Developing Fast Training Resource from Demonstration

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Abstract: - The purpose of this study was to identify the procedure and feasibility of developing fast training resources from demonstration. Technology is growing and updating information quickly, people need to constantly update their knowledge and empowerment. For industry competition, the employees require to enhance the skills on their job. There is a need to develop fast training resources. In a short time frame, Preparing and disseminating relevant and timely information and instruction to the right people has become the main challenge for most human resource departments. Traditional instructional design and development processes often require months or even years, and involves a big budget. This resulted in the emergence of a faster, cheaper and more effective solution for developing e-learning resource. Computer operating for accomplishing jobs had become a major characteristic in this information age. It is necessary to figure out a way of e-learning developing based upon computer operating demonstration. In this study, a general procedure of demonstration based fast training resource development was verified and concluded.

Key-Words: Demonstration Based e-learning Resource, Fast Training Resource Development, Technology in Human Resource Development

1 Introduction

Today's industry or business needs change very often. Information used on the job also possesses very short shelf-life. Technology education in training and learning has become vital in the chase to meet and address the changes in the human resource development process.

Most of the students after graduating from secondary school are forced to look for a job to support family and themselves. The same time studies, which are compatible with work, are becoming more popular and consequently also increasing interest in e-learning[1].

E-learning development is very closely linked to technological development. As technologies and their functionality grows, course creators must continuously work at e-learning material development and quickly respond to changes [1].

There were some possible barriers and enablers to e-learning use in further education. These included that providing sufficient support for lecturers, particularly in terms of providing enough time for them to develop and embed their use of e-learning in their everyday teaching practice [2].

Professional who develop training courses know that during the challenging developmental phase of the five-part Instructional System Design- Analysis, Design, Development, Implementation, and Evaluation- the actual learning materials are created[3]. The development phase is at the very heart of building a successful training program. It was also known that creating learning materials can be an extremely time-consuming process [4-6].

Institutions are in a battle to meet ever-changing market needs, client and customer demands, and internal and external pressures [7-9]. This requires a clear, concise, and documented strategy for improvement of employee performance. Managing and improving the performance of employees and supporting staff is a journey rather than a destination, and, requires careful thought, allocation of resources, executive support[10]. This change toward the acquisition and management of learning and performance using sophisticated technology presents a tremendous challenge in today's business, education, and government environments [11, 12]. It represents a necessary paradigm shift to adequately prepare eLearning resource for the constantly changing working environment. Simply put, while information and data could be moved faster, achieving true success could only be claimed after accurately targeting and disseminating information to the correct audience at the right time and in the right amount and format for performance improvement.

Demonstration is a teaching method in which explanations are given by example or experiment. Learning from demonstration is an important teaching method in technology education. It is also known as "programming by demonstration", "imitation learning, and "teaching by showing" received significant attention over the last 50 years [13]. The goal of demonstration teaching method is to replace the time-consuming manual programming with direct showing task by an expert. The expert's demonstration was segmented into primitive assembly actions and spatial relationships between manipulator and environment, and subsequently submitted to symbolic reasoning processes. In the context of human skill learning, teaching by showing was investigated for a complex manipulation task to be learned by an anthropomorphic robot arm [13]. In today's technological rich environment, major work tasks are always related to or based on computer operating.

There is a need to figure out a way to create e-learning resource based upon expert's demonstration of complex manipulation task. The purpose of this study was to identify the procedure and feasibility of creating e-learning resource based upon computer operating demonstration.

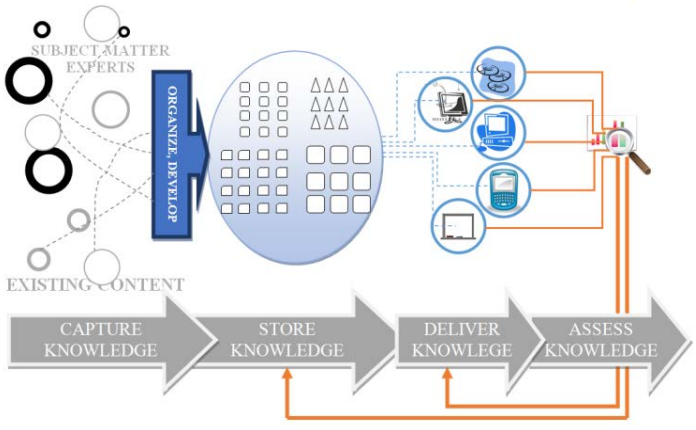

Fig.1 A Conceptual Model of eLearning System

2 Problem Formulation

Technology is an integral part of our social structure. This structure can be defined in part by its use of technology which transforms the environment, ideologies, and its sociological elements. It is this interaction, that is, the dependence of humans on technical means for survival that warrants the study of technology by all people.

Technology education is a important course to host learners with the opportunity of adopting technology to gain innovation. Based upon the recognition of problem solving, technology resource and technology process, learning experience could provide a profound foundation of preparing behavior in using technology [14].

One of the goals of technology education is to teach students about the processes and content knowledge pertaining to technology and to equip them with the necessary skills to solve problems through manipulating materials and tools to meet their needs in ways that will be of benefit to society [15].

2.1 Technology and Technology Education

Technology is human innovation in action[16]. It involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities. As such, technology has a process, knowledge, and context base that is definable and universal.

The processes are those actions that people undertake to create, invent, design, transform, produce, control, maintain, and use products or systems. Technological knowledge includes much of the knowledge of how the technological processes are developed, applied, and used. The context of technology involves the many practical reasons why it is developed, applied, and studied.

The processes include the human activities of designing and developing technological systems; determining and controlling the behavior of technological systems; utilizing technological systems; and assessing the impacts and consequences of technological systems. Technological knowledge includes the nature and evolution of technology; linkages based on impacts, consequences, resources, and other fields; and technological concepts and principles. The systems that are developed can easily be categorized as informational systems, physical systems, and biological systems.

People develop technological processes and knowledge for a reason—they want to develop and use systems that solve problems and extend their capabilities[14].

Technology education is a subject of studying technology in which learners could learn about the context, process, and knowledge related to technology [16]. Technology education is a subject area of common education and provides learner the opportunity of understanding technology.

The Technological Method Model provides a framework for teaching technology. In the Model for Technology Education, students will identify problems or opportunities utilizing the problem solving method, selecting the appropriate resources and employing technological processes to produce outcomes for which they will assess the consequences.

In effect, to teach technology, students must "do" technology which translates into involving students in each element in the Model for Technology Education and in the interactive nature of the Model[14].

2.2 eLearning

Today's industry or business needs change very often. Information used on the job also possesses very short shelf-life. Technology education in training and learning has become vital in the chase to meet and address the changes in the human resource development process. People need to acquire the information and knowledge in time so that they can perform and align their goals and plans with their professional job needs. Preparing and disseminating relevant and timely information and instruction to the right people in a short time frame has become the main challenge for most human resource departments. Traditional e-learning might not be the best solution as it generally involves quite a long development cycle and a big budget. Traditional instructional design and development processes often require months, or even years.

2.2.1 eLearning System

An eLearning system should have the input, output, and measures of the system, and references of organization, department, business unit, and individual. To achieve this goal, three key components should be utilized.

1. Capture and creation of data, information and knowledge assets in support of each individual's performance functions across the organization.
2. Intelligent storage, leveraging useful taxonomies, and search and retrieve capability

that better manages and improves access to content.

3. Dissemination and access practices, including but not limited to: e-Learning, instructor-led training, documentation, mentoring and coaching, and outside sources.

A conceptual model of eLearning is shown in Figure. 1. A complete system for managing information has been out of reach for many organizations, due in large part to the lack of a comprehensive strategy. The measures of any system for knowledge and learning should include the accuracy, specificity, and timely delivery of the knowledge the user receives, and how effective that knowledge is in changing behaviors and improving performance [17].

2.2.2 Design & Develop eLearning resources

There are four elements of designing eLearning resources [18-20]:

1. Determine the scope and research the eLearning resource.
2. Design the eLearning resource
3. Develop the eLearning resource
4. Review, trial and evaluate the eLearning process

In the first element, several things should be done.

- Clarify the brief and focus for the e-resource with the client
- Research the likely target audience for the e-resource, their characteristics and learning needs
- Read, interpret and analyze existing relevant information to determine the learning content for an e-learning resource
- Determine the suitability of an e-learning resource for the likely target audience
- Identify any ethical and legal considerations
- Document findings of the research

For designing the eLearning resource, five criteria should be met.

- Use knowledge and experience in learning theory and instructional design to create the design for the eLearning resource.
- Consider resources, materials and technical requirements needed for development of the eLearning resource based on the design.
- Present and discuss the design with the client and obtain further feedback of the eLearning resource.
- Incorporate feedback and address any additional issues in the design.
- Confirm with client the design to be developed into the eLearning resource.

For developing the training resources, there are six performance criteria should be met.

- Identify the relevant people to collaborate with on the development of the training resources.
- Determine the timelines and resource issues for the production of the training resources

Consult and use relevant technical guidelines and requirements.

- Address any identified legal or ethical obligations or issues that arise in the development of the training resources.
- Develop content and technical framework of the training resources, and address any issues as they arise with relevant persons.
- Document the development of the training resources.

For reviewing, trialing and evaluate the eLearning process, six steps could be conducted.

- Review the training resources against the client brief, likely target audience and learning needs
- Plan for trial of training resources with potential users
- Trial the resource with appropriate recording of outcomes and feedback
- Analyze outcomes and feedback of the trial
- Make adjustments to finalize the training resources
- Discuss and reflect on production of the e-learning resource

2.3 eLearning Development Cycle

To deliver an e-learning, virtual reality or multimedia solution that achieves its goals to a high standard with a minimum of fuss, Rosen [21] suggested that there are five stages in the development cycle. Those are analysing, designing, developing, delivering, and tracking. This process can take anywhere from 220-2,500 man hours to complete, requiring upwards of 4 developers to create the material within months.

Fig.2 eLearning development cycle

The cycle is shown in Figure 2. It is an effective method for creating training resources for human resource development. There is high demand for speed to market. As you can see from the chart above, this isn't a realistic goal for the traditional eLearning development process.

There is a need to find a timing way to prepare eLearning resource. The purpose of this study was to identify the procedure and feasibility of creating training resources based upon computer operating demonstration. Today's industry or business needs change very often. Information used on the job also possesses very short shelf-life. Technology education in training and learning has become vital in the chase to meet and address the changes in the human resource development process. People need to acquire the information and knowledge in time so that they can perform and align their goals and plans with their professional job needs

Table 1 General eLearning Development Time Consumed

eLearning development stages	**Time Consumed**
Analyze	$T_{analyze}$
Design	$T_{design} = T_{expert} + T_{developer}$
Develop	$T_{develop}$
Deliver	T_{IT}
Track	T_{track}
Overall Time	$T_{analyze} + T_{expert} + T_{developer} + T_{develop} + T_{IT} + T_{track}$

3 Problem Solution

3.1 Methodology

Methodology would be presented in the following session. It would include information of research problem & limitation, Procedure creating, and Evaluation.

3.1.1 Research Problem & Limitation

The problem of this study was that what a procedure of creating training resources based upon computer operating demonstration is. The purpose of this study was to identify the procedure and feasibility of creating training resources based upon computer operating demonstration.

For achieving the study goals, this study would focus on only those computer operating learning tasks. Computer operating learning task could be single production software, or a special customized system, or a complex information operation. Examples are listed in the followings:

Production software: AutoCAD, Access, Excel, Word…….

Customized System: Company Information System, Online Information Service…..

Complex Information Operation: A task requires multiple production software and/or customized system operating.

3.1.2 Procedure creating

A prototyping method was applied to conduct procedure creating training resources in this study. Following the prototyping method, basic requirement identification, developing the initial prototype, review of the prototype, and revise and

enhance the prototype would be conducted for creating procedure for this study.

3.1.3 Evaluation

A feasibility study was conducted for the proposed procedure. Operational feasibility would be considered for this evaluation section. Operational feasibility is a measure of how well a proposed system solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development.

The operational feasibility assessment focuses on the degree to which the proposed development procedure fits in with the existing educational/training environment and objectives with regard to development time consuming, outputs, and existing tools availability. Specifically, hypotheses were set as following:

- Following the proposed procedure, the time consumed for creating training resources would become shorter.
- Following the proposed procedure, those created resources would support eLearning.
- There are obtainable tools supporting the procedure to creating training resources.

3.2 Findings

In this session, findings would be reported according to methodology. First, the proposed procedure was reported. Second, resource creating time evaluation would be reported. Third, feasibility of procedure output in each step was reported. At last, tool availability verification was reported.

3.2.1 Procedure

There are three steps in the proposed procedure. The procedure is started with the expert's demonstration. The second step in the procedure is Meta-editing. The third step is resource publishing. All three steps are listed in the Figure 3.

No matter a brand new computer operating or a certain task operating, experts would always start with their own demonstration planning. At this time, learner could directly observing how the operation could be done and the computer screen could be captured simultaneously. Demonstrator's narrative information could be recorded into audio track of the captured video. The outcome of this first step could be an operating demonstrating video with narrative information. Another major contribution in this step would be demonstration directly delivered to learners. There are two tasks in this step. They are listed in followings:

- Identifying tasks and flows
- Demonstrating the operation

There are three subtasks in the demonstrating task. With learners, they could be done at the same time as a synchronous learning situation. With learners on side, demonstration would be solely applied for training resources creation. Those are listed in followings:

1) Directly showing to learners
2) Capturing computer screen of detail operating pictures
3) Recording demonstrator's narrative information of demonstration into the sound track of video

The production of the first step is a demonstration video with audio narration about operating details.

Fig.3 Proposed Procedure for Developing training resources based upon Demonstration

At the second step, recorded video could be further edited by demonstrators according to their meta-knowledge of the operating demonstration in the first step. Several tasks could be done in this step. Those tasks are listed in followings:

- Add navigational tags for visual enhancement
- Turn audio narrative information into note for visual reference
- Add detail explanation with the reason, sequence, progression, succession, and results to each operating move.
- Add Quiz for formative evaluation
- Covert texts in notes into audio for enhancing audio narration.

In this second step, meta-knowledge of the demonstrator could be joined into the digitizing raw data in the form of picture, video, audio, and text. The specific functions are listed in the followings:

- Visual navigation
- Audio navigation
- Interaction learning activity for the learner
- Visual explaining information
- Scripts of operations in the demonstration

The productions of the second steps are the original video of demonstration and that meta-knowledge information in digital format carrying visual navigation, audio navigation, quiz, explain, and demonstration scripts.

In the third step, raw materials could be compiled into three types of training. Those are demonstration movie, training movie, and evaluation movie. For each type, their functions are listed in the followings:

1) **Demonstration Movie:**

- Demonstration with all the meta-information

2) **Training Movie:**

- Navigating learner to go through the operating path, clicking, and keyboard input.
- Following the navigation, one correct operation drive the movie play to the next operation start point.

3) **Evaluation Movie:**

- Without navigating information, allow learner solo play the whole operation.
- No navigation could be followed. One correct operation drive the movie play to the next operation start point.

3.2.2 Resource Creating Time Evaluation

For exploring the operational feasibility in the focus of time, an evaluation process would be conducted in this session. In Table 2, time consumed for the proposed procedure and for a general procedure are listed according to eLearning development stages, analyze, design, develop, deliver, and overall time.

Table 2 Resource creating Time Evaluation

eLearning development stages	Time Consumed for the proposed procedure	Time Consumed for a general procedure
Analyze	0	$T_{analyze}$
Design	$T_{design} = T_{expert}$	$T_{design} = T_{expert} + T_{developer}$
Develop	0	$T_{develop}$
Deliver	0	T_{IT}
Overall Time	T_{expert}	$T_{analyze} + T_{expert} + T_{developer} + T_{develop} + T_{IT}$

The overall time of the proposed procedure is reduced to only expert design time. Based upon this situation, it is concluded that following the proposed procedure, the time consumed for creating eLearning resources would become shorter than a general procedure.

3.2.3 Procedure Output Evaluation

For exploring the operational feasibility in the focus of output, an evaluation process would be conducted

in this session. The output of each step would be summarized for evaluation. In TABLE III, the evidence of feasibility for output in each step is presented.

Table 3 Procedure output feasible for demonstration learning

Step	Output	Feasibility Evidence
Demonstration	Direct demonstration for learners Video of captured computer screen and audio narration for demonstration	Learners could fully observe expert's demonstration.
Meta-Editing	Meta-knowledge of navigational tags, audio narrative information, detail explanation of each operating move, quiz in the format of text, audio, picture and video	Provide a learning environment with visual and audio navigational information. Procedural knowledge are presented for each operating move.
Resource Publishing	Demonstration movie Training movie Evaluation movie	Three functional opportunities are supported for learning from demonstration

According to the evidence revealed in Table 3, it was concluded that following the proposed procedure, those created resources would support training.

3.2.4 Tool Availability

According to the evidence discovered in Table 4, it was concluded that there are obtainable tools supporting the procedure to creating training resources.

Table 4 Tool availbility of each step

Step	Function Required	Example Software	Feasibility Evidence
Demonstration	Computer screen captured during demonstration	Kidlogger: http://kidlogger.en.softonic.com/ Actual Keylogger: https://www.actualkeylogger.com/download.html	By applying existed tool, the required function could be fulfilled.
Meta-Editing	Video overlay with text Video annotation Text to speech Video caption editing Quiz creating	Adobe Premier Anvil: http://www.anvil-software.org/ Text to mp3: CaptionsMaker: http://captionsmaker.com/IQ-MP3:http://www.iq-t.com/en/PRODUCTS/iqmp3_01.asp	By applying existed tool accordingly, the required functions could be fulfilled.
Resource Publishing	Demonstration movie Training movie Evaluation movie	Adobe Captivate: http://www.adobe.com/tw/products/captivate.html, Articulate: https://www.articulate.com , Camtasia: http://www.techsmith.com/camtasia.html; easygenerator: http://www.easygenerator.com/; iSpring Solutions: http://www.ispringsolutions.com/; Lectora: http://lectora.com/; Udutu: http://www.udutu.com/	Three functional packaging techniques are supported for from existed software.

4 Conclusion

The problem of this study was that what a procedure of developing fast training resources based upon computer operating demonstration is. Today's industry or business needs change very often. Information used on the job also possesses very short shelf-life. Technology education in training and learning has become vital in the chase to meet and address the changes in the human resource development process. People need to acquire the information and knowledge in time so that they can perform and align their goals and plans with their professional job needs. Preparing and

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The purpose of this study was to identify the procedure and feasibility of developing fast training resources based upon computer operating demonstration. For achieving the study goals, this study would focus on only those computer operating learning tasks. Computer operating learning task could be single production software, or a special customized system, or a complex information operation.

A prototyping method was applied to conduct procedure creating eLearning resource in this study. Following the prototyping method, basic requirement identification, developing the initial prototype, review of the prototype, and revise and enhance the prototype would be conducted for creating procedure for this study. A prototyping method was applied to conduct procedure creating eLearning resource in this study. Following the prototyping method, basic requirement identification, developing the initial prototype, review of the prototype, and revise and enhance the prototype would be conducted for creating procedure for this study.

A proposed procedure was proposed and verified with operational feasibility. It was concluded that the proposed procedure is feasible for developing fast training resources. In Figure 4., the procedure conceptual framework is presented. Based upon Demonstration and Meta-Editing, training resources could be created. According to the findings, the procedure is feasible in time consumed, output fit, and tool availability for developing fast training resources based on demonstration.

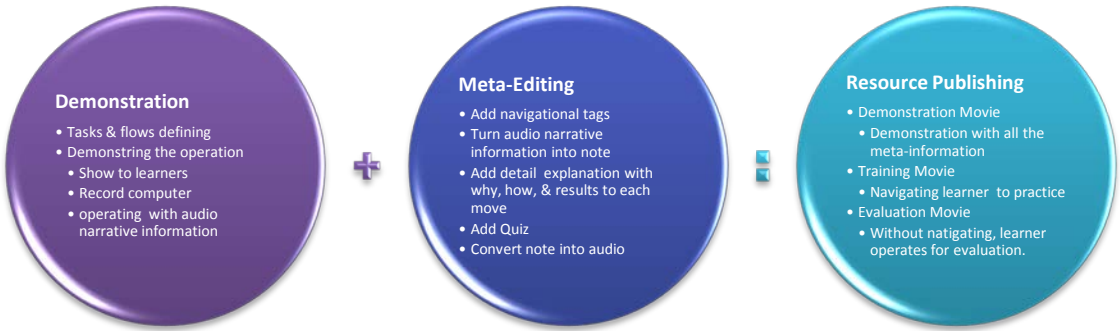

Fig.4 Conceptual framework of demonstration based training resource development

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