

Shedding Light on the National Identity of Local Music in Northern Thailand: Design and Implementation via Responsive Web Application

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Abstract

The aim of this study was to use the management of information technology to improve the collection of Northern traditional music and to store it in a rich and valuable musical database. This traditional music also contains a lot of valuable information about the progenitors and culture of Northern people that is not available elsewhere and tends to get forgotten and lost. Statistical analysis was used to evaluate user satisfaction with the system. Two groups of sample have been collected for testing (n<30) the satisfactions in topic of graphic user interface, system performance and confidence on web application. The results indicated that the satisfactions of the usefulness of the application of musician and others was not different and the two groups agreed that the use of the web application could support and improve the collection of Northern traditional music by distribution via a responsive web application. The use of suitable management and information technology can provide benefits to society and shed light on the national identity, especially with regard to Northern traditional music.

Keywords: Design, Implementation, Local Music, National Identity, Responsive Web Application

1. Introduction

Nowadays, new forms of technology such as mobile technology, mobile applications, and web technology have become common channels of distribution for media file types, especially on mobile phones. Users can immediately open and listen to music or a song via these devices, which can be accessed in either online or offline mode. Thus, the convenience of the technology provides useful promotion or direct distribution to the audience. As we have seen, multimedia applications in the market, have focused mainly on music and songs, with many examples being accessed and listened to more than one million times using many devices. Because of the number of mobile devices nowadays, the estimated increase in mobile phone ownership around the world is projected to be 6.7 million in 2018¹ and this includes many

mobile devices being used to listen to sounds or songs on smart phones. Most people appreciate smart phones for many reasons such as their convenience, ease of access, their safe use, and the fact that they can be used everywhere and at any time, while a few people continue to use a desktop computer instead. Conceptually, to present or publish music or a song via the internet, it is necessary to consider which channel to use and which way to publish.

In the Northern region, traditional music was recorded in many databases, depending on the recorder. The original music or songs created by local artists may be disappearing because the experts able to explain the contents or history in the song are disappearing. Such music contains much valuable information about the progenitors and the culture of the Northern people which is not available elsewhere and tends to get forgotten and lost.

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For study or investigation of the roots or history based on traditional song, the researcher must go to a museum or to the institution holding the collection, while nowadays in the most developed countries visual presentations are popular. Although, visual presentation can be useful in terms of high technology, a limitation is the high cost. In the twentieth century, several methodologies are available for collecting and presenting traditional music. For example, an application on the worldwide web, or a program for storage are basic methodologies to develop and implement.

Thus, the aim of this study was to use management information technology to develop and improve the collection of northern traditional music in order to store the rich and valuable musical data in a database and to shed light on the connections between the national identity and artists using as channels of distribution a smart phone and a responsive web application to access the musical database for sharing and studying.

The article is divided into four parts. In the first part, extant northern traditional music was investigated and identified and its details recorded. Then, we present our conception including information from a review of the literature. The next section introduces a responsive, retrofitting web pattern and the trends in web technology, which feeds creative thinking on how a management information system is the basis for our work. Then the study moves on to the methodology involved in the design and development of the web application, especially the graphical user interface, though the discussion excludes technical programming. After that, we show the results of our development and implementation of user satisfaction and system performance. Finally, we discuss the ways in which places are remembered through popular musical heritage practices in a web application.

2. Northern Local Music

Northern Thailand is bound by the Salween River in the west and the Mekong River in the east and consists of nine provinces including most of the mountainous natural region of the Thai highlands. Around 700 years ago, Chiang Mai province was the heart of northern heritage with considerable political power and prestige. Nowadays, Chiang Mai is a center for several dimension of Northern Thailand with regard to economics, education, transportation, and Lanna culture. The Lanna culture highlights the national identity of the people in northern locations

and is related to the traditional customs that people respect and use. Moreover, the relation between cultural identity and music can be used to explain and retrieve the roots of a national identity².

National identity refers to the sense of a nation as a cohesive whole, as represented by distinctive traditions, culture, and language, etc.³. It might entail traditional notions of heritage that transfer traditional conceptions and build contemporary popular culture⁴. The distinctive traditions of the nation are separated by location and this applies to the identity of songs between the Northern and Southern regions. For example, the traditional songs or music of the Northern and Southern regions relate to society and can explain some of the culture and the daily life activities of the people. The rhythm and lyrics of the songs are different with the Northern style having a slower rhythm than in the south. In addition, the lyrics cover topics as diverse as love, the environment, and social and daily life activities. We can assume that the national identity, especially with the Northern style called “Lanna”, differs in each part of the country because the root culture has been proliferated from nearby countries such as Cambodia, Myanmar, and Youn⁵. Music in Lanna culture has been improved together with localism, which provides studies and research into the collection of traditional music by ethnomusicology conception. Musicology contains the explanation of Western notation and Thai notation, which are recorded in a large number of songs. In our work, two separate song categories were used:

- (i) Vocal music categories
 - Vocal music is accompanied vocal music, involving music and a singer.
 - An epic is some kind of music where the singer sings from text or lyrics.
- (ii) Instrumental music
 - This type of music consists of a combination of many musical instruments such as a group of wind instruments or of percussion instruments.

3. Conception

The design and implementation of collecting music for studying has been researched in the past. The main concept involves the development of a database system in combination with web technology and multimedia for publishing on the internet.

Wang et al. studied developing a digital music library and they implemented a data music model and constructed a database for music storage⁶. This work focused on the algorithm used to retrieve the information in the database. The results of the implementation in terms of benefit were in helping the audience to search the songs in the database and in conserving the songs in a standard storage location. In fact, there is great variety in the songs and music on the internet, so that searching for songs or music there can frequently result in many results with no categorization of the type of music or the song.

Mazur and Wiklak studied methods for the retrieval of music information on the internet and their methodology helped to improve the sound quality in each sound format. The benefit resulting from this study was enabling the listener to download a high quality file⁷.

Three reviews also suggested appropriate development in technical terms, which directly affected our work. Moreover, the related positive impact in terms of the use of music on the internet requires consideration. The use of social media nowadays can improve the interaction between the audience and the production⁸. A positive social impact of the use of social media will encourage audiences to pay attention to music and songs accordingly to the study of Krause et. al. and Joinson. The study shows the power of the use of social media on listening to music, which impacts the creative thinking of the audience when the music or song relate to their everyday life⁹. Michele considered the publication of online music provided communication between the audience and the song through the creation of virtual space into an online channel, which also encouraged collaboration in creativity involving musical and social practices¹⁰. There is an immediacy of access to resources on the internet especially where the resources can be accessed via a smart phone. The convenience of accessing the database drives audience motivation to listen, learn, and study using the available tools on the internet and also serves people of all ages who appreciate listening to the song¹¹.

Thus, our development should consider all the criteria of use such as the retrieval technique, the quality of source, and the channel of publication.

4. Trend and Web Technology

Our development for Northern traditional music is based on the development of web technology. Web technology has developed powerful tools that provide channels

to access a lot of information on the internet. Nowadays, web technology can be built using many languages such as HTML, ASP, JavaScript, and CGI. A new web technology language is HTML 4.0, which is the most recent and widely accepted version of HTML and includes what are called "Cascading Style Sheets (CSS)"¹². CSS are one type of markup language that can be used in text and word processing documents to describe or translate code for display or printing. When we use the Internet, the markup language has been translated by web browser then displayed in a browser and this defines the data contained within a web document. CSS clouds help the web developer to specify many of the repeated style characteristics such as font and color. Moreover, it helps to enable quick development and CSS provides a useful retrieval method of the information using the HTML code, which is easier to develop as well.

5. Responsive Retrofitting Web Pattern

In practice, large numbers of computer devices directly affect graphical design especially through the screen size. When we access a website via a mobile web, a problem is that the actual size of the screen is not appropriate to the size as seen on a larger desktop monitor. Responsive retrofitting web pattern is a technique that supports the way the web developer builds the web site, which can also be developed using CSS. CSS can be written for different media, with some CSS in the HTML document¹³. Responsive Design provides the user with an optimal experience when using and moving around on the website via a smart phone, tablet, or desktop computer. This pattern makes the website accessible and usable across every possible device and screen size. Figure 1 illustrates a display on a large and small screen size, respectively, where the content and all components will automatically adjust to the appropriate size. Thus, in the development of the mobile web application, responsive retrofitting solves the problem of the appropriate screen sizing.

6. Graphic User Interface (GUI)

GUI refers to the graphics and layout shown on the screen device, including elements such as buttons, icons, and pictures which can be clicked or dragged and pressed to carry out various functions of the program^{14,15}. On screen

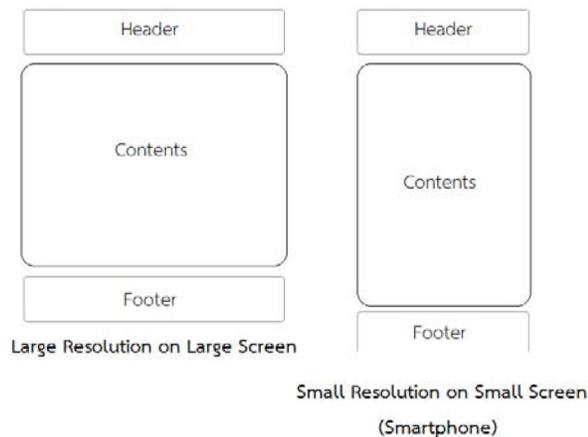


Figure 1. Example of screen size layout for a large and small screen.

design should utilize more an efficient graphical interface than a text interface, because it is more appropriate to the users' needs¹⁶. Our graphical development shows icon associated with Northern Thailand, because this will help to attract explicit users. The images used shed light on the national identity which also makes it easier for users to recognize. Moreover, text size on the web application is an important element that directly affects the user especially for providing information to the user. A suitable font size is 8-12 points in English, and a well known front type name is Times New Roman¹⁷. Our development, the Thai alphabet was used to develop and display the information, and so the font size needed to be bigger than for the English style and we used a font size between 14 and 16 points. To support that our development has an appropriate design, we used statistical analysis for appraisal.

7. Methodology to Design and Develop a Web Application

Designing the web application involves the graphic user interface, the content on the website, and showing the way of development. Our work aimed to develop a web application that presents Northern traditional music. In this step, analysis of the music and categorization are considered. Our work utilized a Northern music expert from the Department of Thai Art, Faculty of Fine Art at Chiang Mai University and Chiang Mai Rajaphat University. The original songs were collected from local musicians and we interviewed them to record the history of the music.

After analyzing and categorizing the music, the following information was recorded in the database:

1. Type of song (i) music (ii) chanting (no music)
2. Band information
3. Musical instruments (combination of musical instruments to produce the sound)
4. Content history

Secondly, the designed database also contained the music file:

- (i) Design database structure (entity relational)
- (ii) Normalization
- (iii) Development database

Third, the web structure design contained the directory of the website:

- (i) Title page (showing a picture of Northern art)
- (ii) Main menu (the menu to search the website)
- (iii) Searching (the text box which accepted keywords for searching for songs)
- (iv) Upload song (the menu for uploading song in each category and multimedia)
- (v) About the project (information on this project)

Fourth, the Graphic User Interface (GUI) was designed, which provides access by and interaction between users and the system and the exchange of information. We also used graphical multimedia showing Lanna cultural pictures because we wanted to indicate the roots of Northern architecture. Our design utilized the correlation between the background and foreground using a purple color.

8. Database Conception

A database is an organized collection of data that provides a systematic collection. The development of a database considers schemes, tables, queries, reports, views, and objects.

A database can be organized based on many models, which contain different solutions to retrieval and recording. Each database model determines the logical structure of the database and determines how the data can be organized, stored, and manipulated in the database system.

With regard to computer science or computer engineering, a database is a relational model, which uses the

SQL (Structured Query Language) to collect and retrieve data in a table-based format¹⁸⁻²⁰. Thus, SQL is an appropriate tool for the development of a database web application as well.

The entity relationship diagram (ER-diagram) is a tool that provides a graphical representation of an information system with regard to the relationship of the people, organization, places, or events within the system²¹. Figure 2

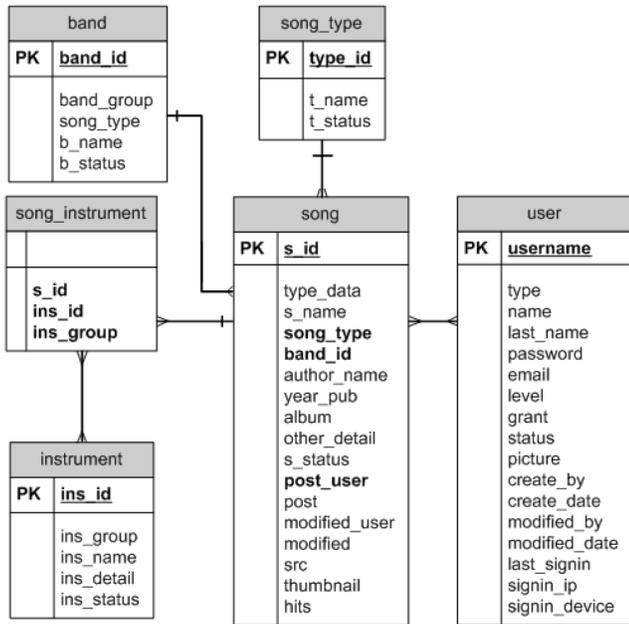


Figure 2. Entity relationship diagram for development of a web application.

shows an E-R diagram that explains the relationships among the attributes in the database.

9. Development and Implementation

The development of the web application for Northern traditional music also used SQL and an available program for developing the website using a responsive web site pattern. A requirement of the web application for Northern traditional music was the need to support collaborative online music between the audience and the recorder or from their own sources. We installed this requirement through social media plug-in Code for support interaction, collaboration, and knowledge sharing. Figures 3 and 4 show each function menu that supports the development methodology to show each panel displaying music and content.

The responsive retrofitting web pattern provided an appropriate display for many devices such as a desktop computer, a tablet computer, and a smart phone. Our development can handle the resolution problem and display in an appropriate size on the screen. Figure 5 shows the appropriate size for display on a smartphone which is how the majority of people access web applications.

After the development and implementation testing, the web application was uploaded to the internet, which could then be accessed using different devices. The outcome of the development was improved resources to

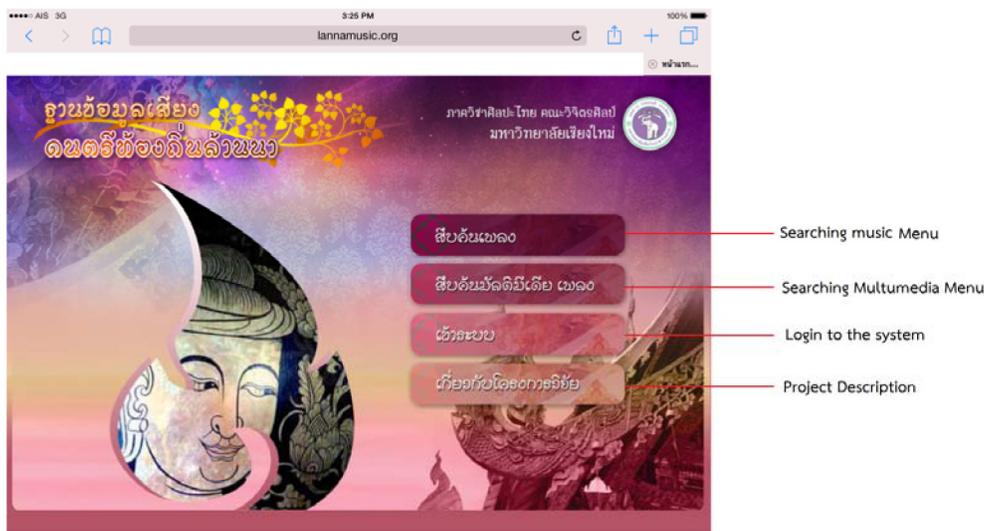


Figure 3. Graphic user interface showing main menu of Lanna music web application.

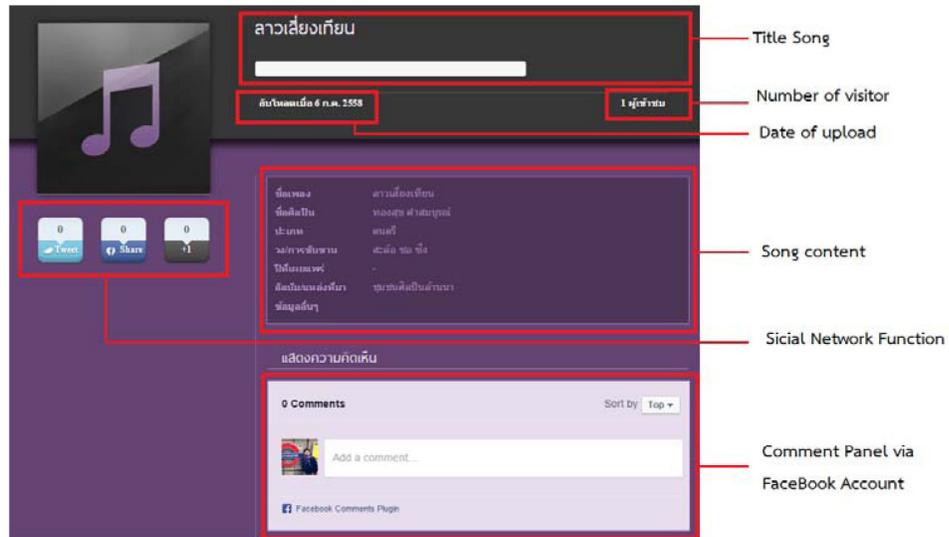


Figure 4. Graphic user interface displayed on desktop computer device showing panels.

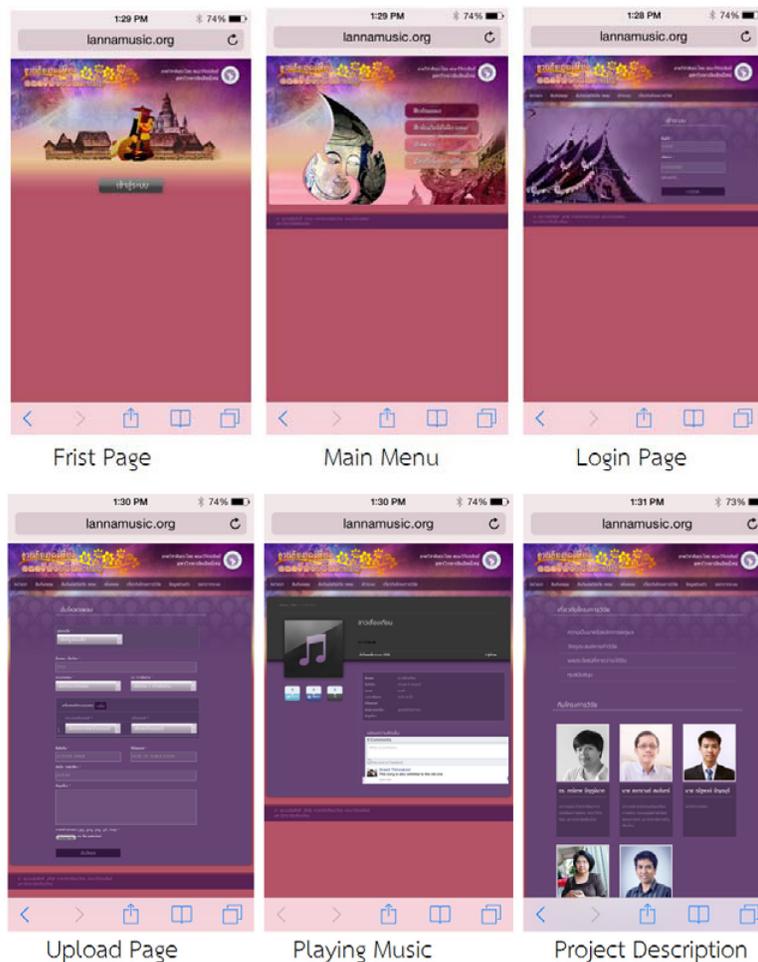


Figure 5. Graphic user interface as seen using a mobile device (iPhone) on www.lannamusic.org

address the lack of storage of Northern traditional songs and also the provision of a platform to support future development.

10. Evaluation of Satisfaction

To test the usefulness of the development, satisfaction and performance were evaluated by testing the opinions of users of the Lanna music application. We used a questionnaire which users were asked to complete.

Table 1. Sampling to test differentiation between musicians and others

Group	Population		Total
	Male	Female	
Musicians	6	4	10
Others	20	15	35
Total	26	19	45

The first section of the questionnaire asked about each criterion on the screen for example, the color and size of font, buttons, background and foreground.

The next section elicited the user’s opinion on user satisfaction. The sampling involved two groups, with the first being musicians and the second group non musicians. The questionnaire results from the sampling of users is shown in Tables 1 and 2.

The information in Table 2. (upper) shows that the average scores of user’s satisfaction (musicians) for the GUI on the Lanna web application was 81.18, with an SD of 8.01 and the average of satisfaction was 78.72. The satisfaction level of the “Other” group had an average of 81.55, SD of 7.47 and a mean of 80.36.

The results of the system performance analysis show the average of the musical group and others were 86.93 and 88.79, respectively, whereas the means were 87.73 and 90.20, respectively. The first group has a higher percentage than the second group in each of the two sections of evaluation (GUI and system performance).

Table 2. Result from survey of users on the appropriateness of development of the GUI and the application

Evaluation criteria	Percentage	
	Musicians	Others
Graphic User Interface (GUI) on Lanna web application		
G1- Button sizes are easy to touch (on tablet and mobile device)	75.50	80.50
G2- Screen size clearly shows foreground and background	90.23	89.80
G3- Color is clear on the screen	90.12	91.12
G4- Icon is easy to click and easy to understand	90.53	88.25
G5- Each picture menu is a good representative of each symbol	78.75	80.22
G6- List menu is easy to read and click	75.50	76.50
G7- Font size is appropriate to device screen	70.10	70.55
G8- User appreciation on GUI elements	78.70	75.50
Average	81.18	81.55
Standard Deviation	8.01	7.47
Mean	78.72	80.36
System Performance		
O1- The web application is useful for displaying music	90.23	90.50
O2- The web application provides useful music or multimedia information	93.50	89.90
O3- The web application can display a song with smooth sound (high quality)	80.80	83.30
O4- The information is helpful (how to use or show music information)	85.23	90.50
O5- Functions in the application make study convenient	80.75	86.32
O6- The web application responds immediately to user	91.11	92.22
Average	86.93	88.79
Standard Deviation	5.48	3.32
Mean	87.73	90.20

The last evaluation section compared the opinion of musician and others on whether the Lanna web application was an appropriate tool for the storage and publication of Northern traditional music. The results show that the average of both groups was 86.57 and 85.40, respectively, whereas the SD was 6.05 and 4.80, respectively (Table 3). As can be seen, there are negligible differences between the percentages of the two groups suggesting that the application is acceptable to both groups.

In next section, we plot graphs with the statistical intervals, based on two sample t-tests used to test both group differences. The comparison of the satisfaction levels between musicians and others is shown in Figure 6.

The satisfaction levels of the two groups were tested to show the intervals of user confidence which differentiated the groups (Tables 3 and 4). The bar chart in Figure 6 shows a similar trend for each aspect considered, which means the satisfaction was not different for that determined in the first step of testing. As Figure 6 shows, data has a normal distribution (equal variance). The musician group is the treatment group and the other group is the control group. In the upper panel of Figure 6, the results show the confidence interval of the pilot group (number 1) and the other group (number 2), and mean interval for each point of consideration.

In the group comparison, the mean of the confidence interval for both groups for testing satisfaction of the GUI

Table 3. Percentages of questions regarding confidence in the Lanna music web application is useful tools for publish northern traditional song

Criteria	Percentage	
	Musicians	Others
Confidence on web application		
C1- User agreed with Lanna music application for store traditional music	80.50	82.25
C2- Lanna music application provides useful information for people who want to study the history of local songs	90.20	89.55
C3- The Lanna music application can help users to record music and information	78.80	80.80
C4- The Lanna music application can shed light on the national identity	85.50	86.65
C5- The Lanna music web application can encourage people to listen to traditional music.	90.23	80.98
C6- The channel of publication via mobile can help people to access the music database	94.20	92.20
Average	86.57	85.40
Standard Deviation	6.05	4.80
Mean	87.85	84.45

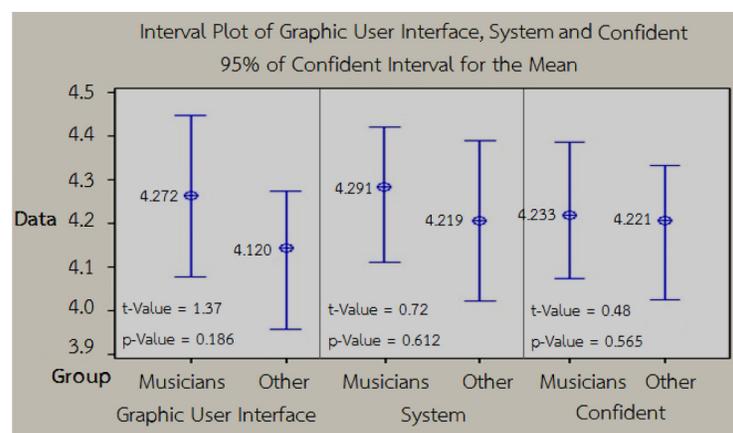


Figure 6. Interval plots testing the consideration of the users' confidence.

was higher (4.272 and 4.120, respectively), whereas the satisfaction level with the system was 4.291 and 4.219, respectively, and the mean confidence level was 4.233 and 4.221, respectively, indicating that the satisfaction of the musicians was higher than for the Others group. The t- and p-values of the three sections in Figure 6 indicate that user satisfaction in the two groups was not different when p-value >.05. Thus, they agreed that the development can provide a useful system, as supported by the confidence level in the application not being different for the two groups.

11. Conclusion

The present research involved the management of music information using modern computer-based technology, which is not new but is an appropriate development. Our development produced a web application for Northern traditional music called “Lanna music”, which has been uploaded to the domain name at www.lannamusic.org. The design and development accommodate audience needs for searching for music in the database which is systematically catalogued. The statistical analysis indicated that the opinion of the usefulness of the application of musician and others was not different and the two groups agreed that the use of the web application could support and improve the collection of Northern traditional music by distribution via a responsive web application. The use of suitable management and information technology can provide benefits to society and shed light on the national identity, especially with regard to Northern traditional music. We can conclude the following outcomes from the study:

- (i) The benefit in terms of a positive social impact is the conservation of local songs which directly support the national Thai identity.
- (ii) The application can be used to publish local songs and make them widely available, which provides for interweaving between international cultures online.
- (iii) The Lanna music website provides a systematic database for storing the rich and valuable recording of Northern music and can be a center of exchange for musical knowledge.
- (iv) Our development sheds light on the connections between the national identity and artists using smart phones and a responsive web application.

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13. References

1. International Data Corporation (IDC). Press Release Worldwide Smartphone 2015-2019 Forecast and Analysis, according to IDC. [Internet]. [update 2015; cited 2015 Aug 25]. Available from: <http://www.idc.com/getdoc.jsp?ContainerId=254912>. 2015.
2. Maria MBV. Cultural identity and using music in the intercultural educational Process. *Procedia - Social and Behavioral Sciences*. 2014; 132(1):235–40.
3. Lee Y. Modern Education, Textbooks, and the Image of the Nation: Politics and Modernization and Nationalism in Korean Education. Korea: Routledge; 2000.
4. Moore K. *Museums and Popular Culture*. Cassell: London; 1997.
5. Andrew HFT. A brief history of Lan Na. Northern Thailand from the past to present by Hans Penth. / *The Peoples of Chiang Mai* by Andrew Forbes: Chiang Mai City Arts & Cultural Centre; 2004.
6. Wang C, Li J, Shi S. The design and implementation of a digital music library. *International Journal on Digital Libraries*. 2006; 6(1):82–97.
7. Mazur Z, Wiklak K. Music information retrieval on the Internet. *AISC 80*. 2010:229–43.
8. Krause EK, North AC, Heritage B. The uses and gratifications of using Facebook music listening applications. *Computers in Human Behavior*. 2014; 39(15 May 2014):71–7.
9. Joinson AN. ‘Looking at’, ‘looking up’ or ‘keeping up with’ people? Motives and uses of Facebook. *Proceedings of SIGCHI Conference on Human Factors in Computing Systems*; New York: USA. ACM; 2008. p. 1027–36.
10. Michele B. Creativity in virtual spaces: Communication modes employed during collaborative online music composition. *Thinking Skills and Creativity*. 2015; 17(September 2015):117–29.

11. Dorin O. Personal development of adults through religious music Motivations and chances. *Procedia - Social and Behavioral Sciences*. 2015; 180(5 May 2015):1192–98.
12. Rachel M. Understanding web technology. *Computerweekly*. [Internet]. [update 2015; cited 2015 May 20]. Available from: <http://www.computerweekly.com/feature/Understanding-web-technology>.
13. Chris O. Understanding the limitations of a responsive retrofit [Internet]. [update 2013; cited 2015 May 23]. Available from: <http://blog.wsol.com/understanding-the-limitations-of-a-responsive-retrofit>.
14. Shaw ZT. Research of user interface in digital camera for elders. [Master Thesis]. Tatung University Taiwan; 2009.
15. Cho J, Kang H, Kim S. A mobile application development tools based on object relational mapping solution. *Indian Journal of Science and Technology*. 2015 Aug; 8(18):1–5. doi: 10.17485/ijst/2015/v8i18/75937.
16. Chin SH. Examining the user satisfaction on Web APP in LUI, PUI, and GUI. *International Journal of Computer and Communication Engineering*. 2013 May; 2(3):356–62.
17. Chien CH, Chen C. Exploring text representation in small screen reading. *Journal of Design*. 2005; 10(1):123–35.
18. Jeffery D. Principle of database and knowledge-base system. Rockville Md. Computer Science Press; 1998.
19. Date CJ. An introduction to database system. 8th edn. Boston; USA: Pearson/Addison-Wesley; 2003.
20. Teorey T, Lightstone S, Nadeau, T. Database modeling & design: logical design, 4th edn, Morgan Kaufmann Press; 2005.
21. Laura A. Entity relationship diagram definition. [Internet]. [update 2014; cited 2015 May 20]. Available from: <http://searchcrm.techtarget.com/definition/entity-relationship-diagram>.