

A Digital Storytelling Process Guide for Designers

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Abstract—Digital Storytelling (DST) is a method of delivering information to the audience using narrative and digital media contents that are infused with the multimedia elements. In order for the educators cum the designers to create a compelling digital story, experts have proposed a number of phases. Nevertheless, some of these suggested phases contain redundant processes. Therefore, the main aim of this study is to eliminate the redundancy and propose a single DST guide for the designers. A comparative analysis was employed where ten DST models from various experts were analysed. The proposed guide was then distributed to 70 respondents in an Institute of Teacher Education (ITE). Data were analysed to determine the relationships between factors such as perceived usefulness, perceived of use, perceived ease of understanding and interaction of tablet with the overall quality of the DST process. The correlation analysis indicates that higher scores of the factors are associated with higher score of the overall quality of the DST process.

Index Terms—Digital Storytelling; Narrative; DST Process.

I. INTRODUCTION

Storytelling is a method for delivering information to the audience. It is popular among educators due to its easy and fast method, which promotes students' involvement [18]. The transition from the traditional storytelling to Digital Storytelling (DST) was introduced by the late Dana Atchley (digital story pioneer) in collaboration with Joe Lambert in augmenting multimedia technology into the traditional story [10]. Based on the combination of text, graphics (sketches), and audio (musical instruments), the narrative is delivered in an easy and memorable way to foster communication, collaboration, and creativity skills [3,7,23,26]. Therefore, the role of educator becomes more effective by infusing technology into the education curriculum [25]. In addition, the emergence of DST in the education curriculum will ease the process of DST creation for low-cost tools [12,13]. DST is employed in all subjects in education whether in the form of instructional media (courseware) or presentation. It is also a medium of instruction in primary schools, secondary, and higher education [8]. The next section introduces a little background of DST and its benefits in the creation of multimedia materials. This is followed by problem background regarding the diverse experts' views of DST processes. The analysis of the data retrieved using comparison of diverse experts and validation using an expert review were further discussed. A statistical analysis on data collection in terms of quality of the process ends the section on findings of the study. The last section concludes and summarizes the study conducted.

II. BACKGROUND OF STUDY

With the combination of storytelling and multimedia elements such as graphics, text, audio, video, narration, and music, DST presents interesting information for specific topics [23]. The digital narrative should be delivered effectively and infused with multimedia elements namely as the narrative-generated videos with images, music or sounds and animations [11, 19]. Thus, the diversely different opinions of experts on DST have led to various forms of stories produced. Precisely, DST is further classified into three categories according to its content: (i) personal narratives, (ii) stories that examine historical events, and (iii) stories that are primarily used to inform or instruct [6, 29]. This study focuses on the narrative to inform or instruct stories as it involves the creation of multimedia learning materials. The application of multimedia technology in learning resources is practically usable for educators because it could solve problems of self-learning and different levels of students' knowledge [17]. Teaching and learning strategy has a positive impact on improving the quality of students' achievement and knowledge with the diversity of the learning resources [28]. This can be accomplished by implementing an innovative strategy through the process of multimedia material creation. In principle, the process of the multimedia material creation comprises of three phases: preproduction, production, and postproduction. However, [21] claimed that there was four phases in DST process, namely preproduction, production, postproduction, and distribution as depicted in Figure 1. Most of the steps in each phase of the multimedia creation process are similar with DST except for the varied description. In order for the educators (i.e the designers) to create a compelling digital story, there are sets of processes introduced by experts. Nevertheless, the experts suggest varieties of processes to guide them; of which some are redundant.

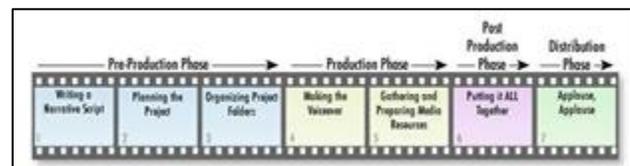


Figure 1: Process of DST by [21]

There are sets of processes introduced by experts to guide designers during the creation of DST. Mostly DST processes involve the distribution phase because the story creation aims to make reflection and share stories [4, 11, 16, 19, 21, 23]. Some

experts in turn preserved the three-phase DST process: preproduction, production, and postproduction including steps such as creating story ideas, creating scripts, collecting media materials, importing and editing media (voice, audio, and images)[1,9,14]. Only a few experts did not include creating storyboards as a crucial step as illustrating story occurs during the creation of storyboards. [20] concluded more detailed steps which involved technical aspects, media and communication integration. Therefore, this study proposes a comprehensive process by complementing the technical aspects and narration content so that it can be easily followed by the designers. Conflicting views which arise between experts on the creation of DST lead to the requirement of a single guide of DST process. In accordance, the main aim of this study is to propose a single guide process in the creation of DST. A comparative analysis was employed where ten DST models from various experts were analysed. The quality of the process is then evaluated by a set questionnaire to indicate the relationship of various factors.

III. METHODOLOGY

In proposing the desired process, this study is implemented in three phases as shown in Figure 2. In the first phase, a total of ten DST models are identified and used as basis to attain the generic steps in the creation of DST. Content analysis is to justify and identify generic steps, which can be concluded in the new process. While in the second phase, a comparative analysis is to seek the commonalities of the processes by comparing the views from diverse experts. An expert view is conducted in order to validate and review the proposed process. Finally, the third phase is the implementation of the process by designers, with the aim of creating DST. The quality of the process is then evaluated using a set of questionnaire. The following are the activities employed for the development of DST process.

A. Comparative Study

A comparative analysis is employed to produce a new comprehensive DST process. As reference, a study by [21] which is the precursor of DST process is mapped to other samples in order to produce a single guide process. There are four major phases in the DST process as discussed in the previous section. The first phase is preproduction where the process of planning story idea is initiated. Steps of the phase include preparing for the plan of script narration and production materials (create storyboard). The second phase is production,

which involves transforming story ideas into digital media materials as planned in the storyboard. The third phase is postproduction, which involves the final creation of DST and final editing of multimedia elements (audio, video, and images). The final phase is distribution where the process of sharing stories with the audience via web or digital media (CD). Reflection and comments are made from a vast audience. Next, the comparative study aimsto identify the generic steps that are suitable in the creation of DST, as presented in Table 1. The samples are identified and compared by grouping the samples into four major phases and mapped to phases suggested by [21]. There are eleven essential steps identified in the process for DST creation. Based on the indicator and condition specified in Table 2, all of the steps are included in the DST process because they have a score of more than 5 [2]. Therefore, the study decided to sustain all the steps into four major phases of the DST process. The preproduction phase consists of creating ideas in a story form, writing a script, creating a storyboard, and listing of media materials (images, video, and audio). In the production phase, the steps are recording voice, collecting media materials, and editing media materials. The postproduction phase includes assembling all materials and publishing materials. Meanwhile, for the distribution phase, reflection and previewing story are made by distributing and sharing the story through CD or web.

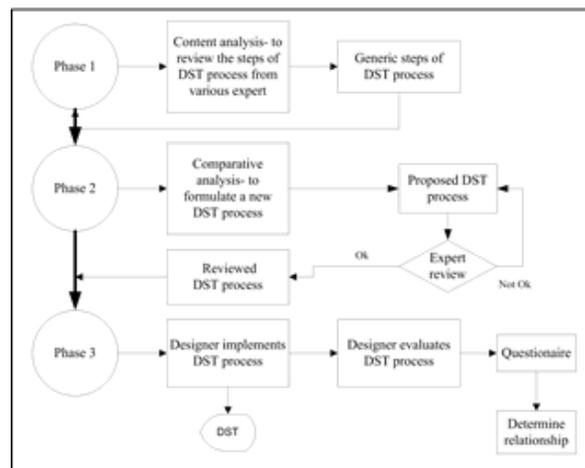


Figure 2: Summary of Method

Table 1
Comparative Analysis of the DST Process from Various Experts

Phase	Expert/Steps	[21]	[24]	[20]	[16]	[11]	[15]	[4]	[3]	[1]	[22]	Score
Pre-production	Create story ideas	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	9
	Write a script	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
	Create a storyboard	✓	✓	✓	✓	×	✓	×	×	×	✓	7
	List of media	✓	✓	✓	×	×	✓	×	×	✓	✓	6
Production	Record voice	✓	✓	✓	×	×	×	✓	✓	✓	✓	8
	Collect media materials	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	9
	Edit media materials	✓	✓	✓	×	✓	×	✓	✓	✓	✓	8
Post-production	Assemble all materials	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
	Publish materials	✓	✓	✓	×	×	×	✓	×	×	✓	5
Distribution	Reflection and preview	✓	×	✓	✓	✓	×	×	✓	×	×	5
	Distribute and share via web	✓	×	✓	✓	✓	×	✓	✓	×	×	6

Legends: ✓ = Apply, × = Does not apply

Table 2
Condition for the Selection for DST Process

Condition (total score)	Indicator
8 to 10	Compulsory to apply
4 to 7	Recommended to apply
0 to 3	Discarded

B. Expert Review

Next, an expert review is conducted in order to validate and review the proposed process of DST. Nine experts responded to the invitations made via telephone calls and then an appointment was set up for semi-structured face-to-face interviews. The number of experts is sufficient for an expert view [27]. The experts involved in this review process were selected based on their own expertise in Human-Computer Interaction (HCI), DST, Multimedia in Education, Instructional design and Information Technology (IT). They are asked based on their expertise so that the comments and improvements can be made based on the proposed process. Their responses are considered and justified according to their respective areas as stated below:

Expert X: *Testing should be included as a step before audience look at the story*

Expert Y: *On the whole, the process is ok. Since the creation of DST involved the process of creation multimedia material, you should involve instructional model (ID) in the process as a reference model. Testing should be included after assembling all media materials before distributing the story via web. Terminology for certain words should be standardised according to your study.*

Expert Z: *Please standardise your terminology. Change the terminology for ‘user’.... adapt it with storytelling area.*

From the findings of the interview, majority of the experts agreed and approved the steps of the process. Only three experts gave enriched comments to the process. Two experts commented that testing should be included as an additional step before the stories are distributed. The other commented that the terminology ‘user’ should be changed to ‘audience’ so that it is applicable in the DST area. Meanwhile, testing or previewing stories have been employed by [20]. Peers will test and review the story before it is distributed and shared with the real audiences. Therefore, previewing is another term for testing in the DST process. With their expertise, a comprehensive process is formed. Figure 2 depicts the reviewed process of DST.

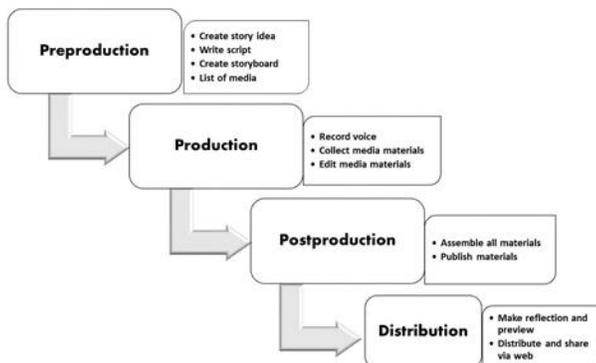


Figure 2: Process of DST

C. Questionnaire

An instrument is developed from a set of questionnaire based on 7 Likert scales which comprised of 6 factors (perceived usefulness, perceived ease of use, perceived ease of understanding, applicability, interaction of tablet and overall quality). Prior, the instruments have been validated with face and construct validity by experts and factor analysis, respectively. Having high reliability of Cronbach Alpha for all factors which is 0.97, this instrument is then distributed to 70 respondents cum trainee teacher in an Institute Teacher Education (ITE).

IV. RESULT AND DISCUSSIONS

This section presents the findings of data analysis and discussion of the main result from the responses obtained. Firstly, the demographic profile of the respondents who participated in the study as illustrated in Table 3. Out of 70 users, 67.14% of the respondents are female and the remainder are male (32.85%). As for the racial composition, majority of the respondents are Chinese (57.14%), Malay (41.42%) and only one respondent (1.43%) is Dusun. Figure 3 depicts the composition of race and gender of the respondents.

Table 3
Demographic profiles

Gender	Frequency	Percent
Male	23	32.85%
Female	47	67.14%
Total	70	100.00%
Race	Frequency	Percent
Malay	29	41.42%
Chinese	40	57.14%
Others	1	1.43%
Total	70	100.00%

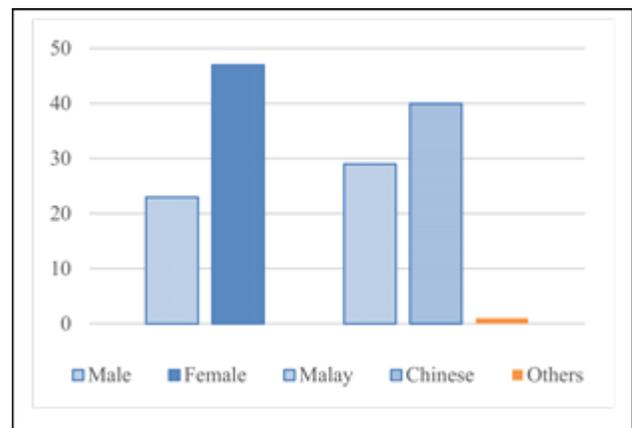


Figure 3: Demographic respondents

Next, in order to determine the association of the factors with the overall quality of DST process, they are analysed with Pearson Correlation Analysis. The relationship of each factor such as perceived usefulness (PU), perceived ease of use(PEU), perceived ease of understanding (PEOU), applicability(APP), interaction of tablet(ITAB) is tested with the overall quality of the process, as shown in Table 4. The relationship of other factors with the overall quality(OQ) is illustrated in Figure 4.



Figure 4: The relationship of factors

Results proved that there are significantly positive relationships between the factors, as the r values are positive and $p < .01$. The correlation between perceived usefulness and overall quality with significant value, $p = .001$ and $r = .29$, perceived ease of use and overall quality with significant value, $p = .00$ and $r = .38$, perceived ease of understanding and overall quality with significant value, $p = .00$ and $r = .57$, applicability and overall quality with significant value, $p = .00$ and $r = .57$, and finally interaction with tablet and overall quality with significant value, $p = .00$ and $r = .66$. Meanwhile, the strength of the relationship among the factors are measured and estimated using Davies scale [5] as tabulated in Table 5. With the reference to the scale, the overall quality have very strong positive relationship with majority of the factors (PEU, PEOU, APP, ITAB) that is $r > +0.30$ except weak relationship with perceived usefulness(PU) that is $r = .29$. Thus, the correlation indicates that higher scores of the factors are associated with higher score of the overall quality of the DST process.

Table 4
Pearson Correlation Analysis

Factor	PU	OQ
PU		0.29
Sig.(1-tailed)		.001**
N	70	70
Factor	PEU	OQ
PEU	1	0.38
Sig.(1-tailed)		.00**
N	70	70
Factor	PEOU	OQ
PEOU	1	0.57
Sig.(1-tailed)		.00**
N	70	70
Factor	APP	OQ
APP	1	0.57
Sig.(1-tailed)		.00**
N	70	70
Factor	ITAB	OQ
ITAB	1	0.66
Sig.(1-tailed)		.00**
N	70	70

** Correlation is significant at the 0.01 level (1-tailed).

Table 5
The Strength of the Correlation

Coefficient size(r)	Strength Description
+0.70 – +1.00	Extremely strong positive
+0.50 – +0.69	Very strong positive
+0.30 – +0.49	Moderate strong positive
+0.10 – +0.29	Weak
+0.01 – +0.09	Very weak
0	No relationship

V. CONCLUSION

The research findings have revealed that there are eleven generic steps which are categorised into four major phases in the DST process. Besides, the validation from experts' responses and feedback are aimed to fabricate a comprehensive process. Expressing ideas of a story is a fundamental step in the creation of DST. Thus, designers should rise ideas that will embark on the creation of a story. The following steps in the DST process will guide the designers to produce any multimedia material. However, the difference in the DST process compared to other existing multimedia process is the distribution phase. In this phase, audiences are given an opportunity to improve and edit the story. This finding is very useful for reshaping the process of DST in accordance with various areas of expertise and experience in the creation of multimedia materials. Furthermore, it can be clearly perceived that the overall quality of the DST process is significantly associated with perceived usefulness, perceived ease of use, and perceived ease of understanding, applicability and interaction with tablet. Hence, the process is also helpful to guide designers especially novice designers cum educators who are unfamiliar with the concept of DST. For further study, a detailed guideline as a reference for designers to produce multimedia applications which used the concept of DST.

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