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Design of a Mobile Game App in Information System Documentation to Improve ICT Learning of Business Students

Preeti Bharti [1], Md. Rakibul Islam [2], Ronnie D. Caytiles [3]*

Abstract: Information system (IS) documentation education belongs under the topics of information and communications technology (ICT) is considered an important part of business education studies. Business students gain knowledge in this field in order to fully understand the things happening in different business processes, however, most of the time, this topic is often being neglected by students due to their lack of interest. Thus, in order to make this ICT learning more comprehensible, simple, and more enjoyable for business students, this paper proposes that IS documentation education would be integrated into a mobile game application.

Keywords: information system documentation, mobile game, data flow diagram, entity relationship diagram, system flowchart, program flowchart, document flowchart

1. Introduction

Information system (IS) documentation is recommended to be studied by business students [1]. This topic, being related mainly with information and communications technology (ICT) needs to be tailored for business education. That's why Management and Accounting Information System textbooks would serve as a basis for this project.

Documentation is a much-ignored topic by business, management, and accounting students because of the lack of interest in ICT systems. But this topic absolutely is an important part of every stage in the cycle of any business system. Well-written and organized documentation makes the work of future system users at any stage easier.

It has been observed that most students are fund of playing games on their mobile devices. Some of them even have more time playing than studying their school lessons. So an idea of combining learning with playing mobile games was proposed. This can benefit management students studying IS, may they

[1] Multimedia Engineering Department, Hannam University, Daejeon, South Korea
Email: 1112preeti@gmail.com
[2] Multimedia Engineering Department, Hannam University, Daejeon, South Korea
Email: rakibulrocky27@gmail.com
[3]* Multimedia Engineering Department, Hannam University, Daejeon, South Korea
Email: rdcaytiles@hnu.kr (Corresponding Author)

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be in the senior high school level or in college. This topic needs to be absorbed because they themselves will be using this knowledge to be more effective professionals in their field.

Documentation techniques are among the important tools in business that are used to communicate, instruct and record information for any reference or operational purpose. With the help of this, it is very easy to track the flow of the system's progress and its workings can be explained very easily [2]. Process documentation enables the creation of a systematic information structure as the basis in developing the business system flowchart. Flowcharts, being included in IS documentation techniques facilitates effective communication regarding the system. Technical and non-technical users can be able to understand easily the things being indicated in a flowchart. Thus, there is effective communication. These techniques also help in business system troubleshooting and evaluation processes. In different business cycles such as revenue cycle, expenditure cycle, and conversion cycle, IS documentation would help a lot to furthermore understand the business processes. This can help the managers and auditors to better quantify the financial complications of the system, help trace financial recording processes and audit trails.

This paper deals with the design of a mobile app that can be used to improve and motivate business students in learning information system documentation. The game contents include five games dealing with documentation tools such as data flow diagram, entity relationship diagram, document flowchart, system flowchart, and program flowchart. With this mobile game app, it is expected that enhance learning will be achieved and business students will be more enthusiastic in learning information system documentation as part of their curriculum.

The remainder of this paper is organized as follows: Section 2 outlines the review of related literature; Section 3 details the mobile game app contents; the mobile game app structure was highlighted in Section 4; and Section 5 concludes the study.

2. Review of Related Literature

Since students of this generation are fund of playing mobile games, an idea of injecting lessons in the game is proposed specifically in the field of business information systems. Related literature regarding mobile learning and the use of games in learning has been gathered and has furthermore pushed this research proposal to be written.

According to studies conducted by researchers from different organizations, game-based classroom tools that exercise children's working memories can enhance their abstract reasoning and problem-solving skills plus it enhances student's cognitive learning flexibility, which impacts a person's ability to switch between tasks and use multiple concepts and ideas to resolve issues [3-7].

On the other hand, a study conducted by Buchanan, *et al.* [8] has concluded that the use of serious games and interactive exercises can provide a safe and effective practice environment for computer network defenders. Authors have developed several Flash-based, casual games designed to target different levels of learning objectives as defined by Bloom's Taxonomy, for various skills, subject matter knowledge, and tools. Development of the said games must combine subject matter content, instructional design learning objectives, and engaging game design in order to encourage learners to practice and develop their skills [9].

Games that have been proven to improve learning have been attached with the current technology trends to furthermore improve education. A research project in Kenya [10] made a mobile-empowered curriculum delivered through 3G-enabled tablets. The curriculum from textbooks was joined with mobile applications having interactive, engaging, and locally designed content in the form of songs, games, quizzes, and animations to make learning more interactive, interesting, fun, and locally relevant.

Another great idea was the virtual game described and discussed by Parson *et al.* [11]. The game was an augmented reality designed for two players where the narrative action follows a classic linear fiction model. Authors have proven to provide an effective mobile game design for engagement and learning. The game's phases move through teaser, elaboration, conflict escalation, climax, and resolution.

Education game expert, Aldrich [12] stated that online games and simulations help in online learning. Infusing games, simulations, and virtual worlds in online learning can make a transforming experience not only for the student but also for the instructor. His written practical guide provides knowledge on how to identify opportunities for building games, simulations, and virtual environments into the curriculum.

At a professional level of education, mobile learning with game simulations has been proposed to be offered in executive education [13]. The report demonstrated that there is much opportunity for extending learning on executive education programs, and has provided some practical examples on how executive education providers may develop their expertise and practice in this exciting field.

3. Mobile Game App Content

Since this game will be designed for business students, content such as symbols terminologies and descriptions shall be derived from management and accounting information system textbooks [14-16]. Information System Documentation tools include data flow diagram, entity relationship diagram, document flowchart, system flowchart, and program flowchart. In practice, there is not much difference between document and system flowcharts [16], but in this paper, they are separated in order to show distinctions.

3.1 Data Flow Diagram

The data flow diagram shows the logical flow of data through a transaction processing system of an organization. They use symbols to represent the processes, data sources, data flows, and entities in a system. They do not represent the physical system. Primarily, they are used in the systems development process as a tool for analyzing an existing system [15].

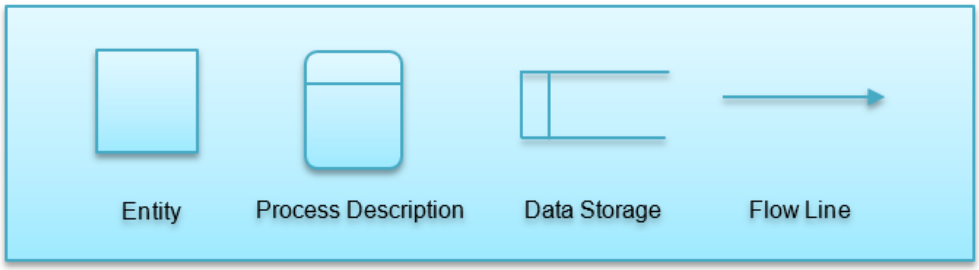

Figure 1. Common Symbols Used in Data Flow Diagram

Figure 1 shows the data flow diagram symbols to be incorporated in this game app. In business, the first image refers to an entity, may it be an external data source or a data destination. The second image is the symbol where information about a certain process is indicated. The third image represents data storage which is usually a file. In some books, this may also be represented by two parallel horizontal lines. The last symbol indicates the direction of data flow.

3.2 Entity Relationship Diagram

Entity Relationship (ER) diagram is a documentation technique that is used to represent the relationship between the entities in a system. In business, Resources Events and Agents (REA) is the model version that is widely used. Resources include things such as automobiles, cash, or inventory. Common business-related events are ordering inventory, receiving cash, and shipping goods. The agents are the salesperson, customer, or vendor. ER diagram is most frequently used to model an organization's database [15].

Figure 2. Commonly Used Symbols in ER Diagram

Figure 2 shows the most commonly used symbols in making ER diagrams. Since this is a diagram showing relationships, an entity is always being joined with another entity. Relationships may either signify places, supply, or assigned. This is written at the center part the line. On the other hand, cardinalities represent the numerical mapping between the entities. It can either be *1-to-1*, *1-to-Many or vice versa*, and *Many-to-Many*. The cardinality symbol is placed at both ends of the connectors.

3.3 Document Flowchart

A document flowchart denotes the documents and information flows between areas of responsibility (e.g., departments) within an organization. This shows how documents travel from different departments and is essentially utilized in analyzing the adequacy of control procedures. Flowcharts that describe and evaluate internal controls are often referred to as internal control flowcharts [16].

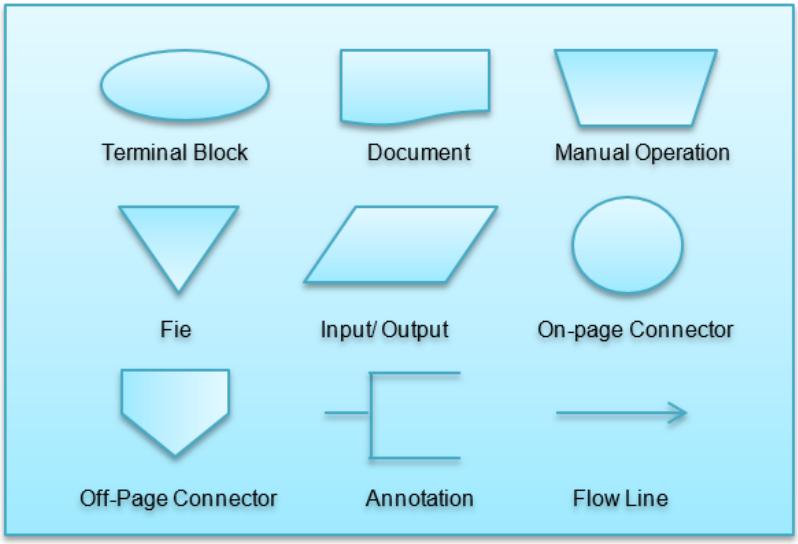

Figure 3. Commonly Used Symbols in Document Flowcharts

Figure 3 shows the different symbols which are being used in making a document flowchart. A terminal block is the one showing the source or destination of documents and reports. In business-related document flowcharts, this usually signifies a customer. The document symbol signifies the documents

which are introduced in the process or created by the process. Samples of these documents in business are purchase requisitions, sales orders, receipts, and reports. The manual operation symbol represents activities such as picking goods from the supplier, arranging then packing the goods, and delivering goods to the customers. The file is used for storing source documents and reports. In business, the input or output symbol is usually referred to as the accounting records such as journals, logs, registers, and ledgers. An on-page connector is the one that continues a flow on the same page while the off-page means that the flow continues to another page. It is often indicated with a reference to the page to which it continues. The annotation may contain a description of the process or flow. The last symbol on the lower right side signifies the direction in which the document flows.

3.4 System Flowchart

A System flowchart depicts the relationship between the key elements, input sources, programs, and output products of the information system. This begins by identifying both the inputs that enter the system and their origins. The input is then followed by the processing portion of the flowchart. It also depicts the type of media being used, may it be paper, magnetic tape, magnetic disk, or a terminal. The resulting new information is the output component. A system flowchart is an important tool of system analysis, design, and evaluation [14].

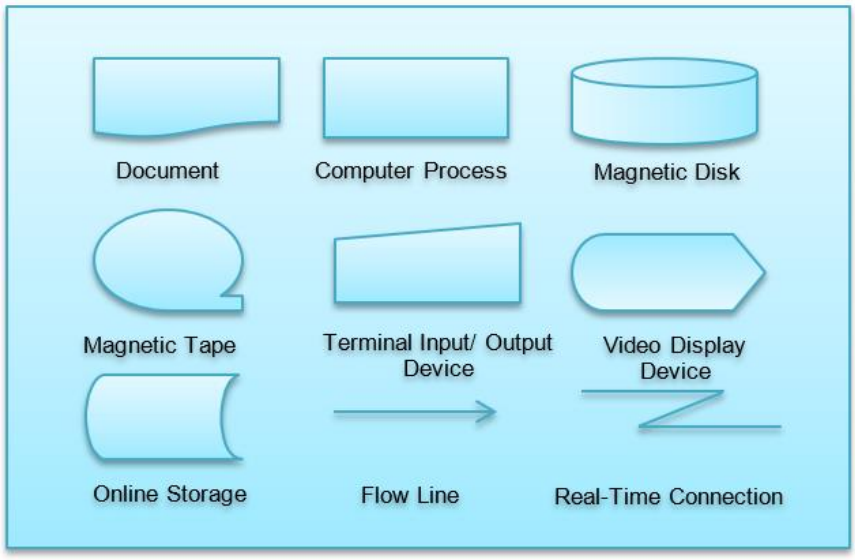

Figure 4. Commonly Used Symbols in System Flowcharts

Figure 4 shows the commonly used symbols in constructing a system flowchart. The document symbol was already discussed earlier. Now the second one is the computer process, which involves running a program. Storage devices also have different symbols such as magnetic disks, magnetic tape, and online storage. The flow line this time indicates a process flow. The zig-zag line indicates real-time connection or commonly known as the online connection.

3.5 Program Flowchart

A program flowchart provides the description of the specific logic in performing a process indicated on a systems flowchart. The flow line symbol acts as the connector for all the symbols and indicates the operational sequence. The processing symbol represents a data movement or arithmetic calculation [15]. Usually, organizations use structured programming techniques in order to create large computer programs in a hierarchical fashion. A program flowchart outlines the processing logic for each part of a computer program and indicates the order in which processing steps take place [14].

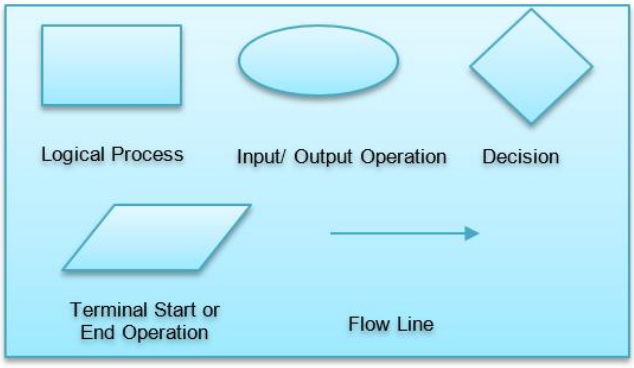

Figure 5. Commonly Used Symbols in Program Flowcharts

Figure 5 shows the common program flowcharting symbols being used by business students. The rectangular shape is the logical process being undergone while the oblong this time symbolizes the input or output of the operation. The parallelogram figure is the one that indicates the start or end of the operation. The flow line symbolizes the flow of logical processes. The decision symbol is the distinct figure of the program flowchart.

4. Mobile Game Application Structure

The game application will consist of five different game types, each having different levels. Lesson discussions and additional information can be integrated into this app by putting the lesson after each level. Students are given the freedom of studying them or not. Simply playing the game would help them be familiarized and be connected with the lesson. After finishing each level, the student can be able to earn a game badge. This can be introduced in class and serve as a classroom activity or just an additional educational tool for self-studying.

4.1 Game 1

The game is called a symbol crush which consists of 10 levels. It uses different types of shapes used in Information System Documentation as shown in Figure 6. Players must match at least three similar shapes vertically, horizontally, or mixed forming a T-shape. Every time shapes match they pop and the name of that symbol flashes. This contributes to the learning of students. With or without any background, they will further learn and be familiarized with the different IS symbols. After then, it adds to the player's score. In order to proceed to the next level, the required score should be met. Players may unlock Game 2 after finishing level 5 of Game 1.

Figure 6. Symbol Crush

4.2 Game 2

The second game is a Quiz Game. A short game that employs a recall of the names of different flowcharting symbols which has been learned in Game 1 and additional learning from the lessons. In the game, the symbol will be flashed on the screen as shown in Figure 7. The student will then be expected to type or supply the acceptable name/names of the symbol within 15 seconds. In order to pass the level, students must be able to answer 10 random items without any mistake. When a mistake is committed, the screen will automatically indicate that your answer is wrong and show a list of acceptable answers. The level will then restart. Finishing this game will unlock Games 3 and 4.

Figure 7. Quiz Game

4.3 Game 3

This new game is called Symbol Classification. This game aims to improve the flowcharting knowledge of business students through the classification, association, or categorization of symbols based on the type of documentation technique it can be found. To put this into the game, there will be randomly falling symbols, words, or groups of words. The player must guide the objects by dragging them towards the block where it is associated. Block 1 for symbols belonging to the data flow diagram, Block 2 for ER diagram, Block 3 for document flowchart, Block 4 for system flowchart, and Block 5 for program flowchart as shown in Figure 8. The block will accept the symbol as long as it is included in the acceptable symbols of the documentation technique. To add difficulty, symbols will drop faster as time passes by.

Figure 8. Symbol Classification Game

This game measures how fast the student can classify the symbols and concepts. A single mistake will make the game level repeat. This just records the highest score but players can earn a badge after lasting for a minimum of 3 minutes.

4.4 Game 4

This game is called Four Pics One Term. This game contains a set of pictures depicting 100 different terms in Business and Management and Accounting Information System. This game would help learners dig through different terms in the subject. After answering every item, additional information pops out. Students can unlock the final game after reaching the 20th item.

Figure 9. Four Pics One Term

4.5 Game 5

Now that the learners have already mastered the different types of symbols and terminologies in different documentation methods in management and accounting IS. It's time to apply this knowledge in different business-related situations. This game is called the IS Documentation Game as shown in Figure 10. There are 100 written situations programmed in order to help students master IS documentation. The type of documentation technique to be used will be indicated. The learner will then construct a flowchart based on the situation. Flowcharting symbols will be provided and situations are based on different business transaction cycles such as Revenue Cycle, Expenditure Cycle, and Conversion Cycle. The game will start with easy situations and later on, show a complex problem.

Figure 10. IS Documentation Game

5. Conclusion and Future Works

Mobile game applications can help in the improvement of instruction as well as the learning process. This can help create conducive and interactive environment for learning. This paper has presented an interactive mobile game app that could enable an effective and enjoyable learning environment for business students in learning IS documentation that includes data flow diagrams, entity relationship diagrams, document flowcharts, system flowcharts, and program flowcharts.

In the future, analysis on making sure that majority or most of the students find these apps educational and enjoying will be presented. Some additional factors must be furthermore studied most especially with the personalization of education for a more effective learning.

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