implemented in this research. By having a quiz about a certain topic, it could enhance the understanding of the participant and participant can remember, link facts and could build skill through the questions that was given. In the context of this research, the quiz question is applied in the developed software where the rationale is to test the understanding of the Myanmar foreign workers about the topics taught. The implementation of the quiz is by displaying the questions on the screen in Myanmar language. Every worker need to answer the quiz question in a multiple choice paper that was prepared in Myanmar language where they need to answer the questions that are presented according to the time set by the course instructors.

### **c. Lecture Method**

The lecture method is the explanation method that is implemented through one way communication by the course instructors to present information to the participants. Nevertheless, the lecture method is said to be one of the old ways, that is the original way that was implemented before for a program or training through giving notes, questions and answers session and a quiz to evaluate the understanding of the participants (Galbraith & Fouch, 2007). Using the lecture method in this research is actually based on earlier observation that was carried out towards learning environment where it is found that the SHIC lecture hall did not have any computer facility or computer lab for use by the course participants. Therefore, the course participants can only listen to the information that was presented by the course instructors through *PowerPoint* slide presentation. Preliminary study that was carried out found that 85.4% (82) of the course instructors use the lecture method throughout the information presentation using Malay language, 78.1% (75) of them use *PowerPoint* slide with pictures and slide in the Malay language, 84.4% (81) carry out the lecture using video shows, 26% (25) of the course instructors prepared printed material in the Malay language, 29.2% (28) of the course instructors prepared printed pictures in Malay language and 37.5% (36) of them use linguist from senior workers midst all through the presentation of information. The conclusion is observation results that was carried out, lecture method is used by all SHIC course instructors with the support of teaching aids throughout the presentation of information.

The rationale of using the lecture method for this research is to explain certain items within the topic according to suitability of the course instructors. This situation needs the participant to first understand the content of the course in-line with their existing knowledge and experience before the learning activities is carried out. Even though, courses involving this method that is said to usually fail in organising matters regarding safety and health at construction site (Price, 2008) and is said to be an ineffective strategy for adult as they are only able to remember 10% of the information that is heard and only 50% of the information is accepted and retained when the information is seen and heard (Adams, 2000), therefore the effectiveness of learning could only be achieve when this lecture method is combined with the teaching strategy and other learning method. According to Robotham (2001), combination of different methods such as discussion method and role play is said to be more effective in adult learning as compared to only the lecturing method. Therefore, for this research, implementation of the lecture method is carried out in combination with the discussion method for solving problems and achievement test in the form of quiz to achieve its effectiveness. Following that, Owen and Helps (1996) explained that preparation of the teaching module by multimedia is one of the best method in improving lecture activities during class. Price's et al. (2008) research also proved that 95% of the public engineering students for the safety and health course state that the combination of lecture method with video proved to be the most effective combination for new workers. Because this course involves new foreign workers who will enter the construction site, the lecture method is to use teaching aid in the form of the proposed bilingual multimedia. The teaching aids use the Malay language and a foreign language (Myanmar) conducted by the course instructors to ensure that the foreign workers understand the information presented before implementation of other learning activities during the course.

The factors rationale of choosing the lecture method supported by teaching aid materials in the form of bilingual multimedia during this research is:

- Language – Based on earlier study that was carried out, there were many Myanmar foreign workers who attended the SHIC has little or do not understand the Malay language. This matter is stated by Abdul Rashid and Abdul Aziz (2003) where foreign workers, especially the newly arrived to the construction industry, have communications (language) problem where they find difficulty in understanding every work order and safety instruction that was given. Therefore, for foreign workers who understand little or no Malay language at all will have a more passive attitude and only listen. So, it is suitable to select the lecture method with bilingual multimedia teaching aid where course instructors will play an important role in conducting the class (Esah, 2004) throughout the explanation about safety aspects at construction site. This software will show texts on the display screen with related pictures to support the information presentation by course instructors. By using this software, the participant will understand the information that was presented by reading the information (texts) displayed on the screen and also listening to the recorded voice using their native language.
- Education Level – According to Abdul Rashid and Abdul Aziz (2004), most foreign workers who worked in Malaysia have low education level and rarely had formal education that they find it difficult to understand work orders and implementation of safety aspects at construction site. Study conducted by Abdul Rashid and Abdul Aziz found that from 81.2% of the foreign workers met, all did not have any formal education until about the age of 15 years. Preliminary study found that 12.7% (13) of them had secondary education and 59.8% (61) of them have only primary education. The rest of the 27.5% (28) of the Myanmar foreign workers did not have any education at all. Apart from that, earlier research carried out also found that 34.3% (35) of the Myanmar foreign workers are less skilled and 40.2% (41) of them are not skilled to use computer. Therefore, choosing the lecture method as teaching strategy for this research is suitable where the course instructors will play many roles in presenting the information through bilingual multimedia during the course.
- Duration of Course – Duration factor also influence the selection of teaching strategy so that the course topic could be presented according to the time set. For SHIC, the implementation needed to be carried out in a period of less than 6 hours or at least 6 hours each time with no extension that lasts until 10 pm, as stated in the Safety and Health Induction Course implementation rule in Malaysia. During that duration, a few important topics in the course module needed to be presented within the 6 hours. Therefore, lecturing with bilingual multimedia teaching aid is a suitable application for this course in presenting the topics with the time set.
- Class Size – Selection of teaching strategy is also influenced by the factor of the class size. According to the Safety and Health Induction Course implementation rule in Malaysia, maximum participant is 40 and minimum participant is 20 and to be carried out in a space or an appropriate room to accommodate all the course participant in a comfortable environment. Therefore with this class size that is rather big, lecturing with bilingual multimedia teaching aid is appropriate in presenting information to all participant at any one time.

## **2.5 Instructional Design**

Instructional design are actually a teaching material building process such as the printed module, computer teaching software and multimedia material which usually involve designing, developing, implementing and evaluating process of the product (Norasiah et al., 2009) with the aim to implement and support individual learning. Therefore, in developing an effective courseware, it needs careful planning and systematic design throughout its development (Soulier, 1988). In developing this courseware, instructional design model is very important and is needed where it prepares an organized and systematic framework for the project with learning concept to produce effective teaching (Norsiah et al., 2009.) It is also an organize procedure that consists of analysis, design, development, implementation and evaluation instruction steps (Seels & Richey, 1994) with a systematic approach for design, production, evaluation and using a complete system instruction (AECT, 1977). Norazlin et al. (2007) added that the multimedia projects that have education and training feature is more effective and meets the requirement of the user and development objective through four main activities emphasized by Gustafson and Branch (1997) that is to carry out the analysis for the student's need, design a set of relevant specification for the student, develop the system and to evaluate the developed system summatively and formatively.

For this research purpose, the software that is developed as an information presentation and teaching aid material for the course instructors in presenting the information to these foreign workers needed a suitable design model to function as a guide throughout the software development by preparing a systematic framework to enable the development process be carried out orderly according to the level or phrase arrangement within the involved model design. There are several instructional design model that is usual used in developing computer aided teaching material such as ASSURE, Dick and Reisser, Van Pattern, Leshin, Pollock and Reigeltuh, Dick and Carey, Seels and Glasgow and other models. Nevertheless for this research, ADDIE model is the basic guide for developing the *IM-SmartSAFETY* software.

### **Model ADDIE**

The ADDIE model created by Rosset in 1987 is renown in the education field especially in teaching. There are 5 levels or basic item under ADDIE (as shown in figure 1). A good instructional design model actually has connection and allows link between participant, course instructors, learning material and learning environment (Siew et al., 2001). As is the same with several models that was created and applied, now and before this, where among others they meets the development needs. There are also models that are not suitable to be applied in developing teaching material because there are some models that are difficult to follow in fulfilling the difficult development needs at every stage. Nevertheless, what is important here is the model selected need to be suitable with the concept of the teaching and learning material to be developed.

Based on this research, ADDIE is use to develop the courseware. Selection of this model is based on the level of ADDIE which is easy to follow for every step and element within. This matter is proven based on the research carried out by Janudin (2009) where ADDIE is usually selected because this model is easy to follow, has work design that is not too complex and ready work flow that is systematic in designing teaching and the final product of this model is expected to fulfil and meet the needs of the user. Apart from that, ADDIE is also a model that is complete for every step within it where Janudin also stated that all component of ADDIE is available for all other designed models with the same intend to produce effective teaching material for the participants. The level in ADDIE is able to drive the researcher to develop the software according to the need or priority of action needed to be attended to first in order to produce teaching material that is able to assist the course instructors present the information effectively to the Myanmar foreign workers.

### **2.6 Multimedia Technology as a Presentation Method**

Multimedia is the combination of similar elements as stated by Chaudhuri (1999), such as texts, images, graphics, animations, audios or chats and videos, and Norfarhana et al. (2010), that is texts, graphics, animations, audios or sounds and videos as the elements that are generally involved in a computer presentation. According to Lachs (2006) by using multimedia, texts are not only placed together with pictures and sound but the effectiveness could be enhanced with combination of several other multimedia elements to give a more effective and complete understanding.

Preliminary study that have been implemented shows 54.9% (56) Myanmar foreign worker like the information presented in the form of picture and 82.4% (84) of them is like the information presented in video form. The rest, 26.5% (27) of these workers prefer information presented in the form of pictorial print materials compared to only 18.6% (19) favored the use of printed materials without pictures. The analysis earlier study also showed that only 24.5% (25) of Myanmar foreign worker are like the information presented is continuously in oral form during the course. Therefore based on the contexts of this study, every multimedia element such as texts, graphics, animation, audio and video is combined to produce an information presentation media that is understandable and attracts the interest of the participant in its own way. Unlike any other media, production of this information presentation media (*IM-SmartSAFETY*) is added with bilingual texts to help enhance the Myanmar foreign workers understanding who could read the texts on the screen and also hear the recorded voice in Myanmar language.

Apart from that, matters that are difficult to explain can be presented easily through mixing of several multimedia elements to allow the participants better comprehension. Duan and Song (2009) explained that under the multimedia principle, student can learn better through texts and pictures as compared to only texts. Therefore, with the combination of several multimedia elements such as pictures or animation to these texts can help strengthen the participants understanding of the explanation given.

In this study, interactive elements is also applied in the development of this software that is to prepare an information presentation media that is attractive and has pictures and texts that moves with sound. These interactive elements also enable the course instructors to use interactive links freely to achieve whatever important information needed. Therefore, teaching via multimedia is said to be unique as it has interactive criteria where it really allows the course instructors to obtain information easily according to the needs and ability fixed by the users themselves.

### 3. Conclusion

On the whole, the need for IM-SmartSAFETY software development elements is very important in fulfilling the needs of Myanmar foreign workers as well as to achieve the learning objective during SHIC. There are six important elements rationally applied while developing this software. Firstly, using course content which is the SHIC module in presenting safety information to foreign workers. Second, using two languages where Malay and Myanmar language are used in the software to facilitate course instructors presentation of information during the course. Third, applying the learning theory in the software so that the learning process did not contradict the learning objective and learning could carry on effectively. Fourth, using teaching and learning strategy where the concept of active learning such as the discussion method is used apart from lecture method and exams achievement in the form of quiz within this software. Fifth, using ADDIE model which is a designing model that functions as a guide in developing the software by preparing an organized and systematic framework for the project with the learning concept and produce effective teaching. Sixth, using the multimedia technology in the software as an information presentation method for better understanding and to attract foreign workers' interest towards the information presented during the course.

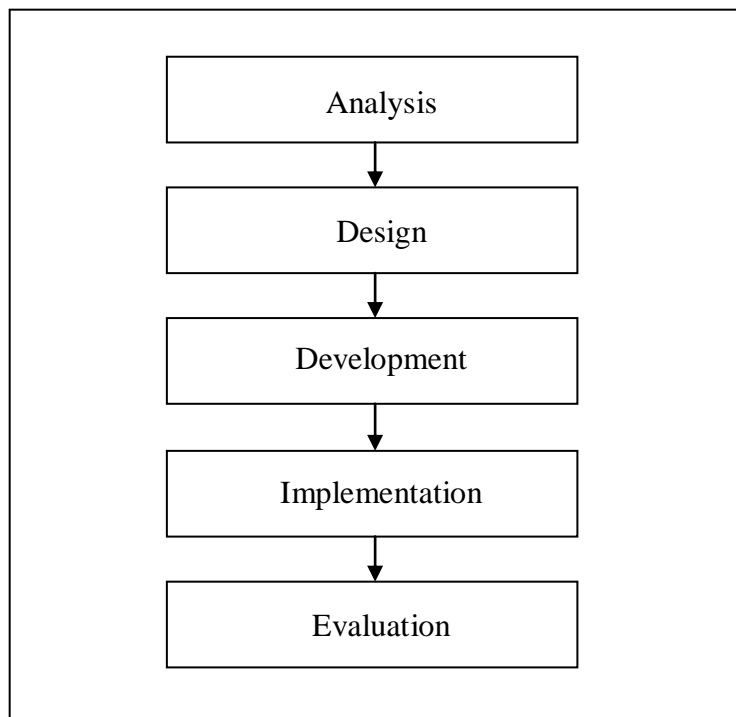


Fig. 1: Model ADDIE



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