

## Designing a New Digital Font for Modi-Script

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### Abstract

The mature form of language is known with its script. There are many languages all over the world took help of other scripts to express its literary values in terms of human phonetic and literary wealth of human civilization. In the history of Indian scriptology Marathi language had used Modi script during 12<sup>th</sup> century. It mainly came into the eyes of researchers because all documents were found in Modi script during the era of great Maratha emperor Shivaji Rajee Bhosale also known as Chatrapati Shivaji Maharaj.

Modi-Script is one of the ancient scripts in India. Modi-Script was the official language to write Marathi documents and administrative papers till 19<sup>th</sup> century. Also, British Government decided to discard the use of Modi due to its complexity and non-uniformity and start the use of "Devanagari (Balbodh)". Although, Modi was taught in the schools and it was used by the older generation till 1950. As time passed by the use of this very important script got reduced and it was on the verge of extinction.

Fortunately, so many documents and manuscripts were found from the different parts of the world like London, Paris, Spain, Holland and South Asia. Number of researchers and historians have increased and tried to save this lost culture. Also, these precious manuscripts are suffering from decay and it can't be manually handled or scanned, Hence there is a need for digitizing those manuscripts and make them available to the historians and researchers. So, there is a scope in designing a digital font for Modi script with proper technique which will help these documents and manuscripts to be preserved in the digital format. This thesis describes the designing of a logically modified font type for Modi-Script which will be useful for printing the educational books and for websites and mobile applications too. Also it describes the importance of the Modi-Script and why it is necessary to save this script by extinction.

**Keywords:** Script; Manuscripts; History; Culture; Values; Digital Font; FontForge

## Introduction

Modi script has been used since 13<sup>th</sup> century and it was primary language for communication from “Yadav Kingdom”. It was mainly used to write administrative papers in Marathi language. There are a few speculations regarding the origin of this script. It is believed that Modi script was invented by Hemadri Pandit during the era of Mahadev Yadav (1260-1309) [1]. “It is popular notions that only Marathi is written in Modi but, other languages have been found to have been written in modi are Urdu, Kannada, Gujrathi, Hindi and Tamil [2]” (Figure 1).

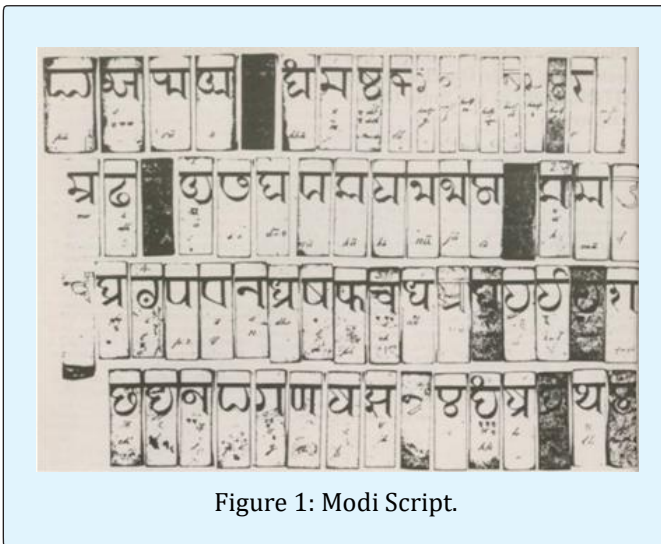


Figure 1: Modi Script.

Hemadpant was chief administrator of Yadav Bloodline. Also, a few other traditional people believe that Balaji Avaji, the secretary of Shivaji Raje Bhosale (1642-1680), also known as Chatrapati Shivaji Maharaj has invented the Modi script. But confirming these facts were very difficult at that time but it's clear that this script has been adapted from the Nagari family of scripts [3]. Modi script is a cursive type of writing Marathi with a few modifications of the alphabets [4]. Modi script was an official language of Maratha Empire since the beginning till mid-20<sup>th</sup> century. But after the 1950s, when British government was established, the use of Modi script was discarded because of its complexity and Devanagari (Balbodh) was brought and it became the primary writing script for Marathi [5]. There are so many precious documents and manuscripts are retained in not only Southern Asia but also in various parts of the world such as London, Paris, Spain, and Holland. The earliest Modi

documents have been found is dated back to the initial decades of the 17<sup>th</sup> century. And most of these documents are mainly administrative papers like Land agreements and official letters etc. This script was also used for journalism and educational purpose till the 1950s (Figure 2).

Charles Wilkins started the first printing method for Modi script by cutting a metal font. It was used to publish newspapers, journals and other individual diaries and papers in Modi. These days so many government institutes are offering courses to learn Modi just to restore the lost culture and fortunately many enthusiasts and Modi researchers are coming forward to learn Modi.

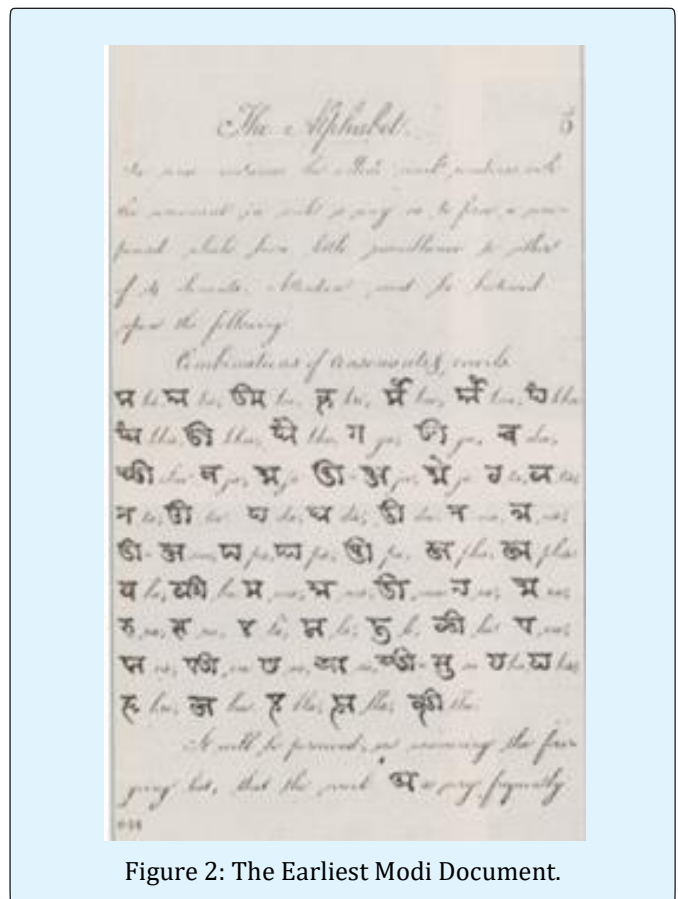
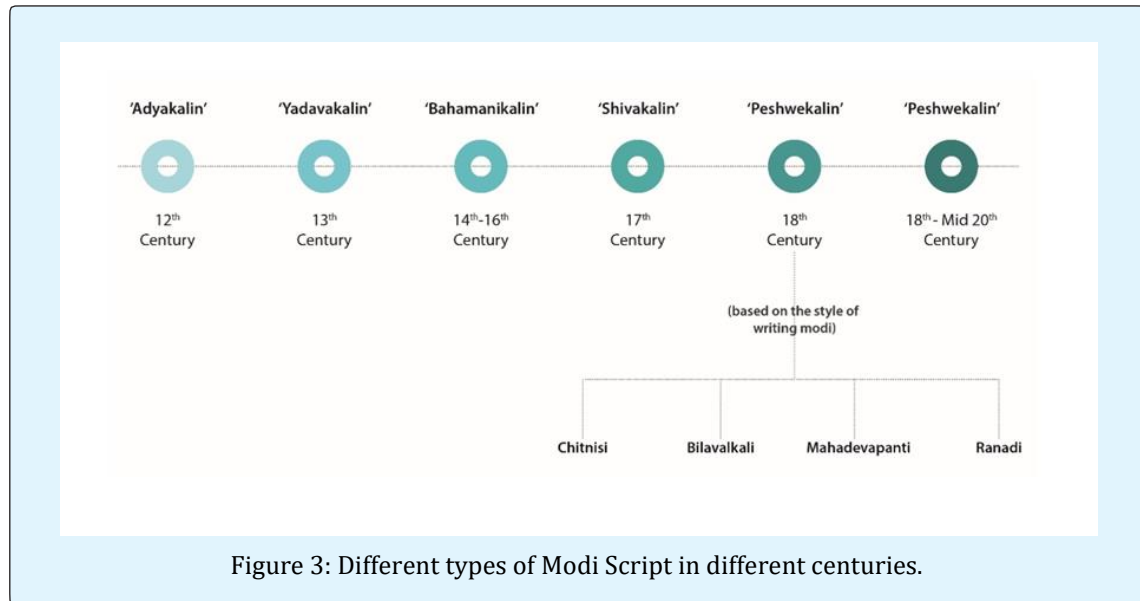


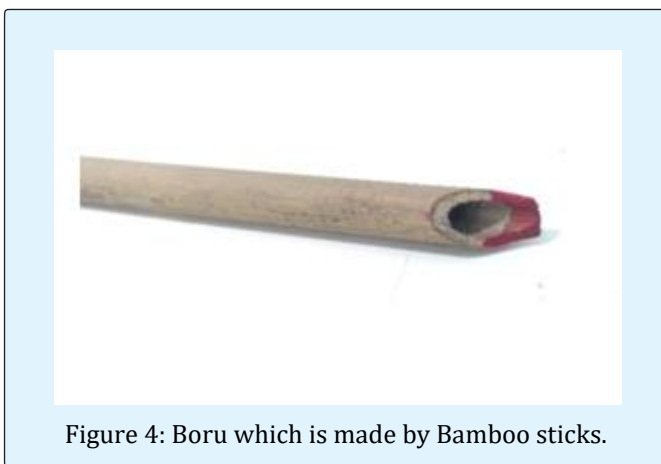
Figure 2: The Earliest Modi Document.

According to century the writing style of the Modi script was also got changed. There are total 5 different styles of writing Modi still available from the existing sources (Figure 3).

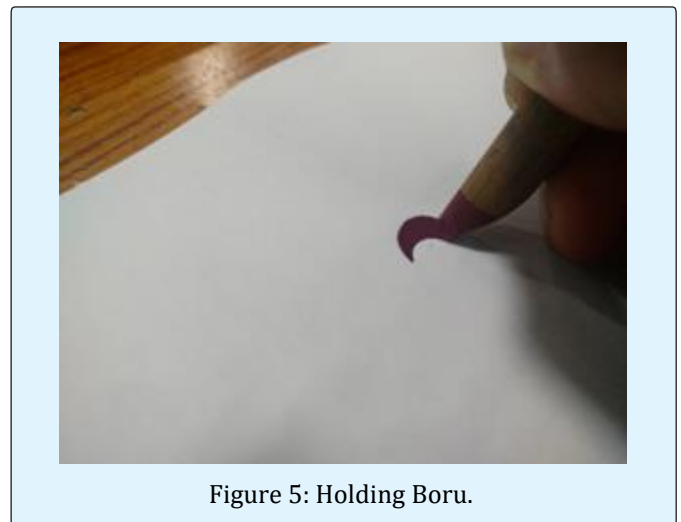


### Basic Character Set of Modi

People used to write Modi with “Boru”. Boru is a ‘lekhani’ (Pen), which is made by Bamboo sticks. To write with Boru, people had to dip it in the ink more often than feathers. The Modi script has total 46 unique letters out of which 36 are the consonants and 10 vowels, these are the basic characters. As it was mentioned earlier here that Modi script is almost same as Devanagari script, when we compare Modi to Devanagari, in Devanagari script there are total 48 unique characters out of which 36 are consonants and 12 are vowels. Just because in Modi script there is no long ‘I’ (eekar) and long ‘u’ (ookar). Also there is one distinctive difference between Modi and Devanagari is drawing “headline” (Shirorekha) once we finish writing a word, but while writing in Modi the headline is drawn first right across the page and then begin writing.



As Modi script was cursive style of writing, the lifting of a Boru (Pen) was not needed. Modi script doesn’t have any punctuation mark or any conjunctions. Also, it doesn’t have any indication whether exactly where the sentence is ending and it was continuously written script hence it doesn’t have any space between the words (Figures 4 & 5).



### Basic Rules of the Modi Writing

- Unlike in Devanagari there is no long “eekarI ” and “ookar u”. There is only single “eekar” and “ookar” which reduces the grammatical mistakes.

- There are few letters such as ‘ee E’, ‘na N’, ‘jha j’, ‘nha n’, ‘ta t’, ‘da d’, ‘dha ^’ are exactly similar to the letters of Gujrathi script [6].
- There is no anuswar ‘m’ in Modi.
- As Modi is cursive type of writing script there is no lifting of pen while writing in Modi. Hence draw a

- horizontal line first and then begin with the writing. Pen is lifted only for few special letters like ‘G’, ‘d’, ‘j’, ‘j’, ‘y’, ‘j’.
- There are no separate ‘Ee’ and ‘EW’ vowel signs like Devanagari [7]. They are represented by ‘A’ with single and double matra ( o and O ).

#### Vowels (Figure 6)

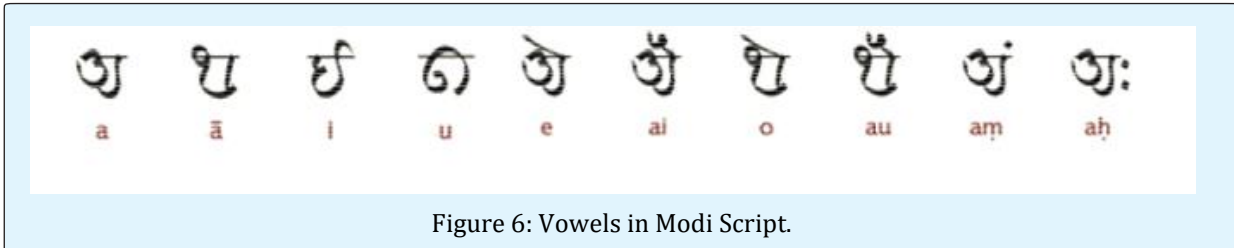


Figure 6: Vowels in Modi Script.

#### Consonants (Figure 7)



Figure 7: Consonants in Modi Script.

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## Understanding the Anatomy of Modi Script

The anatomy of Modi script is almost same as the Devanagari script with little differences (Figure.48). Except rendering behaviours, the guidelines for writing Modi are almost same with different nomenclature. M.W.Gokhale used body patterns to explain the different parts of the letter in anatomy. The human body is used for deciding the vertical amount of the letter taking it as a reference and they are as follows: Urdhvarekha (top most line), Shirerekha (head line), Skandarekha (shoulder line), Nabhirekha (navel line), Janurekha (knee position line), Padarekha (foot line), Talarekha (extreme bottom line) (Dalvi, 2009) [8].

In Figure. 48 the Anatomy of Modi script is shown. It is written "MODI LIPI" (Modi script). As compared to the guidelines for Devanagari script here we have Rafar line (Urdhvarekha), Eekar line, Headline (Shirerekha), Nabhirekha, Base line (Padarekha), Rukar line (Talarekha). Rafar line is where the single and double Matras ends. It is followed by Eekar line where Velanti touches. For e.g. the top most part of the Velanti of letter Pa p is touching the 'Eekar line'. Then Nabhirekha is the centre line of the actual letter followed by base line where the stem of the letter resides. In extreme bottom there is Rukar line, this line depicts the maximum limit of the lower vowel signs (Ookar, Rukar etc.).

## Characteristics of the Modi Font

- **Block loop:** It is the part of the Knot which is closed or filled totally. For e.g. it is seen in a letter Ma M. When stroke is meeting with its own previous stroke on left side then it is completely filled. This block loop is seen in following letters; Ma M, Aa ;, Fa F.
- **Counter:** Counter is the negative space which is enclosed inside a letter. For e.g. letters like Va V, Ba B, Sa S etc.

Sometimes the counter space is drawn completely or slightly open it depends on the designer of the font. But with slightly open counters the readability is higher.

- **Knot:** it means when the stroke coincide with another and extends further to complete the letter. For e.g. Ka K, Ma M, Jha j. Deciding Knot size in font is very crucial because when it comes to type below 10 point then this Knot must create even grey.

## Basic Structure of a Proposed Modi Font

There are mainly three principles in Visual Ergonomics of Typography and they are as follows; Visibility, Legibility and Readability. 'Visibility' means whatever comes into our visual cone. 'Legibility' means individual identity of a letter or how fast we can identify each letter. And 'Readability' means how fast we can decode the given information in paragraph. After studying old Modi letters and documents, we could be able to understand the calligraphic structure of the script, construction of a letter, axis, knots, nodes, loops axis, grey value and contrast between individual letters, character height and width, start and end point of the letter etc.

After long, detailed and careful consideration we decided to go with Mono linear font for this Modi script. Because it has uniform thickness of the stroke and its readability is much higher as compare to previous fonts. Earlier there are hardly any fonts have been designed and developed for Modi script for e.g. Hemadree, Modi Ghate, Modi Kasture etc [9]. but all these fonts are mainly designed for the aesthetical purposes just to look it beautiful and authentic. These fonts have used mainly calligraphic style of writing. Without doubt it looks beautiful but when it comes with whole bunch of sentences and paragraphs then its legibility and readability comes for a toss. It becomes very difficult to even look at the page (Figure 8).

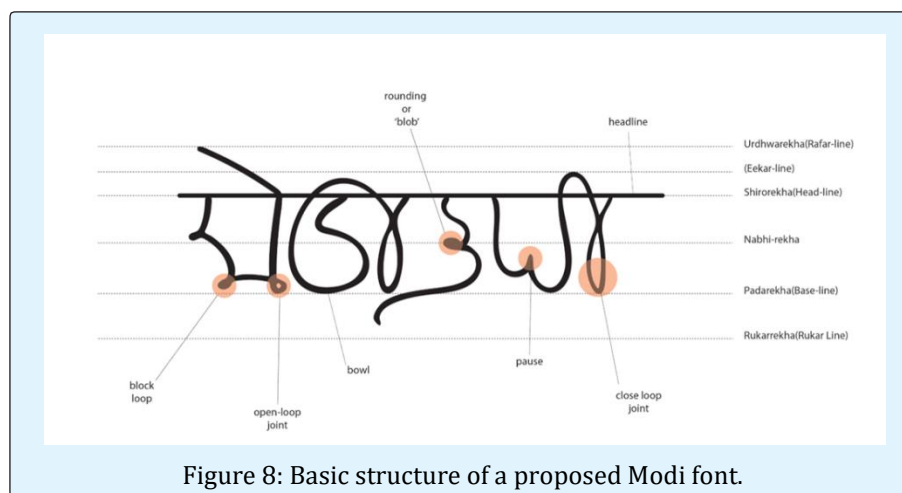


Figure 8: Basic structure of a proposed Modi font.

### Understanding the Tools and Letterforms

Before going on digital medium it's always good to work on papers. Here we have tried various calligraphy tools to explore the letterforms of Modi script. Calligraphy tools like Chisel Markers, Cut nib pens, Bullet tip pens and traditional tool for writing Modi script 'Boru'. With help of this tools it became easy to understand and decide the stroke variations of letter, joints, balance between inner and outer counter space, kerning, flow of each letter (just to achieve the handwritten effect) etc. As Modi is cursive type of script hence spacing between each letter is very important. In Figure 9 Chisel markers are used to write Modi letters. In Figure 10 Cut-nib pens are used for calligraphy. Here the same technique is used to write Modi letters which is used for Devanagari calligraphy. As per the decision we have decided to create Mono-linear font for Modi and to understand the rendering and structural behaviour of letter we have used Bullet tip markers to write Modi letters.

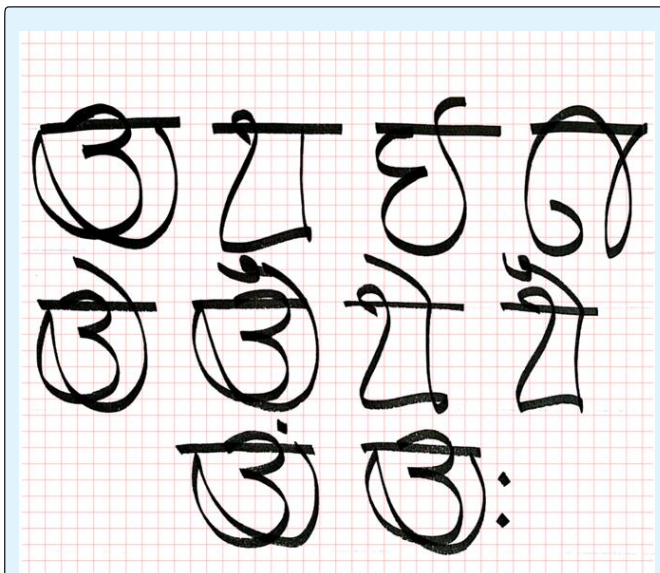


Figure 9: Calligraphy using Chisel markers.

As it is seen in the flow of the characters doesn't come smoothly and uniformly as per the requirement. Also the Headline (Shirorekha), should be having less thickness as compared to the actual stroke width of the character.

In Figure 11, a Cut nib pen is used to write Modi. Here entire character set is written with the cut nib pen to see the structural behavior of the letters. When cut nib pen is used to give calligraphic style then it is seen that the 'Knots' of the few letters which should be open are looking as they have been closed at smaller point. For e.g.

the Knots of Ga G, PhaF, Ma M should be open but at smaller point size they are getting merge into each other.

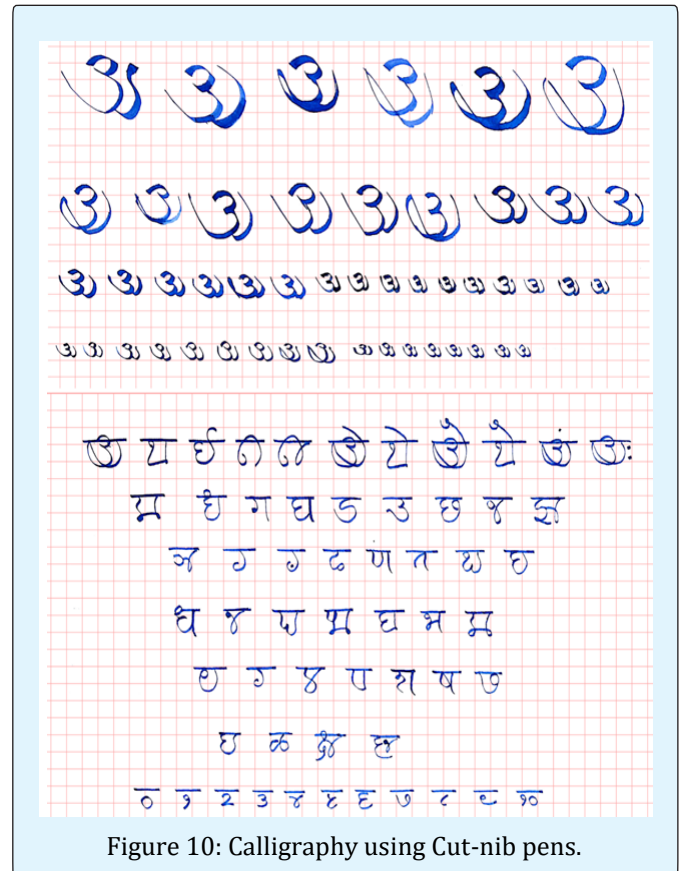


Figure 10: Calligraphy using Cut-nib pens.

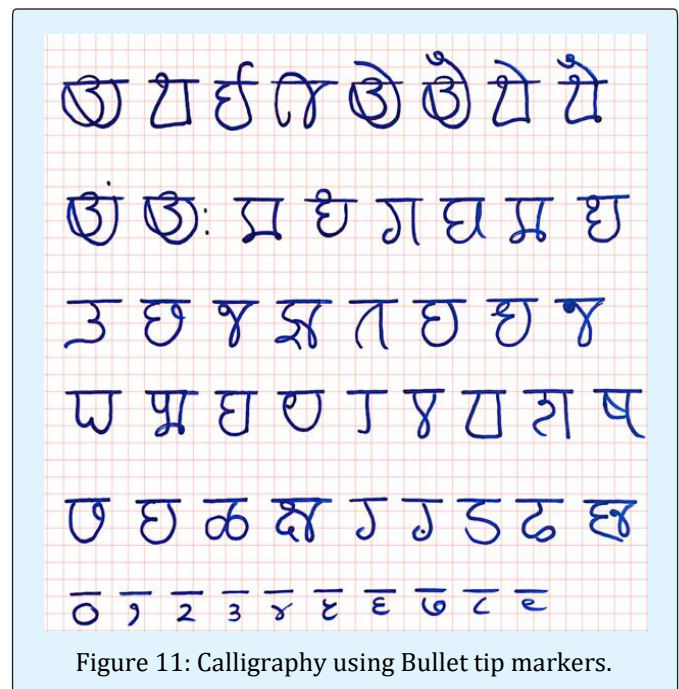


Figure 11: Calligraphy using Bullet tip markers.



Figure 12: Finalizing Modi characters on paper with bullet tip marker.

In Figure 12, a Bullet tip pen is used to write the complete character set of Modi script and the numerals. The unique feature of this Mono-linear font is the stroke width is almost same at every point. And it has been achieved by using Bullet tip markers. The next step is to finalize each character of Modi on paper with proper dimensions using Bullet tip pen (Figure 13).

In this Figure 14 corrections have been made like the thickness of the stroke was uneven at few place, or few knots were closed due to thickness of the marker few characters width was not proper and in some characters loops were fully closed. These corrections needed to get fixed before moving further. As we have decided to follow handwriting style in Modi then it was essential to decide the flow of the characters before digitizing. It is shown in Figure 14 below. Here the flow of the character is shown with the help of start point, Pause and an End point. For e.g. Modi letter Aa A has a starting point on the 'Headline' then it goes above headline and then comes down by breaking the Headline then follows the path then touches the 'Baseline (Talarekha)' then again goes up till the Headline and then take Pause. Then from Pause point goes down again and touches Baseline and then follows a curve and then finally meets the Headline.

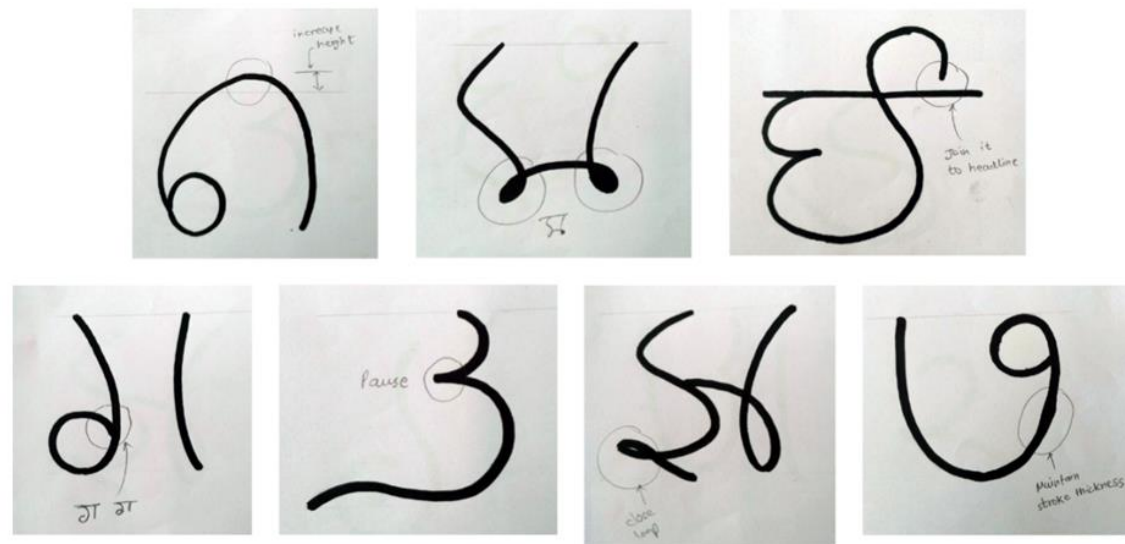


Figure 13: Initial exploration and making corrections to standardize the different features of characters.

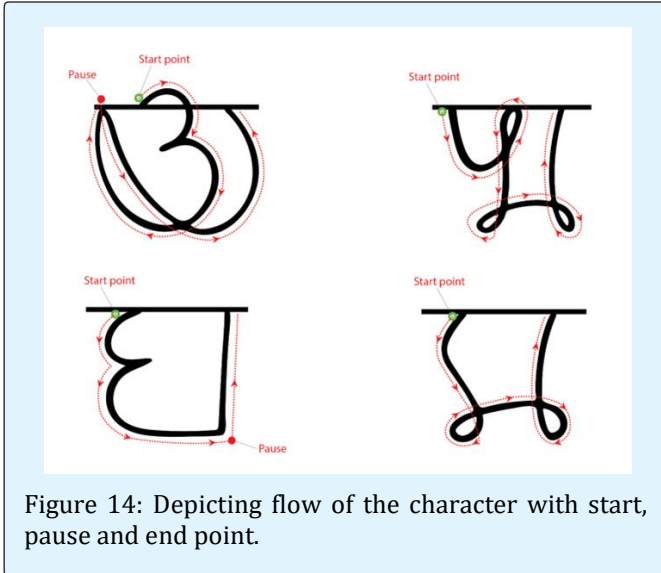


Figure 14: Depicting flow of the character with start, pause and end point.

### Aesthetic Features of Newly Designed Modi Font

After studying various calligraphy tools on paper it led us to fix the design features for newly designed Modi font. These are based on basic characteristics of anatomy of Modi script (section.3.3) like structural features and nomenclatures of letters based on guidelines for Devanagari [8]. And based on these guidelines we have decided design parameters as follows:

- Character height
- Larger counter space
- Setting the spacing between the letters

- Width of the character
- Maintaining the stroke width
- Slightly keeping open counters for better readability
- Keeping in mind the basic language of Marathi and Hindi while designing the glyphs
- The proportion of the letters are decided with the help of M.W.Gokhale's guidelines [8]. E.g. There are four strokes are taken for upper Matra, main character height needs eight strokes and bottom Matras need four strokes

### Digitizing the characters

Digitizing of the characters means its vectorization. Before taking any glyphs into the Font developing software it is needed to vectorize the glyph. This process starts when calligraphy is done on paper with its final corrections and refinement. For vectorising the each glyphs 'Adobe Illustrator CC' was used. This process involves following steps:

- Scanning of handwritten letters and transfer it to Illustrator.
- Using scanned image as a reference draw a new vector shape using appropriate tool, here Pen tool was used (Figure 15).
- Once drawing of a vectorised shape of the letter is done then correction process starts as per the design parameters (see section 3.5).
- Once done with the corrections and the refinement then save the document in the SVG format. Repeat the process to create remaining letters.

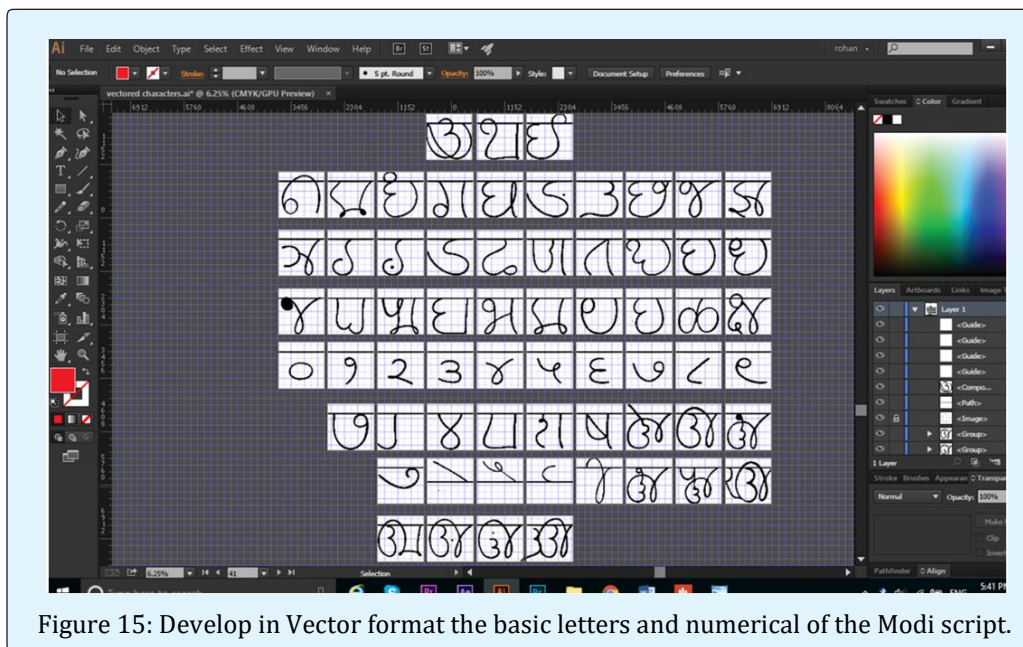


Figure 15: Develop in Vector format the basic letters and numerical of the Modi script.



### Developing a font using FontForge Software

The proposed font for Modi script was developed in a FontForge software [10]. This software works well with beginners as well as professionals because it has well improved toolset for designing a Font. This software is free for Windows and it encourages the commercial use. There are mainly 4 windows in this software [11], they are as follows:

- The Font view Window: This is the landing window which open right after opening of the software.

- The Character view Window: To open this window it is required to double click on the glyphs on the Font view Window. This is the window where actual designing of the glyph happens.
- The Metrics Window: This window is used when we need to adjust the spacing and kerning of the letters.
- The Font Info Window: Every information about the font can be found in this window.

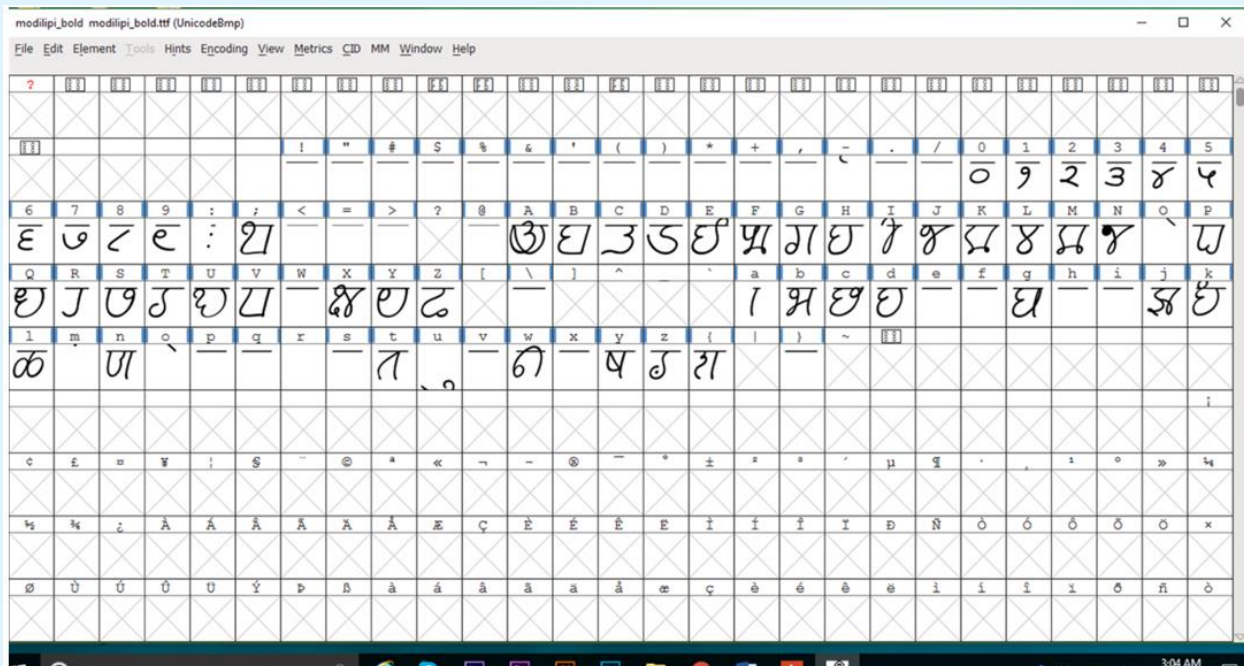


Figure 16: Assigning the Modi letters phonetically to the English letters in 'Font View Window' in FontForge software.

The next step was to import all the vectorised characters, which were designed in the Illustrator to FontForge. This was done by double clicking on the glyphs from the Font view Window and then import specific letter to the respective letter. All these Modi characters are assigned phonetically with the English keyboard here. For e.g. Aa A is assigned to Capital letter 'A', Ba B is assigned to Capital letter 'B' and so on (Figure 16).

Then the next step was to create the vector outlines for

Modi script in the Character Window. This was achieved by double clicking the glyphs in Font view Window and then importing the SVG file created in the Illustrator. Also it has almost same tools like Illustrator like to adjust different knots and different curve etc. For e.g. Modi letter Aa A is drawing here in the 'em square'. EM square means each letter has its own dedicated space in the printing. After this glyph design in character window was completed, the spacing between individual letters i.e. kerning is decided and managed in the Metrics window (Figure 17 & Figure 18).

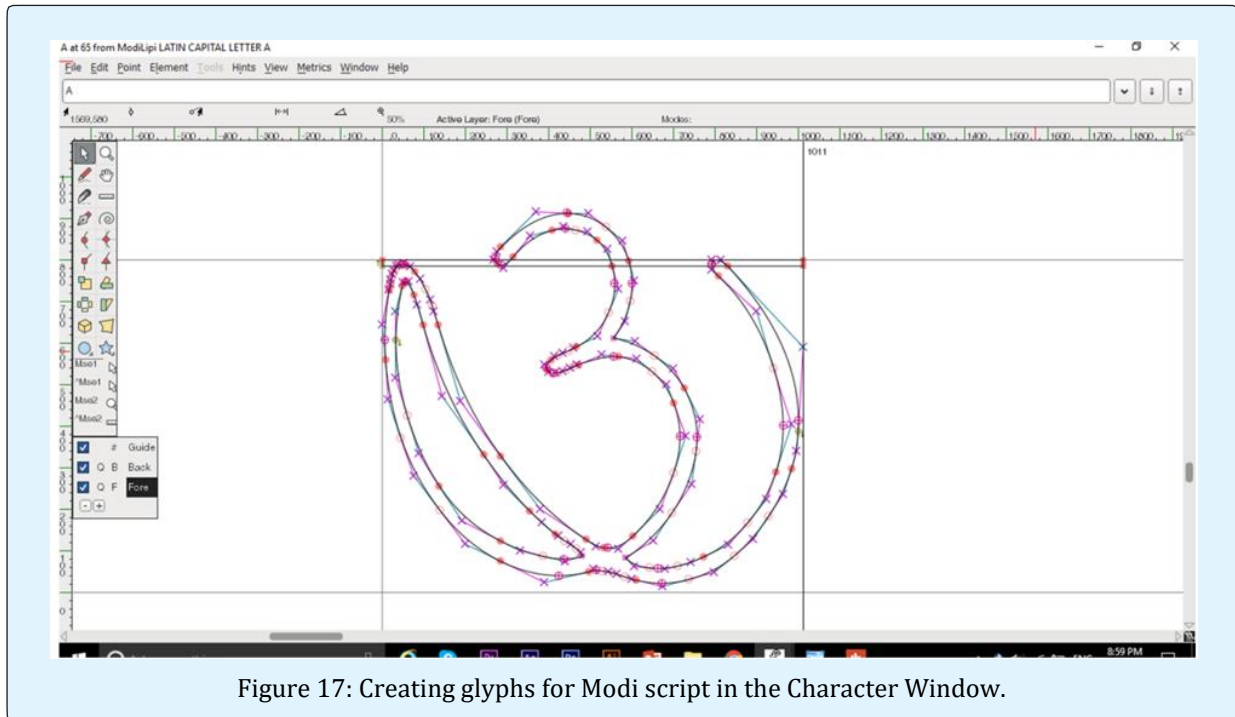


Figure 17: Creating glyphs for Modi script in the Character Window.

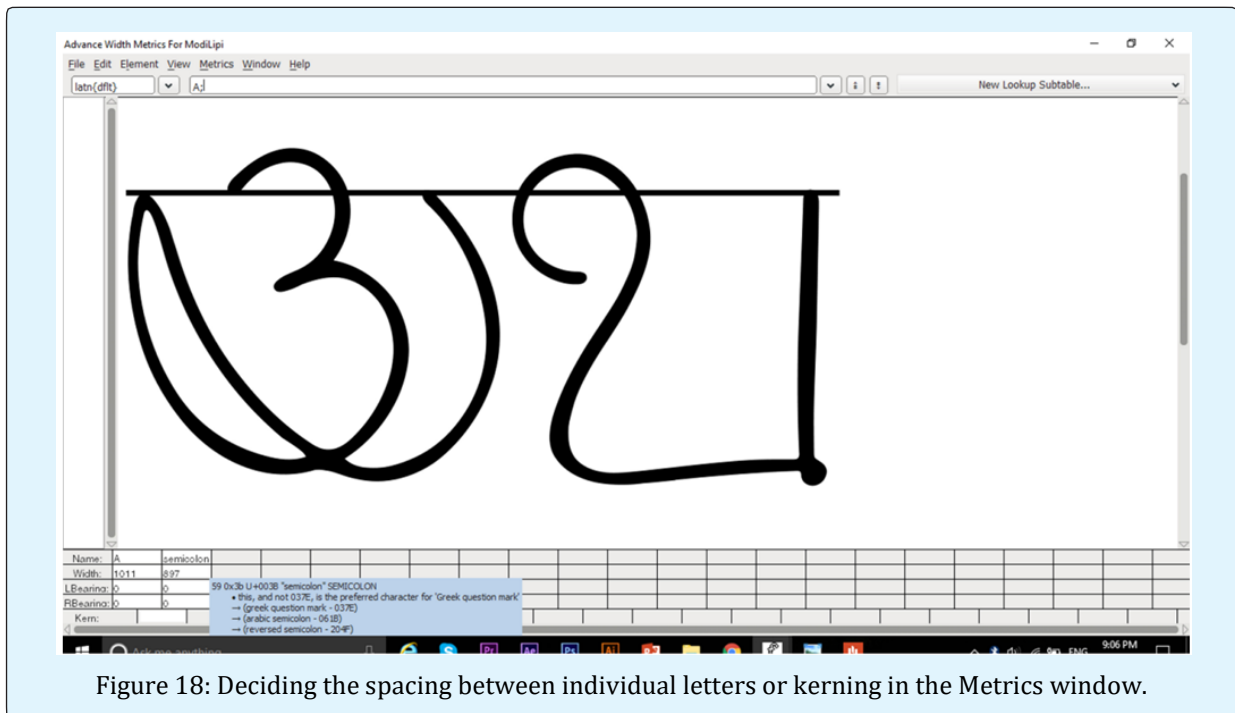


Figure 18: Deciding the spacing between individual letters or kerning in the Metrics window.

### Designing Basic Character Set in FontForge

The Basic Character set contains Vowels, Consonants, Vowel signs and Numerical. All of these were designed in a FontForge software. There are basic 2 types were designed one is 'Modi\_Regular' and other one is

'Modi\_Bold\_Italic', shown in (Figure 20). In Figure 21 it can be seen the keyboard for newly designed Modi font. Each letter of Modi is assigned phonetically with the English letters for simplicity and ease of use. Also the vowel signs are assigned phonetically for e.g. the vowel sign 'Eel' is assigned with the English letter 'I'

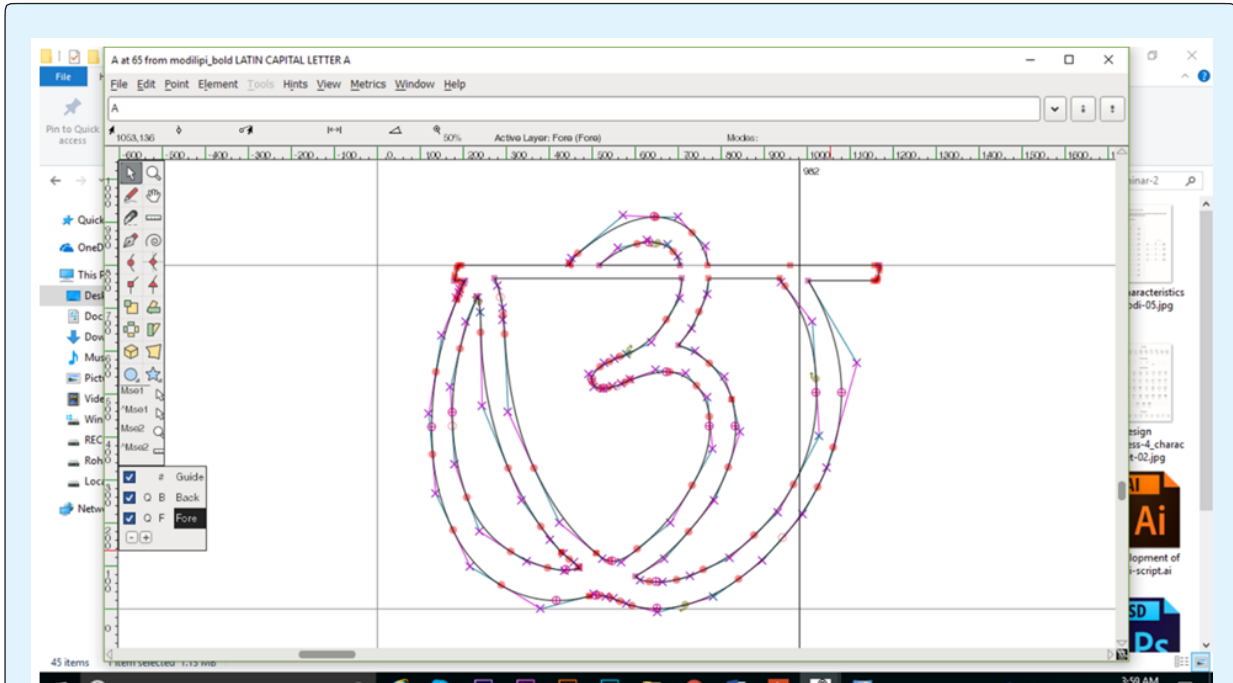


Figure 19: Creating the corrections in the glyphs.

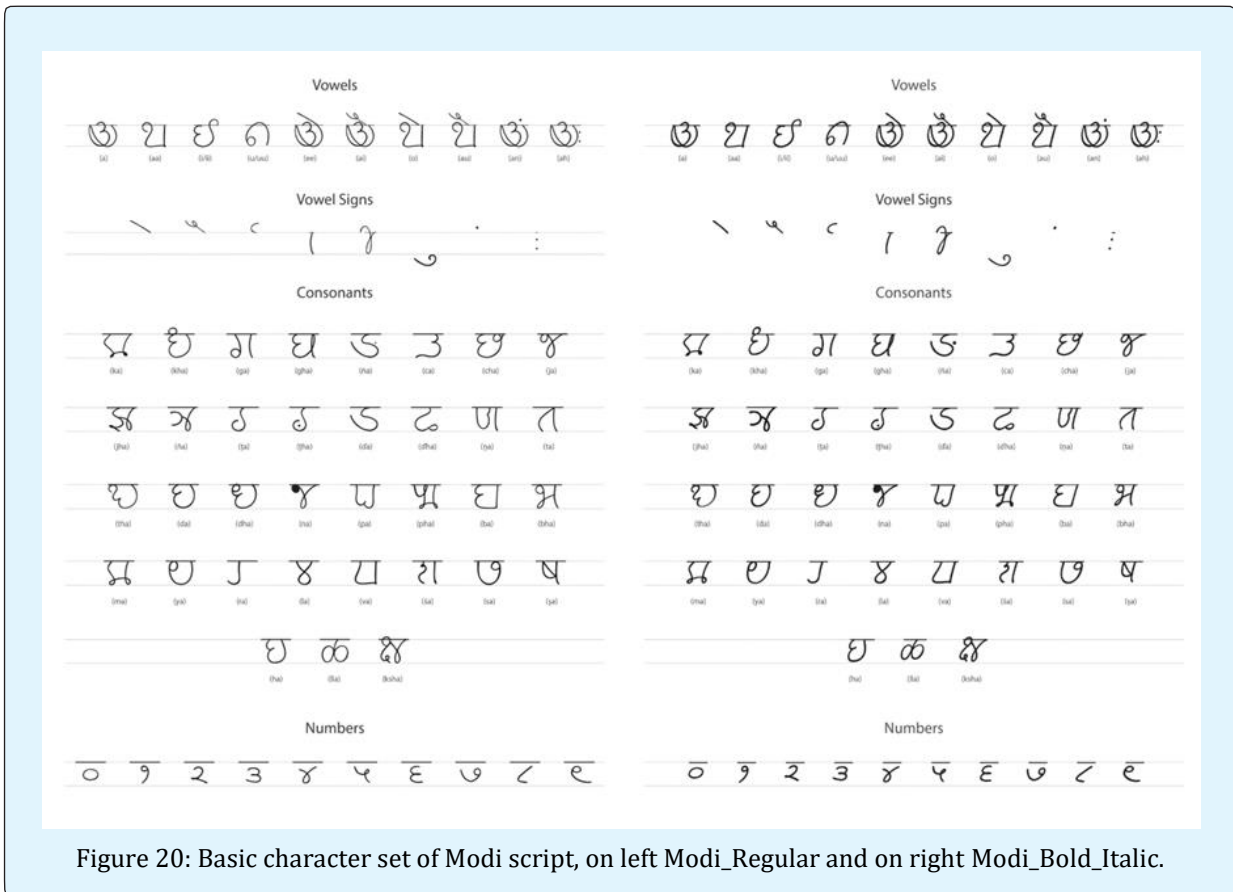


Figure 20: Basic character set of Modi script, on left Modi\_Regular and on right Modi\_Bold\_Italic.

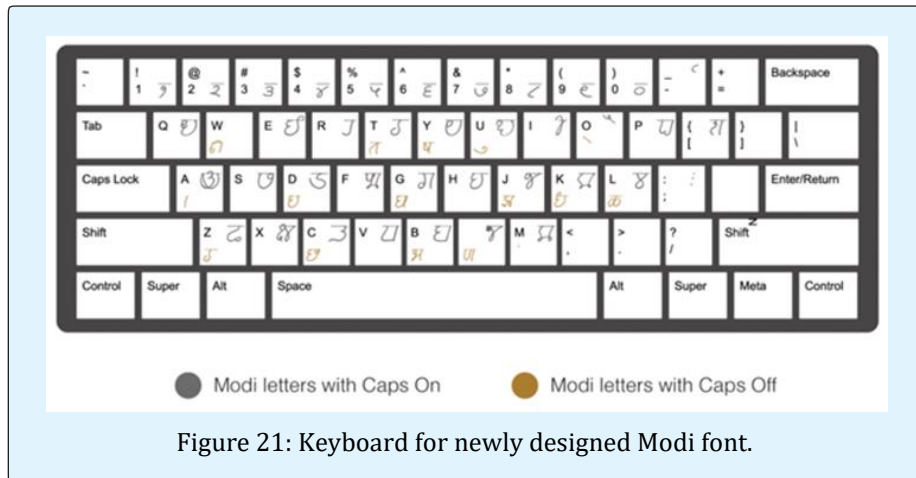


Figure 21: Keyboard for newly designed Modi font.

**Comparing the New Modi Font with Existing Modi Font**

In following Figure 22 it is shown that the comparison

of the newly designed Modi font and existing 'Hemadree' font by Somesh Bartakke. Hemadree font is depicted by red color whereas Modi font is depicted by black color

Vowels & Consonants						Numbers	
●	●	●	●	●	●	●	●
अ	उ	इ	ऋ	ए	ऌ	०	०
प	ब	च	ट	द	ड	१	१
फ	भ	ज	ड	ढ	ण	२	२
ण	त	ड	ड	ण	ष	३	३
उ	उ	द	द	घ	घ	४	४
अं	अं	ण	ण	क	क	५	५
अः	अः	ल	ल	ख	ख	६	६
म	म	व	व			७	७
य	य	श	श			८	८
र	र	ष	ष			९	९
ल	ल	म	म				
व	व	य	य				
श	श	र	र				
स	स	ल	ल				

Figure 22: Comparison of Modi font (in black) with existing Hemadree font designed by SomeshBartakke (in red).

## Applications

This logically modified font Modi Lipi can be used in various ways. As mentioned earlier this font can be used to write books which were written in a Modi script in the time of British era, because those books were printed

manually by writing each sentence in a Modi by hand. Hence we can use this new font to write these books in Modi. Also to preserve ancient Modi documents which can be made available online to the Modi enthusiasts all over the world and also researchers (Figure 23).



Figure 23: Old manuscript is written with the help of logically modified 'Modi Lipi' font.

## Conclusion

The objective of my thesis work was to study the entire historical background of Modi script from cultural perspective. Also, to understand analytical study of the

Modi script and design the logically modified Modi font for the script to set the basic character set for script.

I studied too many original documents written in Modi script which included the actual letters of Kings and their

administration written in Modi script which all dated back to 12<sup>th</sup> Century to 19<sup>th</sup> Century [12-14]. I also studied different writing styles which were used throughout that era. The literature study is done on the script in this thesis is to understand the basic rules of writing Modi script and to understand the characteristics of each alphabet in detail.

With the help of above detailed study of script we aimed to provide an optimum solution for the same by developing logically modified font for Modi script which would be very useful to write informational books in Modi script, also to keep the digital record of the precious old manuscripts which can't be handled manually due to fear of decay. This new font can be used in both print and digital medium. This will increase the interest in Modi enthusiasts and researchers worldwide.

The Research and Development in the fields of ancient Indic scripts have always been helpful to restore the cultural engagement of lost history. Particularly for this topic, it was very important to understand the basics and detailed study of the cultural background of this script. Without that it would have been very difficult to work on such topic.

The main purpose of this study was to investigate into the need of the new fonts required for the Modi script. The main problem earlier was that there was not proper character encoding standards available for the Modi script [2]. Due to tremendous efforts of Mr. Anshuman Pandey it was possible to create this font in Unicode. This thesis paper is mainly focused on the cultural part of the Maharashtra back in 13<sup>th</sup> century. After detailed and deep study of the script I came to know that it was major help in breaking the cultural barriers all around the world, because Modi documents have been found not only in India but all over the different places around the world like Paris, London, Spain and Holland. Hence, it has created the interest amongst the researchers and enthusiasts from all over the world to go to these places and study those documents, which eventually increased the interest in learning the Modi script in depth as well. Now many researchers and interesting people who have the knowledge of the Modi script are being called to these universities to translate the contents written in those newly found manuscripts and documents and make a digital storage of the same [15,16].

My work will be helpful for all of them to restore it digitally as they can use my font to document not only those arte facts digitally but also to create informational books to learn Modi script for beginners. It is very important to save such lost cultural treasure of the ancient history. There are many old books have been found which are about cookery, social, economics, physics etc. which are written in Modi script and its needed to restore them digitally. This newly designed logically modified font will definitely help to be taken further all mentioned issues above.

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