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Development of Gambang Semarang Instrument in an Effort to Digitalize Instrument Based on Virtual Studio Technology (VST)

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Abstract:

The traditional music of Gambang Semarang currently lacks sufficient space to develop. This is due to its high cost, the large number of players, and the need for space to accommodate the instruments. With technological advancements, the development of media for creating music based on traditional instruments can be achieved through various methods. One such method is the digitalization of Gambang Semarang instruments using Virtual Studio Technology (VST). The development of the Gambang Semarang Virtual Instrument, aimed at digitizing instruments based on Virtual Studio Technology (VST), will be conducted using a research and development (R&D) approach adapted from the spiral model research design (Cennamo and Kalk, 2005). The five research stages are adapted into three main stages: (1) product development; (2) demonstration; and (3) delivery. This research was conducted over a period of nine months. Therefore, the research stages include: (1) context analysis and formulation of objectives; (2) determination of alternative solutions; (3) product development, including a Gambang Semarang VST and user guide; (4) product validation involving experts; (5) trials in real situations; (6) product delivery.

Keywords: gambang semarang, digitalization, VST, vstgambangsemarang, virtualinstrument, music

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INTRODUCTION

The Indonesian nation boasts a diverse array of arts that reflect the richness of its musical culture. However, in a broader sense, this musical art form has not been widely introduced to the public, and as a result, it remains a form of entertainment enjoyed by the nation itself. Furthermore, it is known that 143 regional arts have been categorized as nearly extinct, necessitating conservation efforts that directly involve the community to maintain their existence. So far, the government's efforts to develop and preserve the arts, namely the Cultural Sector Facilitation carried out by the Ministry of Education and Culture, have not been able to empower artists, and the results have not been sufficient to provide facilities for cultural actors in general(Suryaningtyas 2019; Zaking 2022). Therefore, concrete efforts are needed to pay attention to the sustainability of traditional arts, so that they can continue to develop. One of the preservation efforts is the discovery of Gatoel, an Android-based digital gamelan innovation. Users can play gamelan using their respective gadgets without having to bring the original instruments (Sholikah 2017).

One example of a traditional musical instrument that deserves attention is the Semarang Gambang. The Semarang Gambang is an accompanying musical instrument in the art form of a musical ensemble in the city of Semarang, and has become a cultural identity of the town (Sadtiti, 2016). Initially, this music was the music of the Chinese group in the Chinatown area of Semarang, which was almost extinct. Thanks to the concern and interest of the Semarang city government, this music was developed and is known as Semarang Gambang music, which has been appointed as one of the symbols of the city's cultural identity. Magnusson argues that in the world of ethno-organology, musical instruments are situated within culture, where they originate, how history unfolds, and how they manifest in digital practices (Magnusson 2021). In line with this, the form of development in the creation and enjoyment of music today has experienced various improvements, both in terms of instrumentation and recording systems. Likewise, in terms of music creation, artists do not have to use original instruments to create music. This creative activity can be carried out through the technique of recording the acoustic sound of original instruments and then digitally processing it to be composed into musical works. The results of the digitalization are then compiled into an application, commonly referred to as VST.

VST (Virtual Studio Technology) Instruments are musical instruments that have been converted into virtual software (Richardson 2018). Several results of literary studies indicate that the creation of audio samples of Banjar Gamelan originated from the desire to produce dance music and regional songs. However, during the process of creating the work, the artist encountered difficulties in finding suitable musical instruments (Assidiq 2021). Likewise, the traditional musical instrument Sapek Talempong has been converted into a VST, although the work is not yet in the form of a VST application, still relying on an established VST (Epria Darma Putra and Handra Kadir 2022; Hardiman 2021). This reality presents both challenges and opportunities for improvement, considering the numerous other traditional musical instruments in Indonesia that could be used as research material for VST development, one of which is the Gambang Semarang instrument. In this regard, the development of a virtual Gambang Semarang musical instrument is crucial in an effort to digitize VST-based instruments. Furthermore, this development will help preserve and introduce the Gambang Semarang musical heritage into the modern music community.

METHODS

This research is a development research project (Research and Development), so, in accordance with the characteristics of the product and the research stages, the researcher employs the Utomo development research approach model, namely adapting the spiral model developed by Utomo, U., Rachman, A., & Wafa (2019). The stages of this research are (1) the product development stage (develop), (2) the product demonstration stage (demonstrate), and (3) the product delivery stage (deliver). The subjects of this research were determined purposively, namely producers and digital music players who are members of the music community in Semarang City and online digital music forums. The number and criteria of research subjects will be determined

later, based on the needs and the adequacy of information and requirements for the research procedures.

The data types in this study include both qualitative and quantitative data. Qualitative data were obtained during the instrument context analysis, goal formulation, brainstorming discussions, development and validation of the Gambang Semarang VST, revisions, trial tools, and preparation of the Gambang Semarang VST guide. Quantitative data were obtained during the validation of the Gambang Semarang VST and the feasibility trial. In the product development stage, the instruments used include observation guidelines, interviews, questionnaires, and suggestion sheets. The interview guidelines and questionnaires were utilized during the instrument context analysis and goal formulation activities, as well as the brainstorming session to determine solutions. The suggestion sheets were used as data collection tools during the validation and trial activities of the Gambang Semarang VST being developed. The observation guidelines were used during the context analysis and trial activities.

RESULTS AND DISCUSSION

Based on the research design, which involves developing, demonstrating, and delivering, the following explanation will be provided.

Based on the types of Semarang gambang instruments, a brainstorming session was conducted with colleagues regarding the objectives of the development research. The issues that emerged were: a) the need for digitalization in the form of an application containing sample sounds of Semarang gambang instruments that can be used to compose songs or accompaniments using Semarang gambang music, b) based on the characteristics of the instruments and their uses, the conclusion drawn was to select the instruments to be used for the VST application: bonang, saron, demung, gambang, and kecrek, and c) in accordance with point b, not all Semarang gambang instruments are made into VSTs; existing VSTs can be used, such as Javanese drum VSTs, violin VSTs, and so on.

Development, Validation, and Revision of the Gambang Semarang VST

During the development stage of the Gambang Semarang VST, the following activities were carried out:

Recording the sound samples of the Gambang Semarang instrument.

The instrument recording stage was carried out using the following techniques:

Recording Equipment

The instrument was recorded using a dynamic microphone to capture the tone produced by the instrument's blades, and a condenser microphone to record the acoustic sound of the room when the instrument's blades were struck. The microphones used were the Shure SM57 and MXL 50. The software used for recording and analyzing the sound was the latest version of Studio One 7.

The recording process is carried out in stages, depending on the instrument's characteristics and its blades, to obtain a complete and rounded sound sample without any noise. The recording or sound sampling process is explained as follows:

1. Saron Sampling

The sound sampling process uses three recordings, each corresponding to the loudness and softness of the saron blades. Therefore, three sound layers are used (soft, standard, and moderately loud). Three sound layers adjust the dynamics of the song or accompaniment to the Semarang gambang when composing the music.

The results of the frequency measurements using the DA Tuner application are shown in the following table.

Table 1. Frequency and tone measurement results on the saron instrument.

Nada	Tone Frequency

1	D	591,9 Hz
2	E	663,8 Hz
3	F#	745,3 Hz
4	G	790,7 Hz
5	A	892,0 Hz
6	B	992,2 Hz
7	C	1055 Hz
!	C#	1131,4 Hz
@	D	1188,5 Hz

2. Demung Sampling

As with the sampling process on the saron blade, researchers recorded three layers to obtain the desired sound intensity.

Table 2. Frequency and tone measurement results on the demung instrument.

Nada	Tone	Frequency
1	D	297,2 Hz
2	E	331,6 Hz
3	F#	377,1 Hz
4	G	396,5 Hz
5	A	444,4 Hz
6	B	498,4 Hz
/6	Bes	528,4 Hz
7	C	560 Hz
!	D	593,5 Hz

3. Gambang Sampling

When sampling sound on the gambang instrument, the researcher took only one layer because, judging from the characteristics of the sound and the playing of the gambang instrument, it tends to be static or fixed in nature.

Table 3. Frequency and tone measurement results on the gambang instrument.

Nada	Tone	Frequency
Sy	B	245,8 Hz
u	C	261,3 Hz
	C#	2738 Hz
1	D	299,5 Hz
2	E	331,3 Hz
3	F#	374,2 Hz
4	G	3930 Hz
5	A	4385 Hz
6	B	481,6 Hz
7	C	5252 Hz
	C#	559 Hz
!	D	5900 Hz
@	E	6617 Hz
#	F#	7416 Hz
$	G	7904 Hz
%	A	548 Hz
^	B	9880 Hz
	C	10406 Hz
&	C#	11150 Hz
91	D	11173 Hz

4. Bonang Sampling

Table 4. Frequency and tone measurement results on the gambang instrument.

Nada		Tone Frequency
1	D	293,5 Hz
2	E	328,8 Hz
3	F#	367,2 Hz
4	G	393,6 Hz
5	A	447,4 Hz
6	B	490,4 Hz
7	C#	561,3 Hz
!	D	582,9 Hz
@	E	660,9 Hz
#	F#	745 Hz
$	G	1946 Hz
%	A	1588 Hz
^	B	995,7 Hz
&	C#	1117,5 Hz

5. Kempul/Gong Sampling

Table 5. Frequency and tone measurement results on the Gong/Kempul instrument.

Nada		Tone Frequency
1	D	74.4 Hz
2	E	82.0 Hz
3	F#	94.4 Hz
4	G	98.0 Hz
5	A	108.6 Hz
6	B	123.3 Hz
7	C#	139.7 Hz
!	D	150.7 Hz
@	E	165.9 Hz

VST product development

At this stage, the VST Gambang Semarang design mapping process is carried out through the Romplur website, a type of VST developer that can be obtained via an online subscription. The steps are as follows:

1. Create a GUI (Graphical User Interface) design.

The Gambang Semarang VST GUI design is a visual representation of the Gambang Semarang VST. The appearance of each Gambang Semarang VST instrument is made uniform to match the characteristics of the VST. The VST instruments are VST Saron, VST Demung, VST Bonang, VST Gambang, VST Kempul/Gong, and VST Kecrek.

Below is an example of the Saron VST GUI.

Figure 1. GUI VST Saron

The Bonang instrument installer file size is 271.2 MB, which varies depending on the number of sounds sampled and the GUI design variations for each instrument. To design the Gambang Semarang VST prototype, the researchers used Romplur software, which is used to create audio and GUI.

Figure 2. VST Bonang

The capacity of VST Bonang is 273.3 MB, the Windows OS installer is 6.5 MB, and the installer for Mac is 27.3 MB.

Figure 3. VST Demung

The VST Demung capacity is 142.3 MB, the Windows OS installer is 6.5 MB, and the installer for Mac is 27.3 MB.

Figure 4. VST Gambang

The capacity of the VST Gambang is 278.3 MB, the Windows OS installer is 6.5 MB, and the installer for Mac is 27.3 MB.

Figure 5. VST Kempul/Gong

The capacity of the VST Gong/Kempul is 328.8 Mb. The Windows OS installer is 6.5 Mb, and the installer for Mac is 27.3 Mb.

Demonstrate

The first phase of the trial was limited to Gambang Semarang artists and music production artists who use VST instruments in all their work.

Comments on the Gambang Semarang VST installation process and readability in DAWs indicated that the installation process was easy. Despite using a DAW, the loading process was relatively fast, and after installation, there was no need to search for files because it was automatically ready to use.

Comments on the processing and sound output of the instruments in the DAW, including tone, timbre, and duration, stated that the tone color and timbre approximated the original instrument sounds. However, some instruments (Bonang and Gambang) needed more attention to enhance the distinctiveness of Gambang Semarang.

Comments on the GUI (design) of the VST instrument noted that the display was visually appealing and attractive. Still, it would have been better if the instrument images included in the design were purely Gambang Semarang. Perhaps the placement and scale of the pictures could be reconsidered if the intended audience is educational.

In general, it states that it is corrected in minor positions for deficiencies that can be optimized and immediately published, making it generally usable, which in turn makes it easier for artists to visualize and create related to Gambang Semarang.

Based on the results of the development of the Gambang Semarang VST and the limited trial process for Semarang Gambang artists and digital music producers, a revision process was carried out by paying attention to the characteristics of the functions and users of the Gambang Semarang VST, including:

1. The sounds of the bonang and gambang instruments require more in-depth attention regarding tone color and how they are handled when played.

2. The addition of the Semarang city symbol, the warak, embedded in the Gambang Semarang VST.

Delivered

At this stage, the product was delivered to music producers and one of the Gambang Semarang artists, namely Brother Enggar Ardiandi, owner of Aksara Production, and Ibnu Amar Muchsin, as coordinator of the Gambang Semarang Community.

CONCLUSION

The development of the Gambang Semarang Virtual Instrument, an effort to digitize instruments based on Virtual Studio Technology (VST), was conducted using a research and development (R&D) approach adapted from the spiral model research design (Cennamo and Kalk, 2005). The five research stages were adapted into three main stages: (1) product development; (2) demonstration; and (3) delivery.

The research stages included: (1) context analysis and goal formulation; (2) determination of alternative solutions; (3) product development, including the Gambang Semarang VST and user guide; (4) product validation involving experts; (5) testing in real-world situations; (6) product revision (if necessary); and (7) delivery.

The product was implemented and delivered to music producers and artists in Gambang, Semarang, specifically to Enggar Ardiandi, owner of Aksara Production, and Ibnu Amar Muchsin, coordinator of the Gambang Semarang Community. Development of a Gambang Semarang VST that can be validated in a relevant laboratory environment and can be used for educational audiences in the context of preserving traditional musical instruments. The implementation of art learning in elementary schools is a strategic means to introduce traditional arts from an early age, while instilling local wisdom values that shape the cultural identity of the younger generation.

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