EXPLORING THE PREFERABLE KEYBOARD PLATFORM TO DESIGN THE CHAM FONTS FOR WINDOWS AND MACINTOSH

Van Ngoc Sang*[1], Mohamad Bin Bilal Ali[2], Noor Dayana Abd Halim[3], Tuyet Nhung Buon Krong[4]

1,2,3 Universiti Teknology Malaysia (UTM), Johor Bahru, Malaysia
sangpodam@yahoo.com, mba@utm.my, noordayana@utm.my
4, Tay Nguyen University, Daklak, Vietnam
tuyetnhungbkw@gmail.com

ABSTRACT

The main purpose of this research is to explore the preferable keyboard platform to design the Cham font for Windows and Macintosh keyboard. Research sample is divided into two groups and the research instrument distributed into two forms of survey. The application was developed using ADDIE model. This survey, the acceptance of Macintosh platform is 69.9%, Windows platform is 95.8%. View by fifty four from respondents for all questions, the results showed that all 54 respondents (100%) either agreed or strongly agreed with every statement. Viewed by sixteen experts using Fuzzy Delphi the results show that percentage of all items are 100%, more than what required (75%), the value of d for total construct is 0.02 (required ≤ 0.2). Thus, it can be concluded that all sixteen experts have come to a consensus that the Cham font is acceptable. Evaluate the Cham font products with three form and the results EFEO Panrang 99.29%, EFEO Panrik 99.98%, EFEO Udong 99.80%. Using technologies to design the new Cham font is not only theoretically significant but also practically significant.

Keywords: Cham font, Cham script, traditional Cham script

1. INTRODUCTION

The Cham script was a systems of signs derived from the Sanskrit alphabet in southern India since the 2rd century on Vo Canh stone stele [1]. While the Cham language appeared on stone stele in Tra Kieu Vietnam in the 4th century [2,3]. Due to many social and historical reasons, the Cham script is considered an endangered language in Vietnam. The crucial problem in Cham language is that the Cham Textbook Compiling Committee (CTCC) has not yet supported to preserve the traditional Cham script (TCS) [4]. This has become an emergent phenomenon and the cause of the biggest conflict in the Cham community. Most Cham elders, students, intellectuals and Cham people strongly desire to conserve the TCS [3,5], because they not only the value their heritage from the ancient sources but also because they see TCS as the main key to understand Cham Royal documents or old text materials, which are written in TCS.

Therefore, using Cham font to typing Cham scrip on the computer is needed. Furthermore, there is currently no keyboatrd for typing Cham font. Thus, we offer solutions to design the new Cham font for Windows and Macintosh systems.

2. LITERATURE REVIEW

The ability to use font to type Cham script on the computer has become essential to help with compiling textbooks, data storage, Champa research, teaching and learning of the Cham script. First the Cham-Pandarang font was created and later the Cam-Tanran font to be used for the Champa program research by l'École française d'Extrême-Orient (EFEO). Subsequently, a another Cham font was used to compile a Cham-Vietnamese dictionary by Khanh The (1995). Based on the EFEO Cham font and the Cham -Vietnamese font in the dictionary, a number of research centres and Cham scholars have created different Cham font types. The fonts mentioned above use the

Unicode encoding standard; however, assigning characters (code points) to represent a character or accent sign for Cham script is not based on any particular rule. This is a disadvantage for the use and storage of Cham documents. The Cham-Tanran font created by EFEO for the Macintosh keyboard 1988 has a relatively standard typography and typeface. However, this font still has some defects and technical errors. Furthermore, if it is converted from Macintosh to the Windows operating system, then typing on the computer for this font is no longer accurate. The Cham Thrah font created by Sang (2002, 2012) and Bingu di tanran font created by Cham Unessco (2012) were developed from Cham-Tanran (EFEO), rebuilt, redesigned on the Windows keyboard. However these Cham fonts are not consistent in the value of the code page, and this causes many difficulties in the exchange of information. With the development of computer science, the construction of new Cham fonts for both Windows and Macintosh keyboard to support typing for the Cham script is needed [6]. Cham font is the basis tool for typing Cham language and preserve the Cham script.

3. OBJECTIVE

This research, we propose solutions to survey the keyboard platform and design Cham fonts for Windows and Macintosh systems. Based on the above research we are interested in this issue and come out with two research questions are as follows:

(i) What is the choice of platform that should be created for Cham fonts?
(ii) What is the level acceptance of the Cham font in term of use, convenience, and quality?

4. METHODOLOGY

This research was implemented using a quantitative approach and the application was developed using ADDIE model. Parts of the research are presented in details as below:

4.1 Cham Font Analysis

Cham script (Akhar Thrah) is a script derived from Sanskrit, using different Latin characters. In order to analyze the Cham script to construct the Cham font, it was first necessary to establish the number of characters needed to create the Cham font. The total numbers of Akhar Thrah characters was 86. After analyzing and removing some duplicated characters, such as H, i, o, and r, respectively (H and 1) = "ꨲ", (i and 3) = "ꨳ", (o and 5) = "ꨵ", (r and 6) = "ꨶ", the total number of characters that needed to be designed for Cham fonts was 82, as shown in Table 1.

Table 1. Total Cham font characters to create

ꨀ	ꨁ	ꨂ	ꨃ	ꨄ	ꨅ	ꨆ	ꨇ	ꨈ	ꨉ	ꨊ
ꨋ	ꨌ	ꨍ	ꨎ	ꨏ	ꨐ	ꨑ	ꨒ	ꨓ	ꨔ	ꨕ
ꨖ	ꨗ	ꨘ	ꨙ	ꨚ	ꨛ	ꨜ	ꨝ	ꨞ	ꨟ	ꨠ
ꨡ	ꨢ	ꨣ	ꨤ	ꨥ	ꨦ	ꨧ	ꨨ	ꨩ	ꨪ	ꨫ
ꨬ	ꨭ	ꨮ	ꨯ	ꨰ	ꨱ	ꨲ	ꨳ	ꨴ	ꨵ	ꨶ
꨷	꨸	꨹	꨺	꨻	꨼	꨽	꨾	꨿	ꩀ	ꩁ
ꩂ	ꩃ	ꩄ	ꩅ	ꩆ	ꩇ	ꩈ	ꩉ	ꩊ	ꩋ	ꩌ
ꩍ	꩐	꩑	꩒	꩓	꩔	꩕	꩖	꩗	꩘	꩙
꩜	꩝	꩞	꩟	ꩠ	ꩡ	ꩢ	ꩣ	ꩤ	ꩥ	ꩦ

4.2 Cham Font Design

From the analysis above, the total number of characters of Cham script that must be designed is 82. However, for convenience of typing Cham script, the developer also designed and added seven new punctuation characters for use in the Latin system, namely ‘, “, :, •, ?, (,).

In traditional Cham script systems, there are two characters, (ꨩ) and (ꨪ), which are very

similar in their style of drawing. In 1963, a group of Cham intellectuals edited the character *kha* ([illegible]) so that it could more easily be distinguished from the character ([illegible]). Therefore, for ease of comparison of these two different characters, the developer designed and added more traditional character ([illegible]) into the new font. Thus, the number of characters that needed to be designed was 90. See Table 2.

Table 2. Code point values corresponding to each Cham script character

Ke	Uni	Cam	Key	Uni	Cam	Ke	Uni	Cam
0	0030	[illegible]	R	0052	[illegible]	p	0070	[illegible]
2	0032	[illegible]	S	0053	[illegible]	q	0071	[illegible]
4	0034	[illegible]	T	0054	[illegible]	r	0072	[illegible]
7	0037	[illegible]	U	0055	[illegible]	s	0073	[illegible]
8	0038	[illegible]	V	0056	[illegible]	t	0074	[illegible]
9	0039	[illegible]	W	0057	[illegible]	u	0075	[illegible]
:	003A	:	X	0058	)	v	0076	[illegible]
;	003B	•	Y	0059	[illegible]	w	0077	[illegible]
<	003C	[illegible]	Z	005A	[illegible]	x	0078	[illegible]
=	003D	[illegible]	[	005B	[illegible]	y	0079	[illegible]
>	003E	[illegible]	\	005C	[illegible]	z	007A	[illegible]
?	003F	?	]	005D	[illegible]	{	007B	[illegible]
@	0040	[illegible]	^	005E	[illegible]	|	007C	[illegible]
A	0041	[illegible]	_	005F	[illegible]	}	007D	[illegible]
B	0042	[illegible]	`	0060	[illegible]	~	007E	[illegible]
C	0043	[illegible]	a	0061	[illegible]	!	0021	[illegible]
D	0044	[illegible]	b	0062	[illegible]	"	0022	"
E	0045	[illegible]	c	0063	[illegible]	#	0023	[illegible]
F	0046	(	d	0064	[illegible]	$	0024	[illegible]
G	0047	[illegible]	e	0065	[illegible]	%	0025	[illegible]
H	0048	[illegible]	f	0066	[illegible]	&	0026	[illegible]
I	0049	,	g	0067	[illegible]	'	0027	'
J	004A	[illegible]	h	0068	[illegible]	(	0028	[illegible]
K	004B	[illegible]	i	0069	[illegible]	)	0029	[illegible]
L	004C	[illegible]	j	006A	[illegible]	*	002A	[illegible]
M	004D	[illegible]	k	006B	[illegible]	+	002B	[illegible]
N	004E	[illegible]	l	006C	[illegible]	,	002C	,
O	004F	[illegible]	m	006D	[illegible]	-	002D	[illegible]
P	0050	[illegible]	n	006E	[illegible]	.	002E	[illegible]
Q	0051	[illegible]	o	006F	[illegible]	/	002F	[illegible]

4.3 Cham Font Development

These fonts designed based on Cham dictionary and Unicode. The results of 3 types of Cham fonts are EFEO Panrang, EFEO Panrik, and EFEO Udong. The typeface of Cham font is designed based on Moussay's Cham-Vietnamese-French dictionary. See Figure 1.

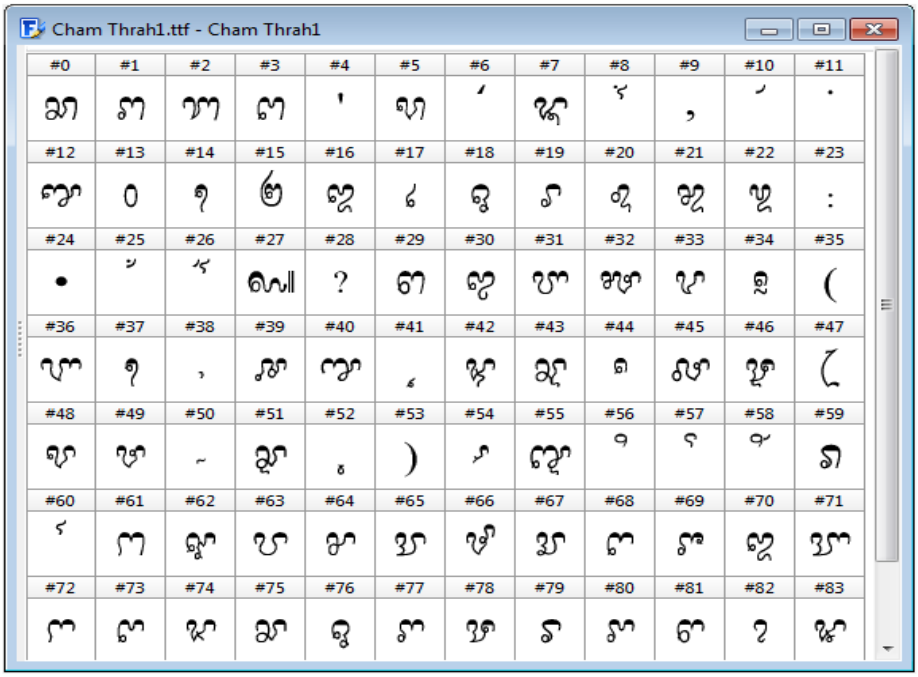

Figure 1: Code point location of EFEO Panrang font

The Times New Roman and EFEO Panrang in Microsoft Word document as shown in Figure 2.

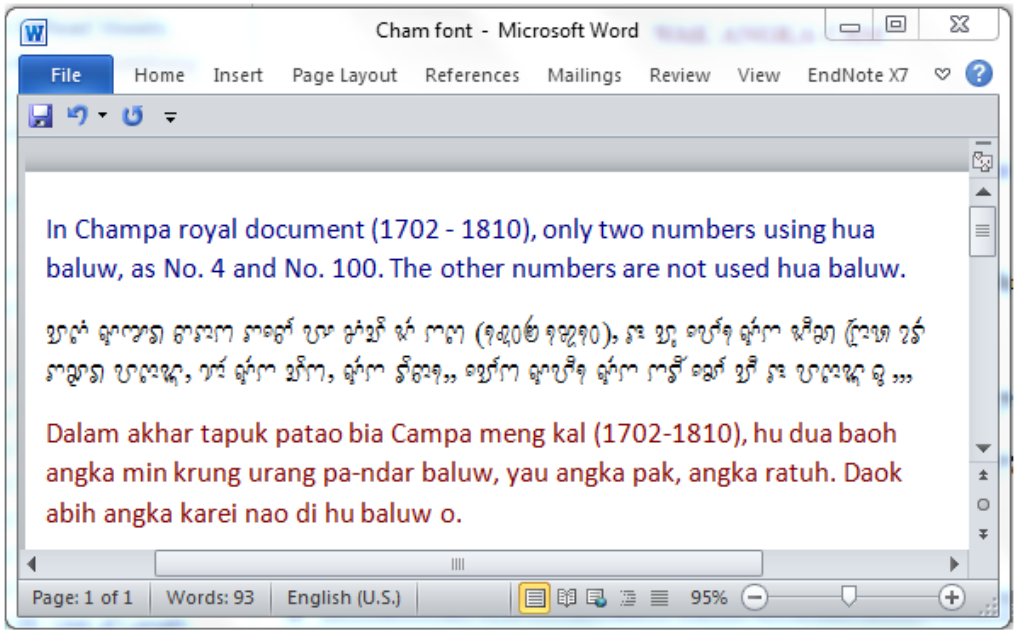

Figure 2: Times New Roman and EFEO Panrang in MS Word document

5. EXPERIMENTS

In this part, we have surveyed the keyboard platform for Cham font by group university students, and government staff, simultaneous to evaluate the acceptant level of Cham font from respondents and experts.

5.1. Exploring the Preferable Keyboard Platform

This part will address the research question: ¿What is the choice of platform that should be created for Cham fonts? In order to choose a platform for the Cham keyboard, such as Macintosh or Windows, we surveyed university students and government staff via an online questionnaire through Google Docs. The results are presented in Table 3.

Table 3. Choice of keyboard platform via online questionnaire

Item	Agreed	Disagreed	Missing	Total
Macintosh platform	114 (69.9%)	49 (30.1%)	37 (0%)	200 (100%)
Windows platform	161 (95.8%)	7 (4.2%)	32 (0%)	200 (100%)

Based on Table 3, the results showed that 114 people (69.9%) agreed that the Macintosh platform should be used, while 49 people (30.1%) disagreed. Meanwhile, 161 people (95.8%) agreed that the Windows platform should be used, while only 7 people (4.2%) disagreed. These results tell us that the respondents from the university students and government staff group have a good perception towards the use of both Macintosh and Windows for the Cham keyboard.

5.2 Acceptant Level of Cham Font from Respondents

This first part will address the level of respondents' acceptance of the Cham font. Each question in this part was answered on a scale from 1 to 5 to measure respondents' acceptance of the Cham font. The survey results for each question are presented in Table 4.

Table 4. The level acceptance of Cham font

No.	Item	Agree	Strongly Agree	Total
1	These Cham fonts display text clearly on Internet Explorer	35 (64.81%)	19 (35.19%)	54 (100%)
2	These Cham font display text clearly on Mozilla Firefox	35 (64.81%)	19 (35.19%)	54 (100%)
3	These Cham font display text clearly on Google Chrome	34 (62.96%)	20 (37.04%)	54 (100%)
4	Cham font character position run perfectly on Windows	19 (35.19%)	35 (64.81%)	54 (100%)
5	Cham font character position on keyboard are easy to use	23 (42.59%)	31 (57.41%)	54 (100%)
6	The Cham font size is similar with the Time New Roman font size	18 (33.33%)	36 (66.67%)	54 (100%)

Based on Table 4, for all questions, the results showed that all 54 respondents (100%) either agreed or strongly agreed with every statement. This indicates that the respondents had a good level of acceptance towards the Cham fonts. No respondent disagreed with any of the statements. Specifically, from the six items asked, item 6 showed the highest number of respondents choosing the answer 'strongly agree', at 36 (66.67%). These results tell us that the respondents agreed that the font size is similar to Times New Roman. Items 1 and 3 had the lowest proportion of 'strongly agree' responses, at 19 (35.19%) and 20 (37.04%) respectively. This implies that among the six items, respondents had the lowest perceptions towards the text display online. However, these items are still considered as high value.

To analyses we compute the score of six items for each respondent. The result is displayed as in Table 5.

Table 5. Number of respondents and total score for Cham font

Number of respondents	Total score
10	30
4	29

5	28
18	27
1	26
4	25
12	24

In order to make decision, we decided to categorize the score to two categories as follow:

Table 6. Categories of total score for Cham font

Categories	Total score
Not Accepted	6 -18
Accepted	19 - 30

Based on Table 5 and Table 6, it can be concluded that all respondent 54 (100%) accept the Cham font.

5.3. Acceptant Level of Cham Font from Experts

This second part will address the acceptance level of the Cham font from experts. We selected a total of 16 experts to evaluate six items instrument using Fuzzy Delphi. For each item in this instrument with a scale from 1 to 5. The level acceptance from Experts is presented in Table 7.

Table 7. Threshold Value and Percentage Consensus by Experts

Experts	**Items**					
	I1	**I2**	**I3**	**I4**	**I5**	**I6**
1	0.05	0.05	0.05	0.038	0.125	0.05
2	0.05	0.05	0.05	0.038	0.075	0.05
3	0.05	0.05	0.05	0.038	0.075	0.05
4	0.05	0.05	0.05	0.038	0.125	0.15
5	0.15	0.15	0.15	0.038	0.075	0.05
6	0.05	0.05	0.05	0.163	0.125	0.05
7	0.15	0.15	0.15	0.038	0.075	0.05
8	0.05	0.05	0.05	0.163	0.075	0.05
9	0.05	0.05	0.05	0.038	0.075	0.15
10	0.05	0.05	0.05	0.038	0.125	0.15
11	0.15	0.15	0.15	0.163	0.075	0.05
12	0.05	0.05	0.05	0.038	0.125	0.05
13	0.05	0.05	0.05	0.038	0.075	0.05
14	0.05	0.05	0.05	0.038	0.075	0.05
15	0.15	0.15	0.15	0.038	0.125	0.15
16	0.05	0.05	0.05	0.038	0.075	0.05
Frequency $d \leq 2$	16.00	16.00	16.00	16.00	16.00	16.00
Percentage item $d \leq 2$	100%	100%	100%	100%	100%	100%
d value for total construct			0.08			

From Table 7, the threshold ($d_{m,n}$) for each item based on the expertise and the percentage expert consensus ($d \leq 0.2$) for all six items are 100%, more than what required (75%). The value of d for total construct is 0.08 (required $d \leq 0.2$). This can be concluded that all 16 experts has come to consensuses, the Cham font is acceptable.

6. RESULTS

Based on the survey results on selecting the keyboard platform for Cham font, we design the three new Cham fonts include EFEO Panrang, EFEO Panrik, EFEO Udong and the results of the accuracy percentage of three Cham fonts are presented in Table 8.

Table 8. The Cham font survey results

	EFEO Panrang	EFEO Panrik	EFEO Udong
Not Accepted	0%	0%	0%
Almost	0.71%	0.02%	0.20%
Accepted	99.29%	99.98%	99.80%

Based on the Table 8, The three Cham fonts achieved the following results: EFEO Panrang (99.28%), EFEO Panrik (99.98%), and EFEO Udong (99.80%). Cham font will be used in schools, institutions as well as in assisting teaching and learning Cham language.

7. CONCLUSIONS

We have presented a new approach in Cham font analysis, design and development for all code point of value. Cham fonts have design based on Unicode and using for both Macintosh and Windows platform. Simultaneous to evaluate the acceptant level of Cham font from respondents and experts by using Fuzzy Delphi and Cham fonts products were developed using the ADDIE model. In addition, these Cham fonts as EFEO Panrang, EFEO Panrik, EFEO Udong positions on the keyboard are easy to use and the Cham font size appears similar to Times New Roman. Therefore, the conversion and storage information on both operating systems provides consistent results.

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