

# Designing Cham fonts for Windows and Macintosh

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# 1. INTRODUCTION

- Cham people are ethnic groups of the Champa kingdom was established in the second century in central Vietnam
- Cham language is one of the languages in the family of multi-island "Austronesian"
- Cham script has appeared on the first stone stele, namely of Dong Yen Chau (Tra Kieu) in the 4th century

# 1. INTRODUCTION

- Using Cham Fonts to write Cham script on the computer has become necessary and useful for several fields
- These Cham fonts are not uniform in encoding value, hence, and it caused many difficulties in the information exchange.

# 1. INTRODUCTION

- With the computer science development, creating new Cham fonts with technical requirements is essential to adapt with user needs in diverse areas, such as academic, research, and information exchange.
- Main purpose is to study for construction a new Cham font which is able to use for both Windows and Macintosh.

## 2. LITERATURE REVIEW

- The Cham script was systems of signs derived from the Sanskrit alphabet in southern India.
- Cham people have used Indian Sanskrit and then they have improved this Sanskrit completely and become the Cham script .
- Information technology has significantly contributed in the indigenous language education, restoring and preserving of ancient writing system is a very obvious fact in many countries

## 2. LITERATURE REVIEW

- In Vietnam, some organizations and individuals have created a number of Cham fonts to support for compilation of Cham documents
- The Cham fonts are designed on Unicode standard; however assigning characters (code points) to represent a character or diacritics of Cham language is slightly different.
- This is disadvantages for using and storage of Cham documents.

## 2. LITERATURE REVIEW

- Moreover, when converting of this font from Macintosh to Windows, the typing system for this font is no longer suitable.
- Hence, *bingudi tanran.ttf* and *camthrah.ttf* font were developed by camtanran.ttf rebuilt it for Windows, and redesigned of characters assigning on the keyboard. However, this font is still facing a number of obstacles and unstable during using process

### 3. CREATING NEW CHAM FONTS

- It is Cham-French dictionary of E. & A. Cabaton Aymonier; Cham-Vietnamese-French dictionary of G. Moussay, and *Akhar Thrah Cham* materials used in Cambodia
- New *Cham* Fonts will bring many advantages in exchanging information, creating and storing *Cham* documents on a computer widespread in domestic and foreign.



## 3.1 CHAM SCRIPT ANALYSIS

- The total numbers of *Akhar Thrah* characters required design are 86 characters.
- After analyzing and removing some of the same characters the total number of characters needed to be designed for *Akhar Thrah* fonts are 82 characters

## 3.1 CHAM SCRIPT ANALYSIS

ᨆᨘ	ᨆᨚ	ᨆᨛ	ᨆ᨜	ᨆ᨝	ᨆ᨞	ᨆ᨟	ᨆᨠ	ᨆᨡ	ᨆᨢ	ᨆᨣ
ᨆᨤ	ᨆᨥ	ᨆᨦ	ᨆᨧ	ᨆᨨ	ᨆᨩ	ᨆᨪ	ᨆᨫ	ᨆᨬ	ᨆᨭ	ᨆᨮ
ᨆᨯ	ᨆᨰ	ᨆᨱ	ᨆᨲ	ᨆᨳ	ᨆᨴ	ᨆᨵ	ᨆᨶ	ᨆᨷ	ᨆᨸ	ᨆᨹ
ᨆᨺ	ᨆᨻ	ᨆᨼ	ᨆᨽ	ᨆᨾ	ᨆᨿ	ᨆᩀ	ᨆᩁ	ᨆᩂ	ᨆᩃ	ᨆᩄ
ᨆᩅ	ᨆᩆ	ᨆᩇ	ᨆᩈ	ᨆᩉ	ᨆᩊ	ᨆᩋ	ᨆᩌ	ᨆᩍ	ᨆᩎ	ᨆᩏ
ᨆᩐ	ᨆᩑ	ᨆᩒ	ᨆᩓ	ᨆᩔ	ᨆᩕ	ᨆᩖ	ᨆᩗ	ᨆᩘ	ᨆᩙ	ᨆᩚ
ᨆᩛ	ᨆᩜ	ᨆᩝ	ᨆᩞ	ᨆ᩟	ᨆ᩠	ᨆᩡ	ᨆᩢ	ᨆᩣ	ᨆᩤ	ᨆᩥ
ᨆᩦ	ᨆᩧ	ᨆᩨ	ᨆᩩ	ᨆᩪ	ᨆᩫ	ᨆᩬ	ᨆᩭ	ᨆᩮ	ᨆᩯ	ᨆᩰ
ᨆᩱ	ᨆᩲ	ᨆᩳ	ᨆᩴ	ᨆ᩵	ᨆ᩶	ᨆ᩷	ᨆ᩸	ᨆ᩹	ᨆ᩺	ᨆ᩻
ᨆ᩼	ᨆ᩽	ᨆ᩾	ᨆ᩿	ᨆ᪀	ᨆ᪁	ᨆ᪂	ᨆ᪃	ᨆ᪄	ᨆ᪅	ᨆ᪆
ᨆ᪇	ᨆ᪈	ᨆ᪉	ᨆ᪊	ᨆ᪋	ᨆ᪌	ᨆ᪍	ᨆ᪎	ᨆ᪏	ᨆ᪐	ᨆ᪑
ᨆ᪒	ᨆ᪓	ᨆ᪔	ᨆ᪕	ᨆ᪖	ᨆ᪗	ᨆ᪘	ᨆ᪙	ᨆ᪚	ᨆ᪛	ᨆ᪜
ᨆ᪝	ᨆ᪞	ᨆ᪟	ᨆ᪠	ᨆ᪡	ᨆ᪢	ᨆ᪣	ᨆ᪤	ᨆ᪥	ᨆ᪦	ᨆᪧ

Table 1. Total number of characters to design Cham fonts






## 3.2. CHAM FONTS DESIGN

- Cham script has a total of 82 characters. However, we design and add seven new punctuation characters
- Then, numbers of character need to design are 90 characters.
- To type the letters of Cham script on computer, usually typing directly on the keyboard with lowercase letters as (q, w, e, r,...) and uppercase letters as (Q, W, E, R, ...).

## 3.2. CHAM FONTS DESIGN

- In addition, font Cham we design also have a particular characteristic, which is four characters (Takai Kuk, Takai Kâk, Takai Klak, Takai Kuak) can be used simultaneously, but do not overlap and very stable position.

### 3.2.1 FINAL CONSONANT LOCATION

we assign all *Akhar Matai* characters (final consonant group) as , , , , , ... the row key numbers, from the first key (~), 1, 2, 3.... to key number 9.

## 3.2. CHAM FONTS DESIGN

### 3.2.2 VOWELS AND CONSONANTS LOCATION

All of the *Ina Akhar* of Cham script such as 𑜀, 𑜁, 𑜂, 𑜃, 𑜄... located on the regional location of vowels and consonants in English keyboard, including Q, W, E, R, ... B, N, M. Also in this area, we assign an extra 6 characters of Takai Akhar,

Semi-vowels	diacritic	Key
<u>Takai kuak</u>	𑜀	W
<u>Dar tha dar dua</u>	𑜁	E
<u>Takai krak</u>	𑜂	R
<u>Takai kiak</u>	𑜃	Y
<u>Takai kâk</u>	𑜄	I
<u>Takai klak</u>	𑜅	L

## 3.2. CHAM FONTS DESIGN

### 3.2.3 DIPHTHONG AND SEMI-VOWELS

all of *takai akhar* (diphthong and semi-vowels) mostly remaining on the right side of the keyboard.

Diphthong and Semi-vowels	diacritic	Key
<u>Paoh ngâk</u>	ˊ	)
<u>Paoh thek</u>	ˋ	-
<u>Craoh aw</u>	ˆ	_
<u>Craoh aw paoh ngâk</u>	ˆˊ	=
<u>Craoh aw tut takai mâk</u>	ˆˋ	+

Table 3. Diphthong and Semi-vowels Location

## 3.2. CHAM FONTS DESIGN

- Cham Akhar Thrah in Vietnam using 82 characters while Cham Akhar Thrah in Cambodia only using 81 characters
- Cham in Viet Nam using ( 𑜀𑜂𑜆𑜐 ) but Cham in Cambodia using ( 𑜀𑜂𑜆𑜐 )
- Cham in Viet Nam using ( , ) but Cham in Cambodia using ( , )
- Cham in Viet Nam using ( , ) but Cham in Cambodia using ( ' )

# 4. EXPERIMENTS

- We have designed 90 characters Cham Thrah corresponding Unicode values as shown in table 4.

Key	Unicode	Cam	Key	Unicode	Cam	Key	Unicode	Cam
0	0030	၀	R	0052	ꠞ	p	0070	ꠣ
2	0032	၂	S	0053	ꠟ	q	0071	ꠣ
4	0034	၄	T	0054	ꠟ	r	0072	ꠣ
7	0037	၇	U	0055	-	s	0073	ꠣ
8	0038	၈	V	0056	ꠟ	t	0074	ꠣ
9	0039	၉	W	0057	,	u	0075	ꠣ
:	003A	ꠣ	X	0058	)	v	0076	ꠣ
;	003B	ꠣ	Y	0059	ꠣ	w	0077	ꠣ
<	003C	ꠣ	Z	005A	ꠣ	x	0078	ꠣ
=	003D	ꠣ	[	005B	ꠣ	y	0079	ꠣ
>	003E	ꠣ	\	005C	ꠣ	z	007A	ꠣ
?	003F	ꠣ	]	005D	ꠣ	{	007B	ꠣ
@	0040	ꠣ	^	005E	ꠣ		007C	ꠣ
A	0041	ꠣ	_	005F	ꠣ	}	007D	ꠣ
B	0042	ꠣ	`	0060	ꠣ	~	007E	ꠣ
C	0043	ꠣ	a	0061	ꠣ	!	0021	ꠣ



# 4. EXPERIMENTS

D	0044	ဃ	b	0062	ဃ	"	0022	"
E	0045	ဃ	c	0063	ဃ	#	0023	ဃ
F	0046	(	d	0064	ဃ	\$	0024	ဃ
G	0047	ဃ	e	0065	ဃ	%	0025	ဃ
H	0048	ဃ	f	0066	ဃ	&	0026	ဃ
I	0049	.	g	0067	ဃ	'	0027	'
J	004A	ဃ	h	0068	ဃ	(	0028	ဃ
K	004B	ဃ	i	0069	ဃ	)	0029	'
L	004C	,	j	006A	ဃ	*	002A	ဃ
M	004D	ဃ	k	006B	ဃ	+	002B	'
N	004E	ဃ	l	006C	ဃ		002C	,
O	004F	ဃ	m	006D	ဃ	-	002D	'
P	0050	ဃ	n	006E	ဃ	.	002E	•
Q	0051	ဃ	o	006F	ဃ	/	002F	ဃ

Table 4. Code point values corresponding to Cham Thrah character

## 4. EXPERIMENTS

- Results character s ('س') has designed on the Outline Window interface as in Figure1. and testing interface on Preview Metrics as Figure2

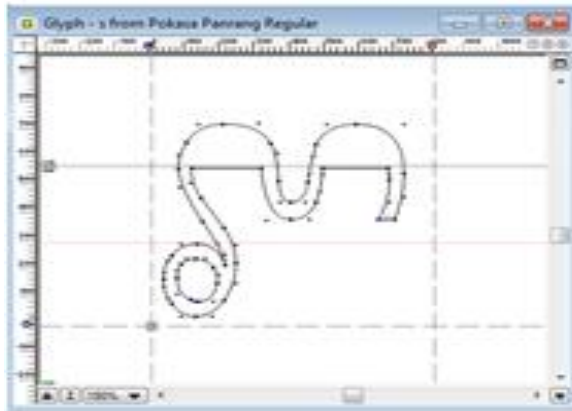


Figure 1.

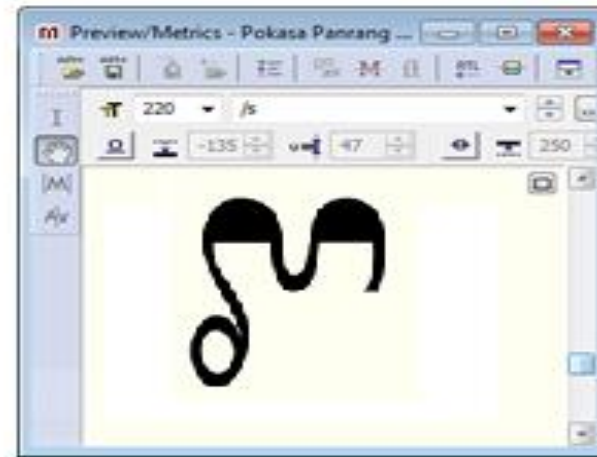
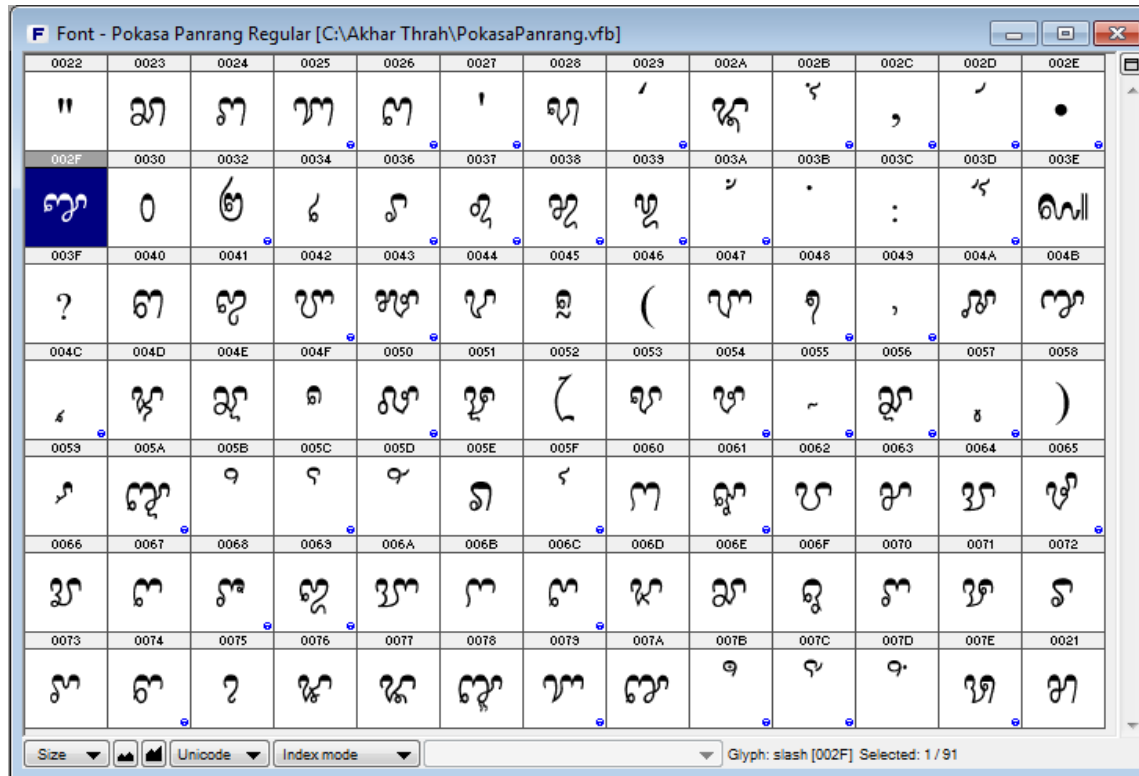


Figure 2.

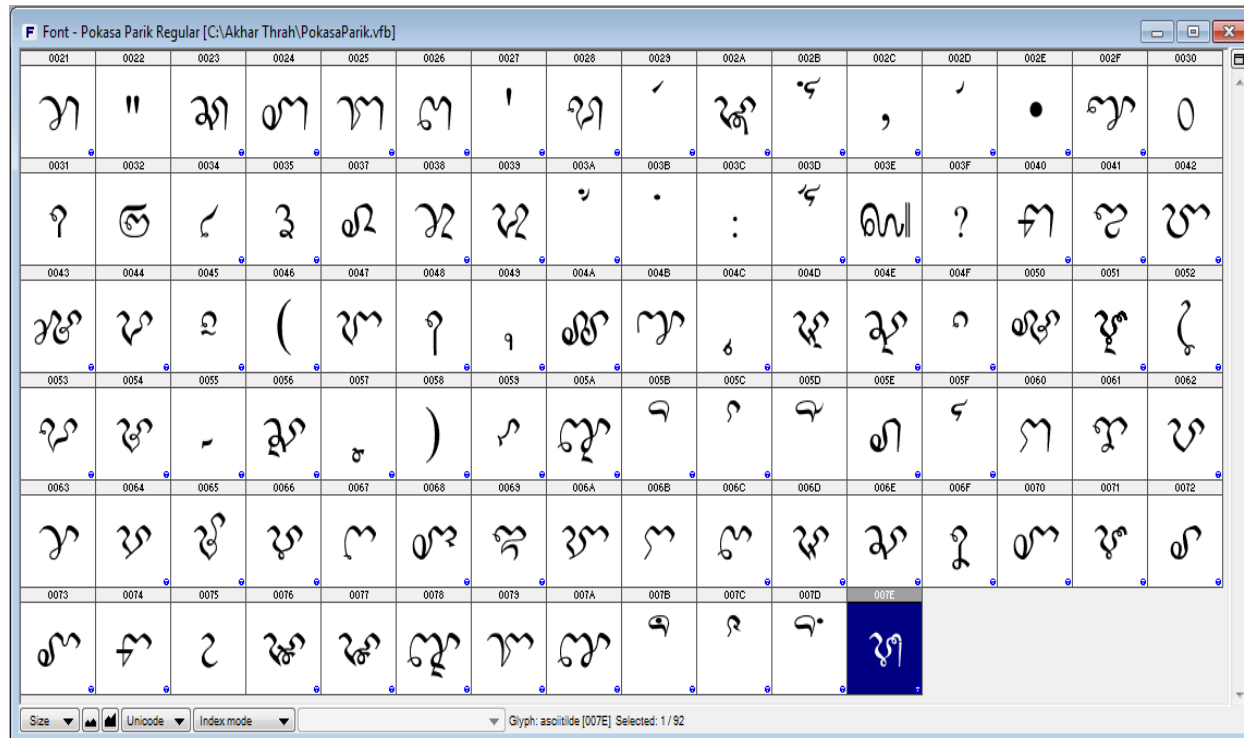
## 4. EXPERIMENTS

- Cham Thrah1* typeface is based on drawings presented in Cham-Vietnamese-French dictionary of G. Moussay, published in 1971



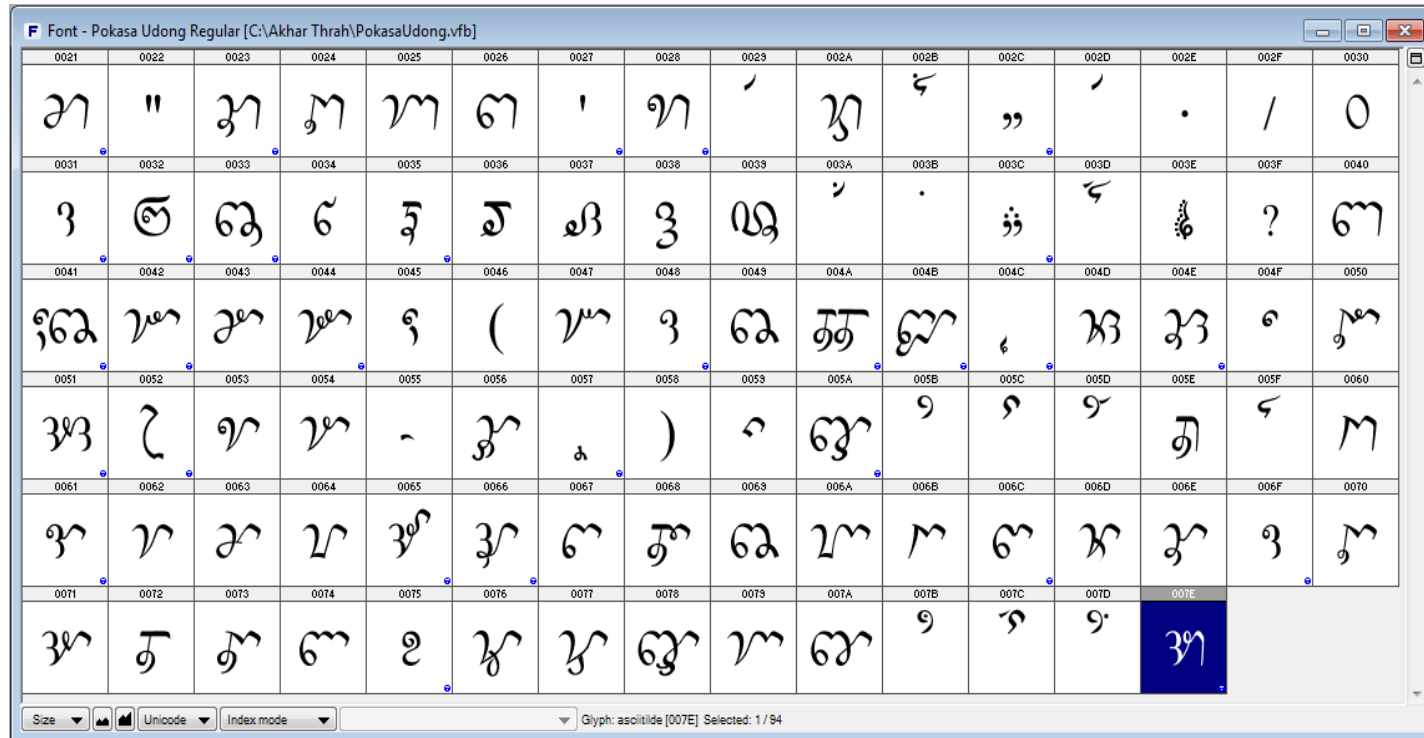
## 4. EXPERIMENTS

- Cham Thrah2* typeface is based on drawings presented in Cham-French dictionary of E. Aymonier & A. Cabaton published in 1906.



## 4. EXPERIMENTS

- Cham Thrah3*, refer to Cham Cambodia script, a typeface of *Akhar Thrah* fonts presented in the Cham language documents comes from Cambodia



## 5. RESULTS

- *Cham Thrah* fonts new create has significant in compilation, research, storage, communication and teaching Cham language
- Three font *cham thrah1*, *cham thrah2*, and *cham thrah3* have the same value on both windows and Macintosh operating systems
- Cham fonts using these methods are shown in section 3 and in Figure 3, 4 and 5.

## 5. RESULTS

survey of 50 users and result shows that *cham thrah* font's new design has surpassed in accuracy and ease of use as shown in Figure 6. Specifically, has achieved 60% of usability and 65% of high accuracy. Similarly, *champa* font only achieve (12%, 8%), *camtanran* (5%, 14%) and *bingu tanran* (23%, 13%).

## 5. RESULTS

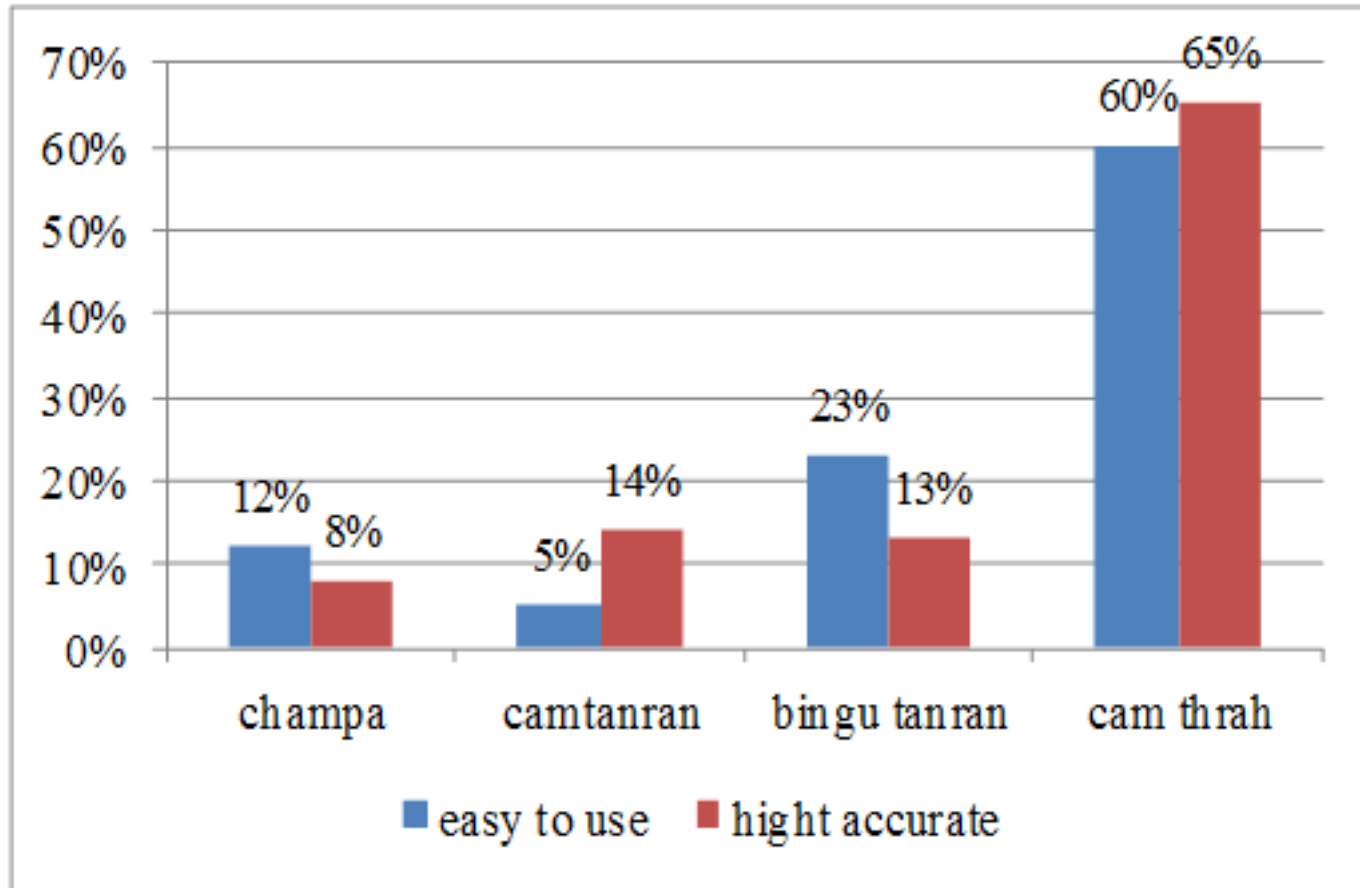


Figure 6. Chart of survey and assessment Cham font



## 6. CONCLUSIONS

- We have presented a new approach in analyze and design all code point value of Cham fonts reasonable on the keyboard, ensuring the scientific of each character on Cham script and convenient in use.
- Cham fonts have design based on Unicode and using for both Macintosh and Windows operating systems. Furthermore, Cham character and Times New Roman characters have the same size in the same text. Therefore the conversion or storage information on both operating systems is steady results.

## 6. CONCLUSIONS

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Thank you for  
listening