Introduction
INTRODUCTION

In this research work, an attempt has been made to present a phonological analysis of Modern Standard Hindi. This analysis is based on the phonological principles of Form-Content Linguistics, now known as Columbia School of Linguistics.

Introduction has been divided into four sections. In section A, we have discussed the historical settings and the Linguistic situation of Modern Standard Hindi. In section B, we have taken up the procedures followed in the collection and collation of the database. In section C, we deal with the theoretical background presented here in terms of Form-Content Linguistics. The scope of the study is discussed in section D.

Section A: Historical Setting of Modern Standard Hindi as Spoken in Allahabad

Any investigation of the historical settings of a language includes a discussion on the perception as to when and where that language was initiated and the trail of its progress that has led it to achieve its present form. Thus, the present section deals with the historical settings of Modern Standard Hindi.

Hindi is perhaps the oldest and simplest of names of a form of speech of northern India. Its spread from the east of Punjab to Bengal where its seeds were sown after the Turkish conquests in the 12th and 13th centuries. After the Turks, when Mughals came to
India, they brought Persian language with them, as the court language of Mughal empire was Persian, which ensured the continuity of a Hindu-Muslim combined class of an educated gentry, officials etc. Persian, being a rich literary language, was beyond the reach of the most of the uneducated masses. There was a need for a simpler form of language which could perform the function of a ‘Lingua Franca’ and thus, Hindi, without any literary affiliation with either Sanskrit or Persian, came into existence. Starting from the coming of the Turks to India, about seven centuries can be taken as the period of the evolution of modern Hindi. The emergence of Modern Standard Hindi was not sudden. Its present day position is the outcome of political and cultural history in the post Aryan advent into India.

The Aryans came into India sometime around 1500 BC, and subsequently the Indo-Aryan languages are believed to have developed in three stages.

1. Old Indo – Aryan
2. Middle Indo – Aryan
3. New Indo – Aryan

**1. Old Indo – Aryan:** (1500 B.C – 500 B.C)

There are three developments during this period which may be summarized below:
a) The development of Vedic and classical Sanskrit: The Sanskrit language developed from Punjab to eastern parts of the country (Bengal and Assam) during this period. Vedic Sanskrit, the language in which the four Vedas were compiled, the oldest Veda being the Rig-Veda, gives us the oldest specimens of Aryan speech in India. The Vedas or collection of hymns were of great religious significance. On the other hand, classical Sanskrit was used for literary purposes. Classical Sanskrit was used for writing plays, prose and epics like Ramayana and Mahabharat.

b) Development of three regional varieties or dialects called Udicya, Prachya and Madhya desa: When Sanskrit language spread to a larger area (from Punjab to Bihar, Assam and Bengal) variations appeared in it at various levels like phonology, grammar etc. Sanskrit language could not maintain one specific form, and as a result, Sanskrit developed many regional varieties and regional dialects.

c) Panini and his Ashtadhyay: Towards the end of old Indo-Aryan period a great Sanskrit grammarian Panini was born (400 B.C) near Lahore. He wrote a book “Ashtadhyay” near the end of Old Indo-Aryan period. Sanskrit had become a dead language and in its place there developed Prakrit language. When Panini observed the decline of Sanskrit language, he
tried to preserve and capture the rules of this language in the form of *sutras* in Ashtadhyay, a book about Sanskrit grammar. His book subsequently became a very famous book in ancient India about Sanskrit grammar. Ashtadhyay, comprises of 4000 *sutras* (rules) and eight chapters. It deals with the spoken Sanskrit of that time and also phonology, morphology (word formation) derivation, morphophonemic etc. Sanskrit was considered a divine language and Panini wanted to preserve its phonology and grammar for future generations to come.

2. **Middle Indo-Aryan**:

The main feature of this period is the development of Prakrit language. The literal meaning of the word “Prakrit” is natural. During this period the masses started using the Prakrit language whereas Sanskrit was used for religious and literary purposes. Sanskrit language was confined to the people of upper class i.e. the elites.

Prakrit was derived from Sanskrit but it was a natural, simplified and modified form of language. The grammar and pronunciation of Prakrit was very easy. Many complexities of Sanskrit were simplified by way of assimilation, and also some other types of sound changes. Some examples are presented below:
i) Sanskrit Prakrit Meaning

<table>
<thead>
<tr>
<th>Sanskrit</th>
<th>Prakrit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>dugdha</td>
<td>duddha</td>
<td>milk hand</td>
</tr>
<tr>
<td>hasta</td>
<td>hatta</td>
<td>(assimilation resulting in germination t and d)</td>
</tr>
</tbody>
</table>

ii) Sanskrit aspirated sound becomes unaspirated in Prakrit.

Prakrit has gone through three stages in its development:

(a) First Prakrit (500 B.C - 100 AD) consists of Pali and Ashokan edicts

(b) Second Prakrit: (100 AD - 600 AD) are also called literary Prakrit stage

(c) Third Prakrit: (600 AD - 1000 AD) are also called apabhramsa stage

3. New Indo-Aryan: (1000 AD on words)

Around 1000 AD, the Aryan speech entered into a new era. Many drastic political, social and cultural changes took place which had tremendous influence on linguistic scenario of India. At this stage Indo-Aryan languages had passed the Prakrit and Apabhramasa stages. During this period, development of modern Indo-Aryan languages took place from various Apabhramasas through a transitional language called Avahatta. The relationship of modern Indo-Aryan languages to their respective Apabhramasas is shown below:
**Sauraseni Apabhramsa:** From it developed Punjabi/Eastern Punjabi; Rajasthani, Gujarati; Western Hindi (and, Hindi and Urdu developed from it)

**Magadhi Apabhramsa:** from it developed Bihari, Bengali, Oriya, Assamese

**Ardh Magadhi Apabhramsa:** from it developed Eastern Hindi

**Maharastri Apabhramsa:** from it developed Marathi language

**Paisaci Apabhramsa:** from it developed Sindhi and Western Punjabi.

The subsequent conquests of Muslims to the north of India, especially Delhi, had greatly affected and fastened the development of modern Indo-Aryan languages. The patronage of Muslim rulers made the vernaculars popular and powerful. The earliest modern Indic literary documents date from around the 12th century CE.

**History of Allahabad**

The city of Allahabad is among the largest cities of Uttar Pradesh, a state in the Indian Federation, and is situated at the confluence of three rivers-Ganga, Yamuna and the invisible Saraswati. The meeting point is known as ‘Triveni’ and is especially sacred to Hindus. The earliest settlements of the Aryans were established in this city, then known as *prayag*. Its sanctity is manifest by references to it in *Puranas*, the *Ramayan* and the *Mahabharata*. According to the Hindu mythology, Lord *Brahma*, the
creator God of the trinity, chose a land on earth (i.e Prayag) to perform 'Prakrsta Yag, at the beginning of the creation and he also referred to it as 'Tirth Raj' or the king of all pilgrimage centres. As per writing of 'Padam Puran' as the sun is amongst the moon and the moon amongst the stars, likewise 'Prayag' is the best amongst all places of pilgrimage. In 1575 AD, emperor Akbar founded the city by the name of 'illahabas' which has now become modern Allahabad. The monarch realized its strategic importance as a waterway landmark in north India and also built a magnificent fort on the banks of holy 'Yamuna'. Allahabad today is an important city where history, culture and religion create a magical confluence, much like the sacred rivers that caress this blessed land. Due to its religious importance, many pilgrims come to Allahabad in the holy bathing season, the Hindu magh (mid January to mid February), to purify themselves. During this month, a great gathering and fair called 'Magh Mela' takes place on the sands of the river. Every 12th year when the waters are felt to be especially purifying, Allahabad holds a much greater festival called 'Kumbh Mela'. Millions of pilgrims attend this festival, coming from all over India. It is believed that bathing during Kumbh cures the bather of all sins and evils and grants the bather salvation.
Diagram 0-1: Map of Allahabad
Over the centuries, Allahabad has remained on the forefront of national importance-more so, during the days of the Indian independence struggle. The chequered history of Allahabad with its religious, cultural and historical ethos also gave rise to several renowned scholars, poets, writers, thinkers, statesmen and leaders.

(http://pedapension.nic.in/old_site/gen/allahabad.htm)

Section B: Field Procedures: The Collection and Collation of Data

The elicitation for corpus for the present research work on explanatory phonology is based on the field work in the *sangam* city of Allahabad. Since this study is based on Modern Standard Hindi, so for the collection of data, we chose different educational institutions such as, K.P. Inter College Allahabad, Hamidia Degree College Allahabad, Hindi Sahitya Sammelan Allahabad. Besides these, a few Hindi speaking families were also selected for this purpose. The names of the native speakers of Modern Standard Hindi which were chosen for this study are as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vineet Mishra</td>
<td>55 yrs</td>
<td>Male</td>
<td>Ph.D</td>
</tr>
<tr>
<td>Ram Parshad</td>
<td>47 yrs</td>
<td>Male</td>
<td>M.A</td>
</tr>
<tr>
<td>Vinod Sharma</td>
<td>30 yrs</td>
<td>Male</td>
<td>M.B.A</td>
</tr>
<tr>
<td>Anita Gupta</td>
<td>35 yrs</td>
<td>Female</td>
<td>M. Phil</td>
</tr>
<tr>
<td>Archana Singh</td>
<td>30 yrs</td>
<td>Female</td>
<td>B.A</td>
</tr>
<tr>
<td>Gautam Pratab</td>
<td>26 yrs</td>
<td>Male</td>
<td>M.A</td>
</tr>
</tbody>
</table>
It may also be noted that none of our informants were under graduates and that they were financially well off. All of them were educated and had distinct and audible voices characterized by clear pronunciation.

Furthermore, it may be pointed out that the methodology of our data collection was based on face to face interviews with the informants spread over numerous sittings.

To begin with, we prepared a non-restrictive list of monosyllabic words of standard colloquial Hindi as they appear in everyday speech of an educated Hindi speaker and also from a practical Hindi, English dictionary edited by Mahendra Chaturvedi and Bhola Nath Tiwari. Besides, a complete collection of the monosyllabic words, we have also collected a large number of bisyllabic and longer words for exemplification in support of our analysis. In fact, we have made an extensive use of bisyllabic and longer words throughout the thesis in validating our phonological analysis. It is worth mentioning here that each and every word of the data was noted down in phonetic transcription on a separate index card. We then prepared the phonemic inventory of Modern Standard Hindi of Allahabad in accordance with the criteria generally followed in traditional American phonemics. The establishment of
the phonemes, while still in the data collection process, enabled us to write all the collected words on the index card in broad, phonemic transcription.

Finally, the exhaustive collection of the monosyllabic words served as a means to provide statistical support for the validity of the present phonological analysis. It could be clearly observed from the data that the “phonemes” established for the Modern Standard Hindi of Allahabad are not equally utilized in the formation of words.

To prepare the graph, we used the analysis pad which contained graph sheets for the purpose. Firstly, we plotted the CVC words on graph sheets using a separate graph sheet for each initial consonant of these words. In each graph sheet, we then filled the slots for all those CVC words that begin with a particular initial consonant, followed by all the vowels vertically, and with all the final consonants horizontally. Additional graphics were employed to get figures for $C_1 C_2$ consonant clusters, both initially and finally for the monosyllabic words.

We have provided quantitative validation for the qualitative analysis of Modern Standard Hindi.

Section C: Theoretical Background

The theoretical background of the phonological analysis of Modern Standard Hindi presented in this thesis is based on the phonological principles of Form-Content Linguistics or ‘Columbia
School Linguistics’ in general, and phonological theory in particular. The roots of this theory can be associated to Ferdinand de Saussure’s ‘Course de Linguistics Generale’ (1916), and another Prague School Linguist N.S. Trubetzkoy has also been an important source of inspiration for the Columbia School, specially for its phonological theory. Phonetics and phonology are two very important areas in Columbia School phonological studies. The Saussurean structuralist model was originally based on the sound systems of language. This referred to the dichotomy between the abstract systems of hypothetical sound units postulated by the linguist and the concrete sounds of language produced and perceived by members of a speech community. Phonetics then, is the description of what + how + where sounds occur and phonology is a postulation and classification of the abstract units of the sound system of language. This would mean explaining the ‘why’s’ of the sound system both at the paradigmatic and syntagmatic level.

In Columbia School phonology, explanation plays a very important role. Analysis is geared towards explaining ‘why it takes the form that it does’. If we compare American structuralist phonemics with Columbia School phonology at this juncture, then we can surely say that Columbia School phonology goes one step ahead of simple description i.e. listing phonemes, allophones, phonotactic distribution etc.
On the other hand, Diver was very skeptical of a prioristic scheme such as, universal grammar. It may be pointed out that the beginning of Columbia School theory emerged almost parallel to Chomsky' generative theory in the mid 60's. But both paradigms differ from one another. A few important differences between the two areas are pointed out below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Generative Paradigm</th>
<th>Columbia School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kind of problems</td>
<td>Big questions about language and mind</td>
<td>Small questions why do Linguistic forms appear where they do.</td>
</tr>
<tr>
<td>Nature of language</td>
<td>Language is essentially a representational system</td>
<td>Language is essentially a communicative system.</td>
</tr>
<tr>
<td>Basic theoretical unit</td>
<td>The sentence</td>
<td>The Linguistic sign</td>
</tr>
<tr>
<td>Grammatical categories</td>
<td>A universal inventory of grammatical categories</td>
<td>Not universal inventory, language particular grammatical categories</td>
</tr>
</tbody>
</table>

The Columbia School theory developed into a full fledged branch under the patronage of Prof. William Diver of Columbia University in the mid 1960's hence, it came to be known as Columbia School theory. Prof. Diver and his students formulated a comprehensive framework of linguistic analysis which was earlier called "Form-Content".
In view of the Form-Content Linguistics, the term “theory” refers to “the general form of solution provided to the problem posed by observation” (Diver 1995: Section 1.4.1). In the development of this school of Linguistics, Prof. Diver was largely benefited from his teacher Prof. Andre Martinet. Columbia School Linguistics provided a canonical functional construct of language in which both grammatical and phonological structure are cryptically formed by exigencies of communication. Since both lexicon and grammar are meaning based, thus analysis of the data concentrates in finding out the unique semantic structure of the language under consideration. The ultimate aim has all along been to describe the linguistic forms in language.

A brief discussion of the Columbia School Linguistic theory with particular reference to phonology has been presented in seven sections. In section $C_1$, we briefly outline the three parts essential for the linguistic theory: the observable phenomenon, the orientations and the hypotheses. In section $C_2$, we present the orienting principles for the phonological analysis, section $C_3$, consists of the phonological and grammatical linguistic units. In section $C_4$, we present the concept of double articulation of language as a parameter for distinguishing phonology from grammar. Section $C_5$, deals with the notion of substance and value in linguistic analysis, whereas section $C_6$, covers the syntagmatic
and paradigmatic aspects. In the last section C7, the validation of the theory has been discussed. We now take up these sections separately.

**Section C1: Linguistic Theory: The Orientations, the Hypotheses, and the Phenomena**

The discipline of linguistics is regarded as a tripartite organization by Form-Content Linguistics consisting of three major components: the observations, the hypotheses and the orientations.

The observations are the observable phenomena in a language (i.e., the sound waves). The orientations are the common facts about the character of language which serve as external control on hypothesizing. The explications for the relationship between the observations and the orientations are the hypotheses. The phenomena, i.e., the speech sounds follow a set pattern in words, they depart from randomness. The theory explains this non-random characteristics of the phenomena. The orientations, are independently verifiable in nature, provide justifications for the theory.

It is worth mentioning at this juncture, that the linguistic theory comprised of this tripartite organization, consists of two sub-theories: the phonological and the grammatical.
Section C2: Orienting Principles

The orienting principles are the facts in which the explanation of the observation lies (psychology physiology, acoustics, vision etc). The fact related to the character of a language serves as an external constraint or control over hypothesizing. The phonological theory which has been presented here consists of the following five orienting principles:

i) physiological mechanism (physiology of the vocal tract)

ii) human behavior

iii) communication

iv) acoustic medium

v) vision

Section C2 (a) : Physiological Mechanism

The impact of human physiology on the study of speech sounds or phonological units, has been emphasized by Diver as physiological mechanism. Thus, the characteristics of the vocal tract and the dynamics of sound production, serve as a base for the phonology of language.

It is to be noted that sound for sound sequences, are often replaced by an alternative class of sound or sound sequences, identical to the changed sound or sound sequences, but lacking the difficult properties. The purpose of such phenomena in language is to maximize perceptual characteristics of sound and to minimize its
articulatory difficulties. The sophisticated sound producing mechanism of humans help them to produce larger number of sounds by the manipulations and configurations of the vocal tract.

Some of the basic physiological parameters that have a direct bearing on the theory of phonology are being presented in four subsections below:

**Section C2(ai): Articulators and Apertures**

Articulators and apertures are the two physiological parameters of sound production. The articulators are the adroit members of the vocal tract, while, the apertures refer to the various degrees of vertical openings of the vocal tract caused by the movement of the lower jaw.

The articulators or the adroit members of the vocal tract are the lips (particularly the lower lip) producing labial sounds p, ph, m, w, u, etc.; the apex, or the blade of the tongue producing apical sounds t, d, n, etc.; the medium of the tongue producing medial sounds c, j, y, etc.; the dorsum of the tongue producing k, g, kh, etc.; the post-dorsum or root of the tongue producing the post-dorsal q; the velum when it opens the nasal cavity for the nasal sounds m, n, η, etc. and when it closes the nasal cavity for producing oral sounds; the larynx with its sensitive edges and high flexibility, when superimposed on the supraglottal articulators produces the following sounds:
a. the tightly closed vocal folds produce glottal stop;
b. the vocal folds drawn apart produce voiceless sounds p, t, k, etc;
c. the vocal folds drawn close together produce voiced sounds b, d, g etc.;
d. the extreme flexibility and sensitivity of the vocal folds can produce various degrees of musical notes, called 'tones', as is seen in Tone languages.

The apertures (vertical openings of the vocal tract in relation to the relevant articulators), range from total closure to maximum opening. The various degrees of apertures are discussed below:

**Aperture 0:** refers to a complete closure of air stream coming from the lungs somewhere in the vocal tract. Sounds termed traditional “stops” p, t, c, k, etc. are produced at this aperture.

**Aperture 1:** the obstruction of air stream is partial at this aperture, as a result of which turbulence is produced by forcing the air through the contact point of the articulators and point of articulation. Traditional “fricatives” f, v, etc.; are produced at this aperture. Parenthetically, it may be noted, that 'voice’ is produced by glottis at aperture 1.
Aperture 1 ½: An unusual feature of Hindi, Urdu and other Indic languages is the use of an intermediate aperture at the glottis between apertures 1 and 2 (cf. Introduction, section-c).

Aperture 2: There is no obstruction of the air stream at this aperture, but the articulator forms a sufficiently narrow constriction with the point of articulation so as to control the air stream from the lungs in a channel turbulence to produce sounds s,ō,x, etc. ‘Aspiration’ is also produced with the configuration of the glottis at aperture 2.

Aperture 3 Through Most Open: The articulators form a resonating cavity with larger degrees of apertures to produce liquids l,r,y,w at aperture 3 and vowels i,u,a, etc at other more open apertures. Also, ‘nasality’ is produced with velum at aperture 3.

It is worth noting that the aperture are classified into Constrictions versus Openings and Clearly Audible versus less clearly. Audible (for details, see chapter-1, section A).

Section C2 (aii): Role of Larynx in the Production of Speech Sounds:

The glottal articulator, namely the vocal folds situated in the larynx is one of the most important of all vocal organs used in
the production of speech sounds. It has already been mentioned that glottis is utilized at aperture 1 for 'voice' and for 'voiceless aspirates' at aperture 2 the intermediate aperture, namely, 1 \( \frac{1}{2} \) is configuration of the vocal folds that is more open than seen in 'voicing' and less open than in 'voiceless aspirates'.

The production of 'voice' and 'voiceless aspirate' is a natural configuration of the vocal folds. The voiced-h, however is an unnatural configuration of the vocal folds as can be seen in Diagram 0-2 below:

**Diagram 0-2: Position of the Vocal Folds: in the Production of 'Voice', 'Voiceless Aspirates' and 'Voiced-h'**

The tongue, made up of muscular structures, is the most adroit among the supraglottal articulators. The light tapering structure of the tongue assigns to it a significant role in the production of speech and also enables it to be moved to a number of points of articulation within the cavity. It may be noted here, that the tongue part vary in their degrees of adroitness from the tip to the root.

The apex, is the most adroit area of the tongue, for, it has a thin, light weight structure. It is capable of being moved to any nook and corner of the mouth.

The medium and the dorsum, are rectangular in shape, massy in weight and less flexible in musculature. Their makeup make thin less adroit than the most adroit apex. In comparison with the dorsum, the medium has a tight musculature which enables it to be used as hilt for the apex.

Moreover, the comparatively more flexible musculature of the dorsum makes it more adroit than the medium, but less adroit than the apex. The post-dorsum or the root of the tongue being the fixed portion of the tongue, is the least adroit among the lingual articulators. It functions as a hilt to the tongue in its entirely and the dorsum in particular.
The varying degrees of the adroitness of the tongue, ranging from the most adroit to the least adroit is illustrated in Diagram 0-3, below:

**Diagram 0-3: Scale of Adroitness of Lingual Articulators**

<table>
<thead>
<tr>
<th>Apex</th>
<th>Most Adroit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsum</td>
<td>More Adroit</td>
</tr>
<tr>
<td>Medium</td>
<td>Less Adroit</td>
</tr>
<tr>
<td>Post-Dorsum</td>
<td>Least Adroit</td>
</tr>
</tbody>
</table>

Parenthetically, it may be mentioned, that the hierarchy of adroitness is limited to the tongue parts only. We have not placed the labium or the velum on this scale.

As mentioned earlier, the lower lip is not only an important articulator for the production of speech sounds, but it is also adroit to a great extent.

Given the musculature of the lower lip and mobility of the lower jaw, we can make a defacto placement of the lip on this scale of adroitness. We can safely place it below the apex, above the medium and near the dorsum on the scale of adroitness.

**Section C₂ (aiv): Size, Shape and Mass of the Lingual Articulators**

The size, shape and mass of the various tongue parts play a significant role in shaping and exciting the vocal cavity.
The thin, light and tapering apex, is ideally suited for the production of many consonants. At the same time it has no role to play in the production of vowels due to its physiology which fails to mould a proper resonating chamber needed for production of vowels. Thus, the more massy, medium-dorsum portion of the tongue is ideally suited for the production of vowels and some other consonants also.

**Section C₂ (b): Human Behavior**

Human beings use language to communicate. As such, language is greatly influenced by the inherent traits of human behavior like intelligence, laziness, etc.

The structuring and manipulation of language is greatly determined by these inherent human traits. As a result of these characteristics, human beings resort to a minimax solution between accomplishment and effort.

Traits, like intelligence, memory, reasoning, thinking, imagining, etc are gifted to humans as opposed to non-human forms of communications (animals, machines) which are devoid of such traits. On the other hand, traits of weakness like being lazy and inert also form part of the human communication system. Thus, they are the determined factors in the structure and functioning of language. Some skewings which are encountered in many
languages are explainable through the human behavior orientation. Some of them are as follows:

1. Preference of voiceless and unaspirated consonants over their voiced and aspirated counterparts. The rationale for such types of skewings are motivated by the human trait of preferring sounds produced by fewer number of articulators over those that are produced by more articulators.

2. Sounds produced by an articulator at the nearest point of articulation are preferred over sounds produced by the same articulator at a distant point of articulators.

3. The characteristics of neighboring segments tend not to be precisely differentiated (the assimilative trait.)

4. In successive segments, large changes of aperture are preferred to small changes of apertures, etc.

**Section C₂ (c): Communication:**

Language is a means of communication where messages are transmitted by means of signals. These signal-meaning pairs in a language are called *signes* by Ferdinand de Saussure. They form the basic unit of grammar.

In phonology, too, communication plays an important role in the establishment of the phonological units in the phonological grid. The traditional American phonemicists shouted slogans for the
substitutional-distributional criteria, but resorted to meaning distinctions as a short-cut method. In Columbia School phonology, however, we do not need to apologize for the use of meaning as communication is a well-established orienting principle in the theory. The phonological units are communicatively established on the basis of distinctiveness in meaning.

In addition to the paradigmatic makeup of the phonological units, communication plays a significant role in the syntagmatic organization of the word. For, it will be generally agreed that, communicatively, the beginning of the word is more important than the end of the word.

Since the initial position of the word carries greater communicative load, it thus, results in a competitive use of the phonological units. In contradistinction, there is lesser communicative load at the end of the word, hence the phonological units are selectively underutilized.

Section C2(d): Acoustic Medium:

Signals of a language are transmitted through a particular medium, the acoustic medium. The acoustic medium is, thus, basically important in the study of both consonantal and vocalic speech sounds. As an orienting principle, acoustic medium has particular relevance in the study of vocalic units. The acoustic properties of vocalic sounds can be acoustically analyzed and
properly identified in terms of the first three formant frequencies, namely, $F_1$, $F_2$ and $F_3$ on the sound spectrograms. The acoustic cues are helpful in the identification of consonants also. Therefore, we are able to distinguish between clearly audible versus less clearly audible sounds (cf. Chapter-I, section A).

It is a fact that some vocalic categories can be properly analyzed in terms of physiologico-acoustic factors. The lack of space at the back of the vocal cavity and the need for an additional chamber through lip-rounding for amplification and distinction of vowels can well be attributed to acoustic medium.

**Section C$_2$(e): Vision:**

Vision as an orienting principle has no role to play in the establishment of the phonological grid. However, we may encounter skewings in the phonology of a language, when the use of labial units suddenly rise unexpectedly. Such skewings can be explained through vision.

Following the 5 orienting principles of Form-Content Linguistics we can say that;

1. Phonology is a particular instance of the utilization of the phonological characteristics.
2. Phonology is regarded as a particular vehicle of communication.
3. Phonology is regarded as a particular instance of learning capacity of humans.

4. Phonology is regarded as a particular instance of acoustic medium.

5. Phonology is a particular instance of vision.

Out of these 5 orienting principles, only two i.e. communication and human behavior are used for grammatical studies.

Section C3: Phonological and Grammatical Linguistic Units

This section deals with the presentation of two types of units which are manifested in a language. They are phonological units and signal-meaning units 'or signes'.

Phonology utilizes sound units as its basic unit, while on the other hand, signes are the basic units of grammar. The phonological theory comprises of the postulation and the explanation of the phonological units or the articulatory gestures. The grammatical theory deals with the postulation and the explanation of signal meaning units (signes)

All the five orientations, presented in section c1 apply to the makeup and non-random distribution of phonological units. Only two orientations play a role in the establishment and non-random distribution of signs. All the participatory characteristics of the phonological units and their distribution within the word are
motivated by all the five orientations. While the motivation for employing *signs* as the basic grammatical unit is supported by the dual orientations of communication and human behavior.

**Section C₄ : Double Articulation of Language**

As suggested by the name itself, the double articulation is the articulation of language manifested on two different planes, that is first and second articulation. This concept was first developed by Andre Martinet.

The first articulation is related with grammar. This level of articulation carries the articulation of ones’ experience into various units in succession, which have been called as “monemes” by Martinet. Each successive unit of human communication is endowed with a vocal form and meaning.

The second articulation on the other hand, comes under phonology. It refers to the phonic aspect of every moneme into a succession of distinct units, the “phonemes.” The signal-meaning units on the second plane are divided into distinct phonological units. These phonological units or “phonemes” recur in different combinations to convey different meanings.

The feature of double articulation describes the economy of language, where the first articulation is economical in the sense that with a limited number of specific *signs* an infinite stretch of communication can be created. In the same way the second level
of articulation is also economical to language. It can be observed in the fact that any particular phonological unit “phoneme” does not occur in only one combination but in an unlimited number of combinations.

**Section C5 : Substance and Value in Phonological Analysis**

Both “Substance” and “Value” are important in linguistic analysis. Substance and Value help in the establishment of the two types of linguistic units of a language, i.e. phonological units and grammatical units, the *signes*.

The phonological units are not isolated individual entities that are grouped together for ease of reference. The phonological units are interrelated to one another in the network of the grid. The interrelationship of phonological units in the grid is known as the Value of these units. The phonological units are classified on the basis of articulators and apertures in terms of physiological mechanism. i.e., the phonological units are classified on the basis of their phonetic substance.

Similarly, it is both the distinctiveness of meanings as well as the substantive difference of these signs, that count for establishing various grammatical systems for a language.

Thus, equal weight is given to Substance and Value in linguistic analysis in Columbia School theory. It is noteworthy that, it was the French scholar Andre Martinet who first talked of
weighing Substance and Value on equal scales. In 19th century. The NEO-grammarians generally neglected Value and based their monumental works on the Indo-European and historical linguistics on substance alone. Ferdinand de Saussure, in reaction to this highlighted the importance of Value at the expense of Substance.

Section C6: Syntagmatic versus Paradigmatic Relation in Phonology

An ingenious scholar and original thinker, Ferdinand de Saussure is credited for introducing many concepts of lasting relevance in linguistics. He is rightfully known as the “father of modern linguistics”. Thus it was Saussure, who introduced the dichotomy of syntagmatic versus associative relation for linguistic analysis, with particular reference to grammar and lexicon. Afterwards, the Prague School phonologists especially N.S. Trubetzkoy, applied this dichotomy to phonological analysis. However, in place of associative relationship, Trubetzkoy introduced the term paradigmatic relationship that appropriately refers to the phonological paradigm.

Following Trubetzkoy, combinatory characteristics in the linear organization of phonological units (or phonemes) are studied under the syntagmatic relations. Whereas the interrelationships of these units in the phonological paradigm are dealt with under the paradigmatic relations.
The syntagmatic versus paradigmatic dichotomy is very important for phonological analysis in terms of the Columbia School theory. Thus, we will fully deal with both the paradigmatic makeup of the phonological units in the grid, and the syntagmatic organization of these units in the formation of words, as we present the phonology of Modern Standard Hindi.

**Section C7 : Validation of the Analysis**

The comparison of the data collected with the phonological principles of the theory is referred to as the validation of the theory. In general, the theory provides for a statement of the method of sound production in terms of a phonological grid and principles that restrict or encourage the potential utilization of the members of the grid in the formation of morphemes. In the comments on the grid and on the frequency counts, detailed comparisons will thus be made at every point between the data and the principles. This will be done primarily by reference to the skewed characteristics readily observable in the data, since the point of validation is a demonstration that the skewings are produced by the phonological principles themselves.

**Section D : Scope of the Study**

The present phonological analysis of Modern Standard Hindi is limited in scope both in the utilization of data and application of orienting principles. The data utilized in the illustrative examples
and in the frequency counts is limited to mainly monosyllabic words. Though, polysyllabic words, particularly bisyllabic words, are also used occasionally as illustrative examples to reinforce the analysis arrived on the basis of the monosyllabic words.

As discussed earlier, phonological analysis of a language (or dialect) is to be carried out in terms of five orienting principles (physiological mechanism, human behavior, communication, acoustic medium, vision). Whereas the phonological analysis presented here is in terms of all the five orienting principles, it must be pointed out that the analysis in terms of acoustic medium is limited in more than one respect. Firstly, this analysis is based on secondary sources rather than original, experimental work. Secondly, only some select aspects of the acoustic base have been dealt with in this work.
Chapter I
Physiological Base of the Phonology of Modern Standard Hindi
CHAPTER-I

PHYSIOLOGICAL BASE OF THE PHONOLOGY OF MODERN STANDARD HINDI

In this chapter, we provide an explanation in terms of physiology as an orienting principle for the phonological analysis, to explain the paradigmatic makeup and the syntagmatic distribution of the phonological units ("The Phonemes") in Modern Standard Hindi, as spoken in Allahabad outlined in the theoretical background in the introduction. The articulators and the apertures are the basic physiological parameters for the classification of phonological units of a language or a dialect. All phonological units, both consonantalt and vocalic, are projected in terms of their phonetic substance on the relevant intersections of the physiologically based axes of the articulators and apertures to form the network of these units, which is formally termed the phonological grid ("Phonemic Inventory"). It is noteworthy that the organization of the phonological units in the grid is not uniform. We find that there are clear holes (empty slots) in the network of units in Modern Standard Hindi. We also find that the phonological units randomly combine in the formation of morphemes and words. There are clear skewings of phonological units in the syntagmatic organization of the word in Hindi. All these
paradigmatic and syntagmatic asymmetries of the phonological units of Modern Standard Hindi have been explained in terms of physiological mechanism as an orienting principle.

This chapter comprises of three sections. In section A, We present and justify the paradigmatic makeup of the phonological units of Modern Standard Hindi. In section B, we analyze the paradigmatic makeup and syntagmatic distribution of the consonantatal units in the words, in terms of the hierarchy of adroitness of articulators. In section D, We present summary and conclusions.

**Section-A: Phonological Grid of Modern Standard Hindi**

The phonological grid of Modern Standard Hindi is motivated by the orientations of human behavior, acoustic medium, communication, and physiological mechanism. The latter two are more important. For, communication helps in establishing phonological units by contrast through minimal and sub-minimal pairs of words. However, we deal with the phonological units in term of their physiological makeup. The communicatively based phonological units, once established, are placed on the basis of their phonetic substance, on the intersections of the relevant phonological axes, namely, articulators and apertures. Thus, on the basis of communication and physiology are established a network of
phonological units, thus, forming the phonological grid of Modern Standard Hindi.

We establish 61 phonological units for Modern Standard Hindi comprising of 41 consonants and 20 vowels. The 41 consonantal units may traditionally be classified into 21 stops, 5 nasals, 8 fricatives and 7 liquids. The 20 vocalic units are classified into 14 long vowels (7 oral and 7 nasal), and 6 short vowels (3 oral and 3 nasal). All these 61 phonological units are presented below in the phonological grid of Modern Standard Hindi:
Diagram 1.1: The Phonological Grid of Modern Standard Hindi
Comments on the Phonological Grid Of Modern Standard Hindi

1. Mechanics of Diagramming

In Diagram 1-1, the phonological units of Modern Standard Hindi are projected on the phonological variables of articulators and apertures. Articulators are the adroit organs of the vocal tract that shape and excite the vocal cavity, leading to the production of speech sounds. The extent of the vocal tract opening controlled by the articulator in relation to excitation is referred to as the aperture.

The grid presents units based on the vertical axis of the degree of apertures and the horizontal axis of the articulators. The crossed and broken line separates the constriction from opening, whereas the dotted and broken line indicates the division between the consonants and vowels.

It may be noted that there are three highly abstract units of V(oeicing), A(spiration), and N(asality), in the grid at apertures 0, 2 and, 3 respectively.
2. Constrictions versus Openings

As shown in the phonological grid of Modern Standard and Hindi (Diagram 1-1), a broad division of apertures is based on the distinction of constriction (apertures 0 through 2) versus opening (apertures 3 through 8). The distinction of constriction versus opening apertures is based on both physiology of the vocal tract and the acoustic medium.

The phonological units produced at constriction apertures include 21 stops, 5 nasals, and 8 fricatives. The phonological units articulated at the opening apertures comprise the 7 liquids and all the 20 vowels of Modern Standard Hindi. Since the degree of apertures are narrow, they can be measured or labelled in exact or absolute terms. It is to be mentioned here that voicelessness is a basic feature on these constriction apertures. However, voiced units are also produced on these constriction apertures, but they advocate the use of an extra articulator (larynx).

In contradistinction, the opening apertures extend from 3 through the most open. As the distance between the articulators and the associated places of articulation increases, in the production of phonological units at these apertures, the articulators can only shape the cavity and the excitation has to be provided by the larynx, through voicing, by setting the edges of the vocal folds in vibration. Thus, voicing becomes a necessary concomitant for the production of phonological units at these apertures. Hence, ideally suited for liquids
and vowels. The 5 liquids and 20 vowels (monophthongs and diphthongs) are plotted on these apertures for Modern Standard Hindi.

These large apertures can be defined in relative terms only and not in absolute terms as for the smaller apertures. Mention is to be made, that voicing is a basic feature at these apertures. Hence, it is not coincidental that we find all voiced units on these large apertures for Modern Standard Hindi.

3. Clearly Audible versus Less Clearly Audible Units

As seen in the phonological grid of Modern Standard Hindi (Diagram 1-1), there is another broad division of apertures, namely, the clearly audible (apertures 4 through 8.) versus the less clearly audible (apertures 0 through 3), based on the acoustic medium. For, only at apertures 4 and above, with the appropriate shaping of the vocal tract and with no impediment of the air flow coming from the lungs, can we produce the clearly audible phonological units of our language. On the contrary, the less clearly audible units are produced at aperture 0 through 3, by impeding to a greater or lesser degree the air flow by the supraglottal articulators. This distinction in terms of audibility provides a basic classification of phonological units into the vocalic units (“vowels”) and the consonantal units (“consonants”) for Modern Standard Hindi.
4. Phonemes versus Phonological Units

As will be seen in chapter III, the phonemes of a language are motivated by communication and can therefore be established by contrast through minimal and sub-minimal pairs. All the phonemes thus established, are then appropriately placed, in terms of their physiologico-acoustic makeup, in the paradigmatic network of the phonological grid (Diagram 1-1). When the communicatively based phonemes of a language are interrelated to one another in terms of their physiologico-acoustic base in the grid, they may be called phonological units. It may however be noted, that the number of phonological units for a language is slightly higher than the number of “phonemes” for a language. For, a few positional variants of some of the phonemes, in terms of their phonetic substance, fall on the relevant intersections of the articulators and the apertures.

Regarding the phonological grid of Modern Standard Hindi, the phonological units to be established in terms of physiological mechanism and communication, includes all the “phonemes” (cf. Phonemic inventory, Diagram 111-1) plus “allophones” of the phonemes” that fall on the intersections of relevant axes, which are raised to the status of phonological units. The relevant axes of articulators and apertures yield 72 intersections for Modern Standard Hindi. These intersections have not been randomly filled. Out of these
72 intersections only 61 are filled by phonological units. We have 5 positional variants for Modern Standard Hindi.

**Articulators** → **Apex-Palate** → **Medium**

Apertures

\[ \begin{array}{c}
\theta \\
\bar{n} \\
\bar{n} \\
3 \\
\end{array} \]

All these 5 positional variants (traditional viewpoint) are considered as distinct phonological units when they are distributed and plotted in the phonological grid of Modern Standard Hindi.

5. **The Production of Voiced-h**

For details see Introduction, section C2(aii).

6. **The Status of N, V and A as Phonological Units**

Like all other phonological units, N (asality), V (vocing), and A (spiriation) are also produced by the combination of articulators and apertures. Thus N (asality) is produced by the velum as an articulator at aperture 3. and V (oicing) is produced by the glottal articulators at aperture 1. Further, A (spiriation) is generated by the glottal articulator at aperture 2.

The phonological units of N, V and A as shown in Diagram 1-1, are set apart from other phonological units in that they do not appear as individual units. The N, V and A are to be differentiated from
other phonological units. As for the consonants and vowels, they enter into the speech chain as distinct phonological units, and their distinctiveness is established through physiology and communication in the paradigm. In contrast N, V, and A do not occur as separate, individual entities in the speech chain. Instead they are superimposed on the consonants and vowels of the language.

7. **Four-Way Classification of Stops**

The phonological grid of Modern Standard Hindi projects a network of 21 stops, namely, \( p, ph, b, bh, t, th, d, dh, c, ch, j, jh, k, kh, g, gh \) and \( q \). It is interesting to note that these stops have a four-way classification, for, we have both voiceless stops (\( p, ph, t, th, c, ch, k, kh, q \)) and voiced stops (\( b, bh, d, dh, j, jh, g, gh \)). Another classification is seen between the unaspirated stops (\( p, b, t, d, c, j, k, g \) and \( q \)) and the aspirated stops (\( ph, bh, th, dh, ch, jh, kh, gh \), for Modern Standard Hindi).

8. **Units Formed with the Combination of Two Apertures**

Some phonological units of Modern Standard Hindi are produced by a combination of two apertures. These units are the diphthongs \( ai \) and \( au \) and their nasalized counterparts \( āi \) and \( āu \) respectively.

The diphthongs \( ai \) and \( āi \) are a combination of the vowel \( a \) at aperture 7 and the semi-vowel \( y \) at aperture 3.

The diphthongs \( au \) and \( āu \) are a combination of the vowel \( a \) at aperture 7 and the semi-vowel \( w \) at aperture 3.
9. **Units with Two Articulators: Labio-Dorsal Phonological Units**

Some phonological units of Modern Standard Hindi are produced with a combination of two articulators. The phenomena is apparent in some units at aperture 3 through 7. The semi-vowel w and the back vowels u:ū:, o:ō:, U Ū are produced with a combination of back-dorsum and labium (resulting in lip-rounding). This phenomena is the result of the involvement of two articulators and the rational behind it is based on acoustic factors (cf. chapter IV).

10. **Units Formed at Two Points Of Articulation with the Same Articulator**

Due to its extreme mobility, the apex of the tongue comes in contact with two separate, distinct points of articulation, namely dentum and palatum to produce two series of stops, and liquids. When apex blocks air passage at dentum it produces the apico-dental units. However, when it curls back to block the air passage at palatum, it produces apico-palatal units. Apico-palatal units are traditionally known as “retroflex” sounds in Hindi.

11. **Phonetic Variation at Two Points of Articulation with the Same Articulator**

The phonological units on the vertical axis of labium are all produced by a single articulator, namely, the lower lip. However, while the point of articulation for p, ph, b, bh, m and w is the upper lip, the
fricatives \( f \) and \( v \) are produced with the edges of the upper teeth as point of articulation. Despite the two different points of articulation for the labial consonants, we have not set two different series of bilabials and labio-dentals, for lack of contrast between the two categories on a single aperture. Labium + Labium contact is found on 0 and 3 apertures, while labium + dentum contact is found on aperture 1 only.

12. Vowels and Non-apical Portions of the Tongue

It has already been mentioned in our introduction that the non-apical portions of the tongue are suitable for the production of vowels (cf. Introduction, section C2 (aiv). A look at the vowels of Modern Standard Hindi clearly show a total skewing in favour of the “medial” and “dorsal” vowels which is shown in Diagram 1-2 below:

**Diagram 1-2: Vowel System of Modern Standard Hindi.**

<table>
<thead>
<tr>
<th>Articulators</th>
<th>Medial</th>
<th>Front-dorsal</th>
<th>Back-dorsal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apertures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ũ</td>
<td>Ũ</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>iː</td>
<td>uː</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>į, ĩ</td>
<td>Ũ</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>āː, āː</td>
<td>oː</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>aː</td>
<td>aː</td>
<td></td>
</tr>
</tbody>
</table>
Section B: The Hierarchy of Adroitness of the Articulators: The Makeup and Distribution of Less Clearly Audibles

As discussed in the Introduction (Section C2 (aiii)), apex holds the top position in the hierarchy of adroitness among lingual articulators, followed by the dorsum, the medium, and the post dorsum (or the root) in that order. It may also be mentioned that we also made a defacto placement of the labium, somewhere near the dorsum, on the scale of hierarchy of adroitness of articulators.

It may however be noted that the impact of hierarchy of adroitness of articulators is relevant only to the less clearly audible units (consonants) which appear on aperture 0 through 3 ("stops", "fricatives", "liquids", and "nasals").

In section B1, we examine the effect of the adroitness of articulators on the number of phonological units produced at aperture 0 through 3 (less clearly audible units). In section B2, we deal with the impact of the hierarchy of adroitness on the frequency of occurrence of the less clearly audible units (consonants) in the monosyllabic words in Modern Standard Hindi.
Section B₁: Paradigmatic Makeup and the Number of Phonological Units in Terms of the Hierarchy of Adroitness of the Articulators

In terms of the scale of adroitness of articulators, we expect the apical consonants to be most favored, followed by the dorsal or labial, the medial and the post-dorsal consonants, in that order.

With a view to establishing the validity of our postulation, we present the paradigmatic makeup of the consonantal units of Modern Standard Hindi, in Diagram 1-3 below:

Diagram 1-3: Hierarchy of the Adroitness of Articulators and the Makeup of Consonantal Units.

<table>
<thead>
<tr>
<th>Aperture</th>
<th>Articulators</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teeth</td>
<td>t, d, th, dh, n</td>
<td>s, z</td>
<td>l, r</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Apex</td>
<td>t, d, th, dh, n</td>
<td>l, r, rh</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Palate</td>
<td>p, b, ph bh, m</td>
<td>f, v</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Labium</td>
<td>k, g, kh gh, nj</td>
<td>x, y</td>
<td>w</td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Dorsum</td>
<td>c, j, ch jh, nj</td>
<td>ŝ, Y</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Medium</td>
<td>q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Post Dorsum</td>
<td>q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>G. Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41</td>
</tr>
</tbody>
</table>
Comments on Diagram 1-3

As seen in the Table, of the 41 consonantal units in Modern-Standard Hindi, the apex produces 17 units (9 apico-dental and 8 apico-palatal), the dorsum 8, the labium 8 and the medium 7. Inasmuch as the labio-dorsal w is simultaneously produced by two articulators, the labium and the dorsum. It is counted both as a labial unit and as a dorsal in the Table. As the post-dorsum (root of the tongue) is the least adroit, we encounter only 1 unit at that axis at apertures 0 through 3.

It is interesting to note that the number of the apical consonants is almost double the number of the labial, dorsal or medial consonants. Although there is a minute difference in the number of the dorsal and medial consonants, the disfavoring for the medial clearly shows up in the frequency of usage in the word in Modern Standard Hindi (cf. section B2)

Section B2: Syntagmatic Distribution of the Consonantal Units in Terms of the Hierarchy of Adroitness of Articulators.

In this section, we evaluate the impact of the hierarchy of the adroitness of articulators on the distribution of the (apical, labial, -dorsal, medial and post-dorsal) consonants in the formation of the word in Modern Standard Hindi. We asses the impact of the hierarchy of articulators on the distribution of consonantal units in
the word through statistical support. We have presented this quantitative assessment in six subsection below.

In section B2 (a), we examine the effect of the hierarchy of articulators on the consonantal units in their entirety. In section B2 (b), B2 (c), B2 (d), and B2 (e) we evaluate the frequency the impact of this hierarchy on stops, fricative, nasals and liquids respectively.

**Section B2 (a): Consonantal Units in Terms of the Hierarchy of Adroitness of Articulators**

In this sub-section, we assess the effect of the hierarchy of the adroitness of articulators on the distribution of the apical, the labial, the dorsal, the medial and the post-dorsal consonants in the formation of the word in Modern Standard Hindi. The actual occurrences of consonantal types, as they appear in the monosyllabic words, are presented in Table 1-1 below:
Table 1.1
Frequency of Occurrence of the Consonantal Units in the Monosyllabic Words in Terms of Articulators.

<table>
<thead>
<tr>
<th>Consonantal units Apertures (0, 1, 2, 3)</th>
<th>CVC</th>
<th>CVCC</th>
<th>CCVC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulators</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Apico-Dental</td>
<td>1508</td>
<td>75.70</td>
<td>643</td>
<td>87.12</td>
</tr>
<tr>
<td>Apico-Palatal</td>
<td>484</td>
<td>24.29</td>
<td>95</td>
<td>12.88</td>
</tr>
<tr>
<td>Apical</td>
<td>1992</td>
<td>49.29</td>
<td>738</td>
<td>53.59</td>
</tr>
<tr>
<td>Labium</td>
<td>823</td>
<td>20.37</td>
<td>259</td>
<td>18.80</td>
</tr>
<tr>
<td>Dorsum</td>
<td>658</td>
<td>16.28</td>
<td>216</td>
<td>15.67</td>
</tr>
<tr>
<td>Medium</td>
<td>559</td>
<td>13.82</td>
<td>148</td>
<td>10.78</td>
</tr>
<tr>
<td>Post-Dorsum</td>
<td>10</td>
<td>0.24</td>
<td>16</td>
<td>1.16</td>
</tr>
<tr>
<td>Total</td>
<td>4042</td>
<td>100</td>
<td>1377</td>
<td>100</td>
</tr>
</tbody>
</table>

Comments on Table I-1

Comments 1: As seen in the last column, the figures 2856, 1132, 908, 754 and 26, represent the total number of the apical, labial, dorsal, medial and post dorsal consonantal units respectively as they appear in the monosyllabic words of Modern Standard Hindi.

As excepted, apical consonants top in the frequency of usage followed by the labial and dorsal consonants. It is not a coincidence that there is a fair competition between the labial and dorsal consonants. For, the labium and dorsum occupy almost the same position on the scale of adroitness of articulators.
It is seen that as expected, the frequency of usage for the medial consonants goes down further, as these consonants are produced by the less adroit medium. There is a drastic skewing against the post-dorsal consonants, which account for a mere fraction of the percentage for the total number of consonantal units. This skewing against the post-dorsal consonant is justified, for they are produced by the least adroit post dorsum.

**Comment 2:** As seen in the CVC column in Table of the 4042 consonantal occurrences appearing in the syntagmatically simple CVC words, 1992 occurrences are apical, 823 labial, 658 dorsal, 559 medial, and 10 post-dorsal. As these figures show, the number of occurrences decline as we move down from the most adroit apex to least adroit post-dorsum. That is the frequency of occurrence for the apical, dorsal, labial, medial and post dorsal consonant in the CVC words fully conforms to our predictions in terms of the hierarchy of adroitness of the supraglottal articulators.

**Comment 3:** As seen in the column for the CVCC words in the table above of the 1377 consonantal occurrences in these words, 738, are apical, 259 labial, 216 dorsal, 148 medial and 16 post dorsal, also conform to the principles of this hierarchy.

**Comment 4:** As shown in the CCVC column in the table, the figure for the 126 apicals, 50 labials and 34 dorsal consonantal units show a receding usage in comparison to the apical consonant which is
what we expect. We however encounter a rise in the frequency of usage of the medial units. The rationale for this is provided in the explanation that for Modern standard Hindi, the second consonant of this cluster is limited to only y or w which is to be found in words like pya: z ‘onion’.

kya: what
dwây: two

Thus we see that the figures and their percentages clearly show skewing in favor of the consonants produced by the most adroit apex, more adroit labium–dorsum, the less adroit medium and the least adroit post –dorsum.

Notwithstanding the above statistics, we also encounter an unexpected skewing which does not conform to the order of this hierarchy of adroitness, we have however provided suitable rationale for these skewings.

**Section B2 (b): Syntagmatic Distribution of the Stops in Terms of the Hierarchy of Adroitness of Articulators: Aperture 0**

In this section, we make a comparison of the frequencies for the apical, labial, dorsal, medial and post-dorsal stops to assess the impact of the hierarchy of adroitness of articulators. In Table 1-2
below, we present the proportional occurrences of the opposing stops in the monosyllabic words in Modern standard Hindi:

Table 1.2
Frequency of the Stops in the Monosyllabic Words in Terms of Articulators

<table>
<thead>
<tr>
<th>Articulators</th>
<th>CVC</th>
<th></th>
<th>CVCC</th>
<th></th>
<th>CCVC</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apico-Dental</td>
<td>518</td>
<td>59.47%</td>
<td>213</td>
<td>78.30%</td>
<td>36</td>
<td>83.72%</td>
<td>767</td>
</tr>
<tr>
<td>Apico-Palatal</td>
<td>353</td>
<td>40.52%</td>
<td>59</td>
<td>21.69%</td>
<td>7</td>
<td>16.27%</td>
<td>419</td>
</tr>
<tr>
<td>Apical</td>
<td>871</td>
<td>36.51%</td>
<td>272</td>
<td>41.71%</td>
<td>43</td>
<td>47.78%</td>
<td>1186</td>
</tr>
<tr>
<td>Labium</td>
<td>512</td>
<td>21.47%</td>
<td>127</td>
<td>19.48%</td>
<td>19</td>
<td>21.11%</td>
<td>658</td>
</tr>
<tr>
<td>Dorsum</td>
<td>595</td>
<td>24.94%</td>
<td>175</td>
<td>26.84%</td>
<td>23</td>
<td>25.56%</td>
<td>793</td>
</tr>
<tr>
<td>Medium</td>
<td>397</td>
<td>16.64%</td>
<td>62</td>
<td>9.50%</td>
<td>5</td>
<td>5.55%</td>
<td>464</td>
</tr>
<tr>
<td>Post-Dorsum</td>
<td>10</td>
<td>0.41%</td>
<td>16</td>
<td>2.46%</td>
<td>-</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2385</strong></td>
<td><strong>100</strong></td>
<td><strong>652</strong></td>
<td><strong>100</strong></td>
<td><strong>90</strong></td>
<td><strong>100</strong></td>
<td><strong>3127</strong></td>
</tr>
</tbody>
</table>

Comments on Table 1-2

Comment 1: A look at the Table shows that there are a total of 3127 occurrences of stops in the monosyllabic words of Modern Standard Hindi. Out of these, the apical 1186 top the list followed by the labials 658 the dorsal 793, the medial 464 and the post dorsal stops 26 in descending order. These figures are in complete conformity with our predictions in terms of the hierarchy of the adroitness of articulators on the frequency of occurrence of the monosyllabic stops.
Comment 2: As seen in the CVC column in the Table above, of a total of 2385 occurrences for all the stops in the CVC words, the apical stops remain on top, with 871 occurrences, followed by the labials 512 occurrences, the dorsals with 595 occurrences, and the medials with 397 occurrences. The comparatively low figure for the post-dorsal stops 10 is justified by the fact that they are produced by the least adroit post-dorsum among the lingual articulators.

Comment 3: As shown in Table 1-2, of a total of 652 occurrence in the column for the CVCC words, the figures for the apical stops are 272, the labial stops 127, the dorsal stops 16, which is what we except as a result of this hierarchy.

Comment 4: As shown in the column for the CCVC words in the Table 1-2, out of these 90 occurrences followed by 19 labial, 23 dorsal, 5 medial stops. It is noteworthy that there is a total skewing at the post- dorsal order with no occurrence at all.

Section B2 (C): Syntagmatic Distribution of the Fricatives in Terms of the Hierarchy of Adroitness of Articulators: Apertures 1 and 2

In this section, we assess the effect of the hierarchy of the adroitness of the articulators on the distribution of the fricative consonants in the formation of the word in Modern Standard Hindi. The actual occurrences of the fricatives as they appear in the monosyllabic words are presented in the Table 1-3 below:
Table 1.3
Frequency of the Fricatives in the Monosyllabic Words in Terms of Articulators.

<table>
<thead>
<tr>
<th>Fricatives (Apertures 1 &amp; 2)</th>
<th>CVC</th>
<th>CVCC</th>
<th>CCVC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulators</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Apico- Dental</td>
<td>286</td>
<td>100</td>
<td>107</td>
<td>100</td>
</tr>
<tr>
<td>Apico -Palatal</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apical</td>
<td>286</td>
<td>55.64</td>
<td>107</td>
<td>43.85</td>
</tr>
<tr>
<td>Labium</td>
<td>88</td>
<td>17.12</td>
<td>50</td>
<td>20.50</td>
</tr>
<tr>
<td>Dorsum</td>
<td>25</td>
<td>4.87</td>
<td>12</td>
<td>4.91</td>
</tr>
<tr>
<td>Medium</td>
<td>115</td>
<td>22.37</td>
<td>75</td>
<td>30.73</td>
</tr>
<tr>
<td>Post-Dorsum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>514</td>
<td>100</td>
<td>244</td>
<td>100</td>
</tr>
</tbody>
</table>

Comments on Table 1-3

Comment 1: Of a total of 792 words, we encounter 402 of the apical fricatives, 148 of the labial fricatives, 37 of the dorsal fricatives and 205 of medial fricatives. All figures favor our expectations except for the comparatively high medial fricatives. The rational for will be provided in our comments below. We also find a total skewing against the apico-palatal fricatives.
Comment 2: As seen in the CVC column in the table above, where out of a total of 514 occurrences, we encounter 286 apicals which is more than half of the total percentage. This is justified is that they are produced by the most adroit apex.

The almost parallel figures for the labials and the dorsal fricative also conform to our expectations.

The medial fricatives are 115; which result in an unexpected rise in their usage in the word. The skewing against the medials in terms of the hierarchy of the articulators is accountable to the fact that we have proportionable number of Perso-Arabic word in Modern Standard Hindi.

Comment 3: Of a total of 244 CVCC fricatives, we have 107 apical fricatives which are produced by the most adroit apex.

The labial fricatives are only 50 in which is justified and the comparatively low dorsal fricatives 12 are also justified in that they are produced by the dorsum of the tongue, which is less adroit than the apex.

The medial fricatives 95, however, show an upward trend which is explainable by the fact that most of these CVCC words are Perso-Arabic and have remained unchanged in their usage in the word.
Comments 4: We encounter a total of 34 occurrences in the CCVC words. Of these, 9 occurrences are of the apical fricatives. The 10 labial only marginally exceed the apicals. There is however, an unexpected rise in the number of medial fricatives which is not in conformity to our expectations. This sudden upsurge is due to the fact that we have proportionable number of Perso-Arabic words in Modern Standard Hindi which have remained unchanged.


In this section, we discuss the effect of the hierarchy of the adroitness of the articulators on the distribution of nasal consonants in the formation of the word in Modern standard Hindi. The actual occurrences of the nasal consonant, as they appear in the monosyllabic words are presented in Table 1-4.
# Table I.4

Frequency of the Nasals in the Monosyllabic Words in Terms of Articulators.

<table>
<thead>
<tr>
<th>Nasals (Apertures 0 &amp; 3)</th>
<th>CVC</th>
<th>CVCC</th>
<th>CCVC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulators</td>
<td>No</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Apico- Dental</td>
<td>195</td>
<td>95.58</td>
<td>99</td>
<td>75.57</td>
</tr>
<tr>
<td>Apico -Palatal</td>
<td>9</td>
<td>4.41</td>
<td>32</td>
<td>24.42</td>
</tr>
<tr>
<td>Apical</td>
<td>204</td>
<td>47.78</td>
<td>131</td>
<td>53.47</td>
</tr>
<tr>
<td>Labium</td>
<td>204</td>
<td>47.78</td>
<td>82</td>
<td>33.47</td>
</tr>
<tr>
<td>Dorsum</td>
<td>19</td>
<td>4.44</td>
<td>29</td>
<td>11.83</td>
</tr>
<tr>
<td>Medium</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1.22</td>
</tr>
<tr>
<td>Post- Dorsum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>100</td>
<td>245</td>
<td>100</td>
</tr>
</tbody>
</table>

**Comments on Table I-4**

**Comment 1:** As seen in the last column in the Table above, of 692 occurrences of the nasal consonants in all the monosyllabic words in Modern Standard Hindi, the 345 apical produced by most adroit apex comprise more than half of the total number. Moreover, 296 labials, the 48 dorsals, and the 3 medials conform to our expectations regarding this hierarchy of adroitness of articulators.
There is a total skewing against the post-dorsal which is in total conformity in terms of this hierarchy of adroitness.

Comment 2: As seen in the CVC column in the table above, we have a total of 427 occurrences for the nasal consonants. There is a parity in the number of apical and labial nasal which neither goes in favour nor against the rule in question. There is a vast reduction in the frequency of the dorsal nasals which is fully justifiable in terms of the hierarchy of adroitness of articulators. It is worth mentioning at this juncture, that the unexpected figures for the labial nasal can be justified in terms of vision and the presence for the labial sounds in the initial position of the word in terms of visibility factor. There is also a total skewing against the less adroit medial and least adroit post dorsal nasals in the CVC words.

Comment 3: As seen in the CVCC column in the Table above, where out of a total of 245 occurrences, the apical nasal retains its top position with 131 occurrences,

The labials nasals occur in 82 instances, the dorsal in 29 and the medial 3, which is what we expect in terms of the hierarchy of articulators.

Comment 4: And finally, a look at the figures for the CCVC nasals show a total skewing in favor of the apical nasals 50 and labials nasals 50 in contrast to a total skewing against all the rest of the
nasal units. This is justified of in that they are produced by the most adroit apex among lingual articulators.


In this section, we measure the effect of the hierarchy of adroitness of the articulators on the distribution of liquid consonants in the formation of the words in Modern Standard Hindi. The actual occurrences of the liquid consonants, as they appear in the monosyllabic words, are presented in the table below:

Table I.5
Frequency of the Liquids in the Monosyllabic Words in Terms of Articulators.

<table>
<thead>
<tr>
<th>Liquids (Aperture 3)</th>
<th>CVC</th>
<th>CVCC</th>
<th>CCVC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulators</td>
<td>No</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Apico-Dental</td>
<td>509</td>
<td>80.66</td>
<td>224</td>
<td>98.24</td>
</tr>
<tr>
<td>Apico-Palatal</td>
<td>122</td>
<td>19.33</td>
<td>4</td>
<td>1.75</td>
</tr>
<tr>
<td>Apical</td>
<td>631</td>
<td>88.12</td>
<td>228</td>
<td>96.61</td>
</tr>
<tr>
<td>Labial</td>
<td>19</td>
<td>2.65</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dorsum</td>
<td>19</td>
<td>2.65</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Medium</td>
<td>47</td>
<td>6.58</td>
<td>8</td>
<td>3.39</td>
</tr>
<tr>
<td>Post-Dorsum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>716</td>
<td>100</td>
<td>236</td>
<td>100</td>
</tr>
</tbody>
</table>
Comments on Table 1-5

Comment 1: As seen in the last column in this Table, of the 1065 occurrences of the monosyllabic words of Modern Standard Hindi, the apicals comprise a major chunk of the total i.e. 923 which shows that there is a clear preferences for the apical liquids as compared to the labial, dorsal, medial liquids. It is noteworthy that there is a total skewing against the post-dorsal liquids which are least preferred in terms of hierarchy.

There is however an increase in the number of medial liquids, which goes against the norm. We observed that there is parity in the number of the medials 30 and the dorsals 30 here. The rationale for this skewing is provided by the fact that in the initial cluster the second member is either a y or w in Modern Standard Hindi.

Comment 2: As shown in the CVC column in the Table above, of a total of 716 of liquids in the CVC words, the apicals occupy the top position with 631 occurrences. As noted above, the drastic skewing in favor of the apical liquids may well be attributed to the extraordinary adroitness of the apex as an articulator. Further, among the apical liquids, the highly favored apico-dentals are 509 and the disfavored apico-palatals are only 122 in the frequency of usage in the word (c.f. : Chapter -II).
As compared to the high frequency of the apical liquids, the labial, the dorsal and the medial liquids are characterized by the low frequency of occurrences. As seen in the CVC column in table, the labials and the dorsals have 19 occurrences each, whereas the medial liquids have 47 occurrences. This skewing in favor of the medial liquid is against our expectation in terms of the hierarchy of adroitness of articulators.

Comment 3: As shown in the CVCC column in the Table above, of a total of 236 of liquids in the CVCC words, the apicals occupy the top position with 2218 occurrences, and the medial liquids with only 8 occurrences conform to our expectation regarding this hierarchy of the adroitness of articulators.

Comment 4: As seen in the column for the CCVC words in the Table above, out of these 113 occurrences for the five types of liquids. The apical liquids have 64 occurrences, labials 11, dorsal 11, medial 27 and post-dorsal 0, which is what we expect in terms of the hierarchy of adroitness of articulators.

Section C: Summary and Conclusions

In this chapter, we have made an attempt to briefly present the physiological base of Modern Standard Hindi in terms of physiological mechanism an orienting phonological principle of Columbia School linguistics. Here we have taken up only those physiological characteristics of the vocal tract that provide
justification for the phonological skewings observed in the paradigmatic makeup and the syntagmatic organization of the word Modern Standard Hindi.

Section A, of this chapter deals with the postulation of phonological units of Modern Standard Hindi in terms of two physiological variables, namely, articulators and apertures. The phonological unit are presented diagrammatically in the phonological grid (Diagram I-1). The phonological grid is a network of horizontal and vertical lines, representing nine articulators and eight apertures. Degrees of apertures are subjected to two broad divisions, namely constriction versus opening, and the clearly audible versus less clearly audible. The constriction apertures are 0 (stops), and 1, 1 ½, and 2 (fricatives). The opening apertures range from 3 through 8 comprising the liquids and vowels. The second division of less clearly audible extends from aperture 0 through 3 and more clearly audible from 4 through 8 where the vowels of Modern Standard Hindi are produced. It has been noted that the phonological grid in different from the “phonemic inventory” which is traditionally based on the substitution- distribution criteria used by American structuralists.

Phonological units in the grid are not only characterized of the specific phonetic substance, which can be identified in terms of physiological mechanism but they are also characterized by the
value relationship that is they are interrelated with one another in the entire paradigm. The phonological grid is different from the phonemic inventory in two major issues. First phonological grid is organized in terms of articulators and apertures. Second the positional variants, too, if they fall on intersections of the relevant articulators and apertures are elevated to the status of a phonological unit.

In section B, we have evaluated the impact of the hierarchy of adroitness of articulator on the paradigmatic makeup of consonantal units and their frequency of occurrence in the monosyllabic wards of Modern Standard Hindi as a yardstick, we have set up the scale of articulators, with the apex as the most adroit, the dorsum (and the labium) as more adroit, the medium as the less adroit and the post-dorsum as the least adroit. In accordance with this scale relationship. We predicted that the apical consonants should be most preferred both in the number of units and in the frequency of usage in the word in Modern Standard Hindi as in any other language or dialect. On the same basis, we predicted that the dorsal or labial consonants, the medial consonants, and the post-dorsal consonants should be progressively disfavored in terms of the number of units and their frequency of usage in the word. We have amply demonstrated through actual counts that the paradigmatic
and the syntagmatic distribution of phonological units fully conform to our expectations.

Apart from assessing the effect of this hierarchy on the consonantal units in their entirely, we have also separately dealt with the monosyllabic stops, fricatives, nasals and liquids in individual subsections, supported by statistical data.