A Knowledge Structure in the Form of a Classification Scheme for Sinhala Music to Store in a Domain Specific Digital Library

BY

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DECLARATION

I certify that this Dissertation does not incorporate without acknowledgement any material previously submitted for the Degree or Diploma in any University, and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text

Date …………………….   ………………………………………………

                                                                S. P. Ratnayake

The undersigned, have supervised the dissertation entitled **A knowledge structure in the form of a classification scheme for Sinhala music to store in a domain specific digital librar**y presented by S. P. Ratnayake, a candidate for the degree of Masters in Information Systems Management, and hereby certify that, in my opinion, it is worthy of submission for examination.

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Abbreviation

AACR	Anglo-American Cataloging Rules
AACR2R	Anglo-American Cataloging Rules 2002 Revision
AIFF	Audio Interchange File Format
ANSI	American National Standard Institution
CASE	Computer Aided Software Engineering
CD-ROM	Compact Disc – Read Only Memory
CGI	Common Gateway Interface
DBA	Data Base Administrator
DBMS	Data Base Management System
DC	Dublin Core
DDL	Data Definition Language
DDC	Dewey Decimal Classification
DML	Data Manipulation Language
DRP	Disaster Recovery Plan
DVD-ROM	Digital Versatile Disc – Read Only Memory
EFR	Extended Flat Record
ER	Entity Relationship
LC	Library of Congress
LCC	Library Congress Classification
MARC	MAchine Readable Cataloging
MIDI	Musical Instrumental Digital Interface
MPEG	Moving Picture Expert Group
NF	Normal Form

OPAC	Online Public Access Catalog
PC	Power Catalogue
RDBMS	Relational Data Base Management System
SPARC	Standards Planning And Requirements Committee
SQL	Structure Query Language
URL	Universal Resource Locator
VRS	Variation Retrieval System
WAV	Waveform Audio File Format
WMA	Windows Media Audio
XML	eXtensible Markup Language

To

All Music Lovers

1. Introduction

1.1 Background of the study

Whatever the culture, music is only one aspect of it. As such Sinhala music is but one aspect of Sinhala culture. The cultural relations between Sri Lanka and India have been in existence from way back in the past. These relations are intimately and inseparably linked to each other. Historical evidence bear witness to the fact that the cultural relations between India and Sri Lanka have existed for over 2.5 millennia. Sinhala historical narratives and ancient literature and archeological remains carry evidence of the ancient relationship that prevailed between classical music of India and that of Sri Lanka.

Excavations carried out on historical sites like Lowamahapaya, and Ruwanlimahasaya of Anuradhapura have unearthed rock columns containing stellar depicting drummers, Conch blowers, flautists, Veena players, Udekki drummers, Cymbal players, Bummaddi players, Pot dancers, and etc. Similarly there is a range of historical artifacts of like nature belonging to the Polonnaruwa period.

Some understanding of the evidence of musical pursuits during the Anuradhapura and Polonnaruwa period can be derived through the study of works like the Mahawansa and the Chulawansa as well as the study of archeological material. Based on this evidence it is possible to identify a number of musical instruments that were in use like drums such as Geta Bera, Pana Bera, Ekas Bera, Mihigu Bera, Maddala, Pataga, Loho Bera, Yuwala Bera, wind instruments such as Flute, Conch, string instrument like Veena, percussion instrument like Cymbals during this period.

Study of fundamental resources reveals that the ancient folk music of Sri Lanka evolved consequent to the Sandesha poetry (messenger poetry) written during the Kotte period. It is evident that the musical elements in invocatory and exorcist rituals like Bali and Thovil

which developed during this period laid the foundation for the evolution of folk music. Since the wording of the incantations used in the Bali and Thovil rituals are essentially of Tamil and Malayalam origin it might be inferred that these rituals to originated in South India. It is believed that the drum rhythms coming down from the Kotte period also are of South Indian Origin.

Similarly the contribution to folk music made during the Kandy period is also immense. This is borne out by the Kandyan Vannam and Panegyric verses of that period. It is believed that these two were mostly influenced by South India as a matter of fact most of the names of Vannams are Tamil origin.

As cultures developed they absorbed features of cultural significance that occurred in that milieu through time. Such an occurrence is evident in how the Kafferinna and the Baila of the Portuguese became an integral component of Sinhala folk music.

A new bent is evident in Sinhala folk drama music as a result of the advent of Sokari, Kolam and Nadagam into the folk musical repertoire. The folk musical elements popularized by Sokari and Nadagam brought on stage in recent years have had a lasting influence on present day drama music.

Examination of modern musical trends in Sri Lanka reveals that they are substantially influenced by North Indian as well as Western music. It might be said that this trends was triggered by the arrival of Rabeendranath Tagore in Sri Lanka around the mid thirties which promoted aspiring Sri Lankan musicians to go for further studies in Shanthi Nikethan.

All that has been stated above go to show as to how vast an area the music of Sri Lanka is distributed over. Should, in such a context, all available Sri Lankan musical features be converted into live music, digitalized and conserved for the future, it would prove that

immense support to future researchers, forthcoming generations and essentially to all music lovers.

The classification of such a library of music in digital form will prove of substantial help to those pursuing knowledge to access the material they seek quite conveniently and speedily.

1.2 Significance of the Study

The significance of the study is that general classification schemes practiced the world over like Dewey Decimal Classification (DDC), Universal Decimal Classification (UDC) or Library of Congress Classification (LCC) do not provide for specific subject area like oriental music. These schemes generally deal with music but not in greater detail. It is said that the content of the document is more significant than the document itself. From this point of view the contents of the present document is more important than the material that went into its making. In view of the fact that the subject approach is more relevant to subject specific classification scheme, the researcher has tried to collect all available information and construct a specialized scheme for Sinhala music. A more important factor above all these is that the present nature of classification relevant to music is being tried out for the first time in this study. Considering the advances made in digital technology a study of the present nature will provide the incentive to other researchers to pursue a similar approach.

Classification traditionally provides formal, orderly access to the materials stored in the library shelves. A domain specific library which is planned to implement on a digital medium provides more features than the brick-mortar library because it provides its service to an unlimited number of users who expect to reach knowledge within a minimum period of time. The expected advantages can be maximized since the classification scheme covers the entire area of the specified domain. The focus of this research is to design a complete classification for Sinhala music and examine the possibility of its implementation in a digital medium and examine effectiveness of such an implementation.

1.3 Problem Statement

Internationally accepted classification schemes such as the Dewy Decimal Classification (DDC), Universal Decimal Classification (UDC) and Library of Congress Classification (LCC) schemes are broad classification schemes specially developed for the print materials in the libraries and cover entire knowledge universe. These three classification schemes are Western biased designed for Western music. (Refer Appendix A for a comparison of music section in DDC22, UDC and LC). Therefore these schemes are inadequate to classify Sinhala music as most of the subjects relevant to Sinhala music are not covered by the schemes. A Domain Specific Digital Library designed for Sinhala music is a specific subject area and the suitability of the DDC and LCC schemes are not appropriate for the following reasons;

Since DDC, UDC and LCC schemes have a western orientation they fail to serve when considering the music practiced in present day Sri Lanka as it is complex form of music containing a mixture of Indian Ragadari music, indigenous folk music of Sri Lanka, Balia and Kaffarinna music introduced by the Portuguese and also certain features of Western music.

There is a research requirement raised to implement a detailed investigation on the evolution of Sinhala music and the design of a scheme of classification appropriate for Sinhala music and the effectiveness in the digital environment.

The aims of the classification system to be developed are as follows;

- **To ensure that it is comprehensive and inclusive** – it must cover the area of contemporary Sinhala music. Therefore, all relevant subject areas of Sinhala music must be taken into account and accommodate future additions to the scheme.

- **To ensure that it is systematic** – the classification system must be developed according to certain logic, is comprehensive and related to the subject area.

- **Lends itself to effective and efficient use of the digital medium** – there should be the possibility of using the classification system in the digital medium effectively and efficiently in terms of improving user accessibility.

- **Facilitates activities related to library maintenance** – availability of provisions for the effortless implementation of maintenance activities such as insertions and deletions or modifications of the stored materials.

- **To provide quick access to the required information** – facilitate the knowledge seeker to drill down and reach any subject area in Sinhala music he/she happens to pursue at any moment.

1.4 Objectives

Main Objective:

Propose a knowledge structure in the form of a classification scheme to store Sinhala music in the digital medium.

Specific Objectives:

1. Trace the evolution of the history of Sinhala music in Sri Lanka in order to get a complete coverage of Sinhala music from early Anuradhapura period.

2. Trace the development of contemporary music of Sri Lanka.

3. Identify different types and categories of Sinhala music

4. Trace whether there are any significant influences from either Eastern or Western musical traditions on Sinhala music.

5. Design a classification scheme in the form of a knowledge structure for Sinhala music.

1.5 Limitations

The domain specific digital library only limited to store live music pieces (either audio or video formats) and sheet music. The other information related to music such as provenance, theory and related ensemble are not be included to the digital library.

This research focuses on the classification scheme to be implemented using the relational data model. It has not addressed other possibilities of the implementation methods such as Object Oriented Methodologies.

Music pieces available in analog format have to be converted before it is stored in the digital library. The technologies related to analog digital conversion have not been addressed in this research.

1.6 Methodology

For the purpose of this study initially, the history of Sri Lankan music was investigated using archeological resources available. Based on the above, the Contemporary music of Sri Lanka was studied essentially through literary resources. Since systems of classification available have essentially a Western orientation, Sinhala music could not be accommodated in terms of any one of such system it was decided to construct a classification system as a knowledge structure for Sinhala music: the core of the present study. In order to implant the knowledge structure in terms of the digital medium the Relational Data Model this supports the Relational Database Management Systems, was identified as appropriate.

2. Literature Review

Sri Lanka is an island situated at the southern tip of the Indian sub-continent, separated from India by the Palk Strait. Although the Indian influences are dominant on the development of cultural and the social elements of Sri Lanka, it is important to carry out a detailed literature review to examine the evidences that examine the development of music, as well as the indigenous and foreign influences, and also the musical instruments used up to the present.

Further, a study of digital libraries and their related technologies is essential in the present context considering the relevance of digital technology because digital technology to this study.

The literature has been organized under two main headings.

- Literature review of the evolution of Sinhala music in Sri Lanka.
- Literature review of the digital libraries and related technologies.

2.1 Literature review of the evolution of Sinhala music in Sri Lanka

When discussing music of Sri Lanka it is appropriate that such discussion be treated under four main headings. The pre-history of ancient Sri Lankan music, its ancient history, medieval history and modern history. In order to acquire substantial knowledge in this regard three main fundamental resources need to be utilized i.e. archeological evidences, information derived from ancient myths, and information derived from chronicles. In addition to the above a close study of modern text and research articles is also involved.

2.1.1 Pre-Historic period

The "Ravana Hastha Veena" was one of the oldest musical instrument in Sri Lanka, was produced by the king Ravana during the period of 400B.C. and it was played using a bow. According to an important Indian musicological text, king Ravana who was an accomplished musician is said to have composed the Raga " Lankadani".

(Abeyasundara, 2004, pp22 – 33)

There were different types of Veena, during the period of Ravana. Originally the Veena was a string instrument firstly believed to have been developed by the Egyptians around 6000 B.C. and later spread to different parts of the old world. This instrument was very popular in India. Several modifications had been made in the primitive Veena by ancient North Indians. It was made of wood and had gold applied to the outer shell of the instrument which had seven or eight strings. King Ravana made his own Veena and it was known as the "Ravana Veena".

(Kulatilake,1974, pp51 - 57)

The musical capabilities of the king Ravana provide certain evidence of the musical background of ancient Sri Lanka, and it can be argued that the musical system of ancient Sri Lanka was based on the musical traditions of India. In addition to this, the only evidence of any musical instruments during this period was the Veena used by king Ravana.

2.1.2 Ancient History

2.1.2.1 Anuradhapura Period (437BC – 1017AD)

The developments of the musical instruments evident during this period, is explained below.

The "Pebalu Veena", so named because of its yellow colour, was a prominent musical instrument in the king's orchestra and was played along with other instrument such as the wind instrument (flute and conch). Sometimes this musical mixture also played along with drums, including "Udekki" and "Kumbha Bera". Ancient Buddhist works such as Nikaya Grantha and "Deega Nikaya" provide evidence of the use of these instruments.

(Abeyasundara, 2004, pp 35 – 36)

The author of Mahavansa describes how a column of "Geta Bera", "Mihigu Bera", "Maddala", "Mudangubera", "Tammattama" and "Udkki" players preceded king Dutugamunu as he marched into Anuradhapura. These leading drums are still used even today in Sri Lanka. But there is no clear evidence whether all these drums are indigenous to Sri Lanka. A wind instrument called the Horanawa was always interspersed with the drums when they were played on ceremonial occasions. There were separate players for the Horanawa and the Shankaya, the two wind instruments in king Dutugamunu's band.

(Kulatilake, 1974, pp104 - 105)

The Mahawansaya provides adequate information about the Anuradhapura era, regarding the "Pancha Thurya Nadaya" (sounds produced by five different types of instruments and the details are given below) and how it was used in Buddhist ceremonial functions. The manner in which "Pancha Thurya Nadaya" is defined in the Mahawansaya and other books vary. The author of the Mahawansaya has used the term "Pancha Thurya Nadaya" in the instance of musical events, conducted at the king's palace. Sometimes the same term has been used to explain the sounds produced at the Buddhist temples. It is possible that there was a difference between the ceremonial functions at the king's palace and those at the Buddhist temples.

Not only the musical instruments, but there is also evidence that several poetic styles have been used at that time. The Sigiri Mirror Wall verses ("Kurutu Gee") were written during 8 and 11 centuries A.D., have provided evidence of this. Prof. Senarath Paranawithana, commissioner of Archeology, who read and analysed 685 Sigiri graffiti (verses). The visitors who came to view the paintings of heavenly damsels on the rock surface on their way back decided to express their emotions by scribbling verses on the mirror wall. These graffiti can

be divided into two categories, of "Gadya" prose and "Paddaya" poems or songs. These ancient "Padya" had followed a certain styles of "Sinhala Gadya" (prose). According to an ancient Sinhala grammatical work, "Elu Sandas Lakuna", the ancient Sinhala poems were based on 12 poetic styles called "Gee Viritha". The authors of the Sigiri verses had conformed to 10 of these rules.

(Arangala, 2009, pp71 - 75)

Sigiri verses 334 describes the Sigiri damsels as follows;

"නිල් කටරොලු මලක

ඇවුණු වැටකොළ මල් සෙස්

සදා සිහි වෙන්නයි

මහනෙල්වන හය රන්වන්හුන් "

Meaning:

There are two types of damsels one is compared to Wetakolo flower and other is compared to the blue Katarolu flower.

(Arangala, 2009, pp52 - 54)

This bears evidence that, the people of ancient Anuradhapura had reasonable proficiency in the use of certain poetic styles. Later these poetic styles were used by modern musician for example Sunil Santha, Daya Rathnasekara and Darmasiri Kurruppuge, in the compositions of new Sinhala songs.

(Arangala, 2009, pp52 – 54)

2.1.2.2 Polonnaruwa Period (1017AD – 1215AD)

The "Rabana", a small hand held drum covered only on one side with a membrane of animal skin, played with the right hand of the player, was introduced to Sri Lanka from Sumatra islands during the Polonnaruwa period. According to Kulatilaka, King Wijayabahu 1married

a queen, from Sumatra islands, and she came along with different retinue of people (casts) including a group of Raban players.

(Kulatilake,1974, pp138 - 140)

King Parakramabahu succeeded king Wijayabahu 1 in Sri Lanka. He was a lover of music and built a special ceremonial hall, called "Saraswathie Mandapaya" to conduct musical festivals. His queen, Rupawathie was also a great musician and she played occasionally in the Saraswathie Mandapaya participating in musical events. According to the "Chula Wansaya", king Parakramabahu had an orchestra which comprised Veena, flute, and Mrudanga players. Mrudanga is a drum and it is assumed it was brought to Sri Lanka from South India.

(Abeyasundara, 2004, pp 40 - 41)

The "Manawulu Sandeshaya", a Sandeshya Kavya (poem) was written in Pali during the same period. According to Kulatilake, King Parakramabahu maintained good relationships with the Hindus who came from India and this might have been the reason why poetry was written in Pali.

Although Pali was not the language of ancient Sri Lanka, it provides further evidence of Indian influence on ancient Sri Lankan music.

The poem ("Manawulu Sandeshaya) laid the foundation to the "Sinhala Pada Gee Viritha" style of Sinhala poetry. There were certain difficulties of singing these Kavi (poems) because of their style. Later it was replaced by "Mathsma Pada Gee Viritha" (මන්සම පද ගී විරිත)", which was popular because of its simplicity in singing to a certain tune.

2.1.3 Medieval History

2.1.3.1 Dambadeniya Period (1215AD – 1272AD)

The verses 306, 307 and 309 of Kau Silumina (a poem written during the Dambadeniya period) discusses a raga called "Anthali", which when sung by a chorus of girls, was corrected by the king Parakramabhu II (who was the ruler at that time). The king had used three "Sapthakas" (three octaves), to compose songs which were sung by the king's retinue and balladeers. The three sapthaka or octaves were called, "Sama" (සාම), "Madara"(මදර), and "Thara"(තාර).

<div align="right">(Kulatilake, 1974, pp 150 - 151)</div>

Verses 306, 307 and 309 of Kau Silumina are as follows;

306 . "වෙණ අනු සලිකල් - සමමදරතරගමරා

නගත නිසන් තරග හි - නර්නිදු ඇගී සෙපියන්"

<div align="right">(Soratha, 1966, pp 29)</div>

307. "ලයදෙකිනදලිරා - නගන මතකතන නිරුදු

නුපුපුලේ හිගු නුවනින් - තුටුදලෙටව් ගිලිහීමෙන්"

<div align="right">(Soratha, 1966, pp 29)</div>

309. "වසමලිය අනු ගී - කියත සහයොග අගනන්

මියුරු කළ තන් එනිරිදු - රිසි බද නිබද වමියන්"

<div align="right">(Soratha, 1966, pp 29)</div>

Meaning

Verse 306

This dance peformed by dancers both male and female was based on the three octaves but it is said that the female dancers never performed to the Madara octave.

Verse 307

There was such intense compatibility between the dance produced by the damsels and the music that the king was so moved that tears flowed from his eyes.

Verse 309

The king was very happy with the performers' dance and the music, and he was delighted by the damsles.

(Soratha, 1966, pp203 - 205)

Verses 119 and 586 of Kav Silumina provide a brief introduction to the Veena used by the king Kusa. Verse 601 provides an indication of an octave and a scale system called "Ola" used during that period. In Carnatic music this term denotes a singing technique. Kulatilake opines that this might be the increased pitch sometimes used in folk songs in Sri Lanka called "Ada Heraya (අඩහැරය)", (ploughman's call) and could be similar to Ola in Carnatic music.

(Kulathialka, 1974, pp151 - 153)

Verses 119 and 586 of Kau Silumina are as follows;

119."ස සොම්නස් වදනින් - දුන් තිඳසිදු එදවස

නරනිඳු කොකුමුව වෙණ - කුසතණ ද දැන් තපසක්"

(Soratha, 1966, pp 12)

586 ''දෙපන්දහස් දෙතුන් - සියඅනු එක හඬ යුත්

කොකුමුවවෙන බර රඟත් - ගදෙව්සිරි වුන් ගත් ගත් ''

(Soratha, 1966, pp 57)

Although Kav Silumina was a poem, there was a certain difficulty in singing these verses, because the metrical structure is very close to a prosody(a description).

In Indian and Western musical paradigms the octave system does exist. There are three octaves included in Indian musical systems but there is no such limitation in Western music. Seven notes are included in each octave. The following table provides further information on the three octave system used in Indian musical paradigms. (Refer table 2.1)

Low Octave	Middle Octave	Higher Octave
S R G M P D N	S R G M P D N	S R G M P D N

Table 2.1-Octave system used in Indial musical paradigm

The Indian musical paradigms were mainly developed with the focus on Singing. The Western musical paradigm focuses on instrumental music and this might be the main reason for its not being restricted to three octaves.

The Indian musical system is approximately 4000 years old, and at the early stage there was no difference between the musical systems of the North and South. In later periods it slowly expanded to other parts of Asia.

(Shankar, 1968, pp19)

There is evidence of the existence of a certain level of affinity between Indian music and that of the Dambadeniya and Anuradhapura periods. This is borne out by the similarities that exists between "Sama", 'Madara" and "Thara" the three octaves with that of the modern octave system used by the Indian musical systems.

Although the "Shankaya", one of the wind instruments used, does not generated a musical melody was employed in temples and kovils and other events as a symbol of prosperity, which as described in the Mahawansaya, is the same instrument played in the medival period of history in Sri Lanka. The Mahawansaya describes different types of Shankayas including those of gold and silver, were used in temples and kovils (Hindu Temples). The "Thupawansaya", "Sadarmarathanawaliya" ancient Buddhist literary works, refer to different

types of "Bera" (drums) which were used on different occasions, including that of the king marching to war. The drums, frequently used on different occasions were the "Gata Bere", "Mrudanga", "Nigath", "Thammattama", and "Uedkki". In addition to these examples, Mahawansaya provides instances of a number of musical instruments used during the medieval period, but most of them are different types of drums such as " Dawul", "Damaru", "Maha Bali Mrudanga", "Burulu Bera". The same types drums were used in South India during this period. There is an argument that maintains these drums were introduced to Sri Lanka from South India.

(Abeyasundara, 2004, pp 46 - 47)

2.1.3.2 Kurunegala Period (1293AD – 1341AD)

A list of Veena such as "Brunga", "Nakula ", "Dadaru", "Brahma" and a list of drums such as "Daduru Bera", "Pana Bera", "Geta Bera", "Roda Bera", "Maha Bera", "Ekas Bera", "Loho Bera", "Tammata" are referred to in "Thupa Wanshaya". But there is no evidence to say that all drums and Veena are indigeneous to Sri Lanka or had been brought to Sri Lanka from India or any other country.

(Pieris, 2005, pp182 – 183)

"Ummagga Jathakaya" explains the concept of "Pancha Naditha" i.e.five different sounds. According to the Ummagajathkaya, Panchanaditha is the sounds of the following instruments such as the "Thantiripata", "Gatapahau", "Maha Bera", "Pana Bera".

(Pieris, 2005, pp182 – 183)

It is obvious that the concept of five different sounds used by the people during this period may be similar to the "Pancha Thurya Nadaya" the term used current usage.

2.1.3.3 Gampola Period (1341AD – 1415AD)

The "Thisara Sandeshaya" a Sandesha Kawya was written during this period. The author of Thisara Sandeshaya has described dancing styles of a female dancer. In the same poem a Veena type instrument called "Bombili" and three different drums called "Thabamettaka Bera", "Maddal" and a "Thalampota" (metal percussion instrument) are described.

(Pieris, 2005, pp183 – 184)

Gadaladeniya temple that belongs to the Gampola Period has a base relief of a group of dancers and instrumentalists playing the Horanawa, Udekki, and Rabana.

(Pieris, 2005, pp 188 - 184)

The Maddala and Cymbals were borrowed South India. The Mddala was the main percussion instrument of South Indian musicians. Thre is evidence to provide that the Sinhala kings who ruled during the Dabadeniya, Kurunagala and Gamplola periods had enjoyed the South Indian music.

2.1.4 Modern History

2.1.4.1 Kotte Period (1415AD – 1514AD)

2.1.4.1.1 Folk songs:

The literature of this period contains a poetic style called "Mathsama Siupada Gee Viritha". It was used in the "Sandesha Kawyas" (poems) written during this period. Several Sandesha Kawyas such as "Salalihini Sandeshaya", "Gira Sandeshaya", "Paravi Sandeshya", "Hansa Sandeshaya were written during this period. A Sandesha Kawya uses a bird as the messenger to send a message, and the poet describes the path used by the bird to reach its destination. The poems based on Mathsama Gee Viritha are easy to sing and most of the folk songs of Sri Lanka are based on this style.

(Makoluluwa, 1962, pp 25 - 28)

The commencement of the use of folk songs in a country is difficult to identify, but it can inferred that folk songs of Sri Lanka may have started during the Kotte period, because the folk songs are based on the "Mathsama Siupada Gee Viritha".

There was a certain impact of Tamil culture on the development of the Mathsama Gee Siupada Viritha because during the same period a similar poetic style was used in South India. During the period of the king Buwanekaba (before Kotte era), a Sandesha Kavya called "Mayura Sandeshaya" was written. This style of poetry originated in South Indian Tamil literature. The poetry written in Tamil was known as "Virali Vidukudu". The Tamil Siupada Gee Viritha of the 14th and 15th centuries had an impact on Sinhala poetry of the corresponding period.

<div align="right">(Kulatilake, 1974, pp 56)</div>

The "Parakumba Siritha" the provenance of which is not clear, was written in 1415 A.D. i.e., during the period of king Parakramabahu VI, who ruled Kotte during this period. This poem, written to a unique metre, was sung as the king entered audience hall. Although, originally attributed to Ven. Thotagamuwe Rahula was later subject to debate. It has been noted that this poem contains quite a number of Tamil and Saskrit terms.

<div align="right">(Kulatilake, 1974, pp218 - 223)</div>

For example;

Parakumba Siritha Verse 108;

"පුවකර දම්ම්බා විරිදු තරම්   බා

මනහර රම්බා පති පිළිබිම්   බා

යසහර ලම්බා උරදිගු නිම   බා

දින පැරකුම්බා රජසිරි   රම්   බා"

<div align="right">(Parakumba Siritha, 1415)</div>

Meaning:

"Blessing to king Parakumbahu who resembles the famous sacra in fortune; who is like an attractive reflection of Cupid; who has hands like those of Sri Rama, and who has spread the pearl string of his fame on the shoulders of the ladies of the directions".

(Wickramasinghe,1954, pp 277)

The Sinhala poetry has been developed based on certain styles, the length of the line, metrical pattern of verse, separation of the last character from the rest of the words, are peculiar compared to other poems. The author of the Parakumba Siritha followed that metrical pattern. But this feature is very common in "Jana Kavi" (Folk Songs) in Sri Lanka. If the metrical structure used in the Parakumba Siritha has certain similarities to folk songs, it provides substatial evidence that Sinhala folk songs started during the same period.

2.1.4.1.2 Songs in "village rituals":

The poetic and the metrical styles of the verses used in rituals such as Bali and Yaga are similar to folk songs. "Thovil" is another type of exorcist ritual. There was a significant difference between "Bali" and "Thovil". "Thovil" was a special ritual perform for devils, Bali is a special ritual perform to treat an ailment of a patient. The rhythms used in Bali were slow in comparison to "Thovil". Considering the fact that the styles adopted in verses related to rituals and those in folk songs were the same or very closed then it has to be assumed that the verses in Hovel and Bali were based on the poetic metre of folk songs and hence belong to the Kotte period.

(Kulatilake, 1974, pp 244 – 255)

2.1.4.1.3 Percussion rhythms of rituals:

It is difficult to trace the commencement of Bali and Thovil, but it is assumed that this type of rituals started in the 15th and 16th centuries or the Kotte period. At the time it was introduced to Sri Lanka from South India by some Hindu Brahmins, some of the Buddhist

monks rejected it and advised people not to follow the Hindu Brahmin's practices. Later Ven. Vidagama Maitreya Thero, modified the original Bali and Thovil practices with a Buddhist touch, both in form and content, in that all the verses and formulas used in the ritual were those extolling the virtues of the Triple Gem the Buddha, Dhamma, and Sangha – and of the Buddhist deities. The metre of the verses of Bali and Thovil are based on the folk songs styles. The original Bali and Thovil performed by the Brahmins did not include drum rhythms. Later, when deities came to be included in the related incantations drum rhythms too came to be introduced. This makes it evident that Low Country drum rhythms came to be introduced during the Kotte period.

The drum rhythms used in the rituals such as Bali, Thovil, and Yaga are still based on the rhythms used in the Kotte period. The Low Country drum or the Yak Beraya, or the Devol Beraya is the main drum used in most ritual nowadays. It is assumed that the type of the Yak Bera used in the Kotte period is the same type of drum used at present. The present Low Country drum rhythms have descended from those practiced in the distant past.

(Bandara, 2000, pp 30 – 40)

It is more useful to do an analysis of Low Country drum rhythms to understand its influence on Sinhala music.

The generic beat in low country drum rhythm is "Thath (තත්)", "Dith (දිත්)", "Thon (තොන්)", "Nun (නං)". All other rhythms are based on these beats. There are no rules for the rhythmic styles nor a notation system (as in sheet music) for low country drum rhythms. Therefore, artistes use the "Tit (තිත්)" notation system of the Kandyan tradition, when they needed to document rhythms. But this does not reflect the entire rhythmic patterns.

(Bandara, 2000, pp 66 – 76)

E.g. Rhythm based on two time interval;

රු ද /කි ට / ත ත්/දොන් -

(Ru Da/ Ki Ta/ Tha Th/ Don –)

Rhythm based on three time interval;

ගු - ද /දී ග ත /ග දී ග / ත ගු ද

(Gun – Da/De Ga Tha/Ga Di Ga/Tha Gu Da)

Rhythm based on four time interval;

දී ගත් - ග / ත කු දොම් -

De Gath – Ga/Tha Ku Dom –

These rhythms played in rituals are based on these patterns.

<div align="right">(Bandara, 2000, pp 98)</div>

Drum rhythms can be classified as follows;

- Rhythms based on singing
- Rhythms based on dance
- Rhythms based with invocatory significance
- Rhythms related to dramatic situations

<div align="right">(Bandara, 2000, pp 94 – 135)</div>

It is more useful to add additional drum beats used in other situations such as "Magul Bera", announcement of royal decree, rhythms related to dirge, martial drums, drums of victory to complete this classification.

2.1.4.1.4 Low Country Vannam:

The low country Vannams, also known as "Sindu Vannam", may have been introduced during the early Kotte period or late Dambadeniya period. The term "Sindu" is originally a Tamil term; therefore people believe it was introduced under the South Indian influence. The meter used in Low Country Vannam is based on the rules mentioned in "Elu Sadas Lakuna". The Elu Sada Lakuna" is an ancient Sinhala grammar text, written in the late Dambadeniya period. This goes to prove that the Low Country Vannams were written during the Kotte or late Dambadeiya period.

Low country traditional Vannams are known as Sindu Vannam and they are different from Kandyan Vannams, because they were written based on a certain religious background compared to Kandyan Vannams, and they are complicated and difficult to sing. People believe this Vannams were written by "Barana Ganithya" (an ancient astrologer) for the God "Upulvan". There is also school of thoughts that maintain that the authorship of these Vannams is anonymous. Although many people believe these Vannams were confined to singing, certain special drum rhythms called "Iratti" were also included in Sindu Vannam.

(Kottegoda, 1996, pp 5 – 15)

There were thirty two Sindu Vannams recorded on olaleaves, but only ten Sindu Vannams are popular. These thirty two Vannams are; "Shuda (ශුද්ධ)", "Kondanachchi (කොන්දනච්)", "Thala Raga(තාල රාග)", "Vishunu Eshwara (විෂ්ණු ඊශ්වර)", "Soddha Vechchi(සොඳ වෙච්චි), "Nallachchi" (නලච්චි), "Upakari (උපකාරී)", "Lalitha Raga (ලලිත රාග)", Mini Baba (මිනි බබා)", "Ganga Dandaka (ගංගා දණ්ඩක)", "Nalu Geethi (නළු ගීති)", "Minibbada (මිනිබ්බද)", "Dandaka (දණ්ඩක)", "Nalu Geethika (නළු ගීතිකා)", "Anura Dandaka (අනුර දණ්ඩක)", "Beda Kamala (බෙධ කමලා)", "Gangakara (ගන්ගාකර)", "Dandaka Raga (දණ්ඩක රාග)", "Gateekara (සටීකාර)", "Hanumantha (හනුමන්තා)", "Mattiya Matti (මට්ටියා මට්ටි)", "Wasantha (වසන්ත)", "Kamala Geethika (කමල ගීතිකා)", "Bhawadii (භාවාදී)", "Brahma Raga (බ්‍රහ්ම රාග)", "Hasthi (හස්ති)", "Hima Kula (හිම කුල)", "Raga (රාග)", "Beri Thodi (බෙරී තොන්දි)", "Lalitha Raga (ලලිත රාග)", and "Solladi (සොල්ලාදි)". But the author of the Vannams had

been educated in Hindu cultured background because some of the words used in these Vannams are Tamil.

(Kottegoda, 1996, pp 20 – 23)

 E.g. The first "Sindu Vannama" – Shuda Thalaya (the word "Thalaya is always used after the name of the Vannama.)

සිරි පිරි ගිරි මුදුනත සුර පුර ලෙසි   නා

සිරිලක පවර දෙව්නුවරෙහි වෙසෙස ව   නා

සිරි සඳ වසති සිරි සඳ සමගිව වෙසෙ   නා

සුරිඳුනි අසන් මෙ ඇදින බස් බැති පෙම්   නා

(Kottegoda, 1996, pp 20)

The meaning of the above verse;

A brief introduction has been given to god Upulvan and explains that the god is living in the city Devinuwara and pleads with the god to blessing him.

The verse follows an equal number of "Lagu" and "Guru" in each line. Lagu and Guru is a grammatical rule in Sinhala verses.

Some of these traditional low country Vannams and other dances have been modified recently. For example, "Shudha Mathra Natuma" was introduced in 1996 by Govt. School of Fine Arts.

2.1.4.2 Portuguese Period (1505AD – 1602AD)

Baila and Kapirinna, music of the Portuguese was introduced to Sri Lanka after the arrival of the Portuguese in ancient Sri Lanka in 1505. They had the maritime region of Sri Lanka

under their sway until the Dutch took over in 1602. During that period the up-country (Kandy) was ruled by a Sinhala king.

Baila is still a popular musical genre in Sri Lanka. When it was introduced to the country the natives called this music "Thuppahi Sangeethaya" or corrupt music, on account of its popularity among drunkards. They danced to these songs at their parties. Hence, the word Baila was defined as music of dance. The melody and the rhythms of this music are exciting and when it is played people feel like dancing. Portuguese never called their music "Baila". They called it "Cancao". But this term is not popular among Sri Lankans. At the early stage all these songs were composed in Portuguese, but later they were transformed to a mixture of Sinhala and Portuguese. However, there was a strong Spanish influence in Portuguese songs. The Baila traditions includes the use of the fiddle (violin), guitar or banjo with a hand held drum called "Rabana".

(Ariyarathne, 1985, pp27- pp31)

The Rabana is always used to create the rhythm for folk songs called "Viridu" in Sri Lanka. There may be a certain relationship between Baila and Virudu and this may be the reason why, Baila became popular in Sri Lanka. Otherwise, may be, the Rabana was used to popularize Baila.

Baila experts believe that there are 8 "Ragas" (melodies) in Baila songs. The terms by which these Baila "Ragas", which are really tunes, are named as follows either in Portuguese or Sinhalese. "Kaffringna", "Fillon the bole", "Rosa", "Minggamai", "Java", "Alankara", "Banda", "Baththe baththe".

(Ariyarathna, 1985, pp69 - 80)

Prof. Rathnajankar (a great exponent of classical Indian music) published a research paper in 1952, where he explains the foreign influences of the foundations of the music of Portugal, Spain and Southern Europe. According to his research, certain folk songs of these countries

are based on "Bupali", "Kamaj", "Bahiravi" and "Mand" Hindustani Rags.

(Ariyaratne,1985, pp 85).

2.1.4.3 Kandyan Period (1514AD – 1815AD)

The Kandyan musical system was based on five basic rhythms; all other musical tunes or songs such as the eighteen Vannams, thirty two Ragas, sixty four Songs, sixty four " Dishties", five "Leelas", nine "Nushties", twenty eight "Surals" and sixty four "Soudams " were based on these five basic rhythms. These tunes were played to dissimilar dancing styles and the "Pancha Thurya Nadaya" .There are different theories on the origin of the Kandyan musical system. One theory goes back to the reign of king Panduwassa (B.C. 504 – 472). This king had an ailment that was difficult to cure. A ritual called "Khoba Kankariya" was arranged by the dancers to treat the king. It was an all-night session consisting of innumerable chanted verses and a presentation of 18 dance forms. The Vannam songs and dances are said to have evolved from the Kohoba Kankariya. The other theories is that the Kandyan musical system was documented in a manuscript called "Wadankusha Rathnamalaya (වාදන්කුෂ රත්නමාලය)" which had been obtained from an south Indian musician called "Ganithalankara". Although many different debates on the origin of the Kandyan musical system exists, it was considerably developed during the period of the king Sri Weera Narendrasinghe (1705). The king was a music lover and he had arranged ceremonial hall called "Kavikara Maduwa" (a place used for the presentation of poems) which was used by the performers for singing and dancing purposes. "Ramolaka Adikarama" (a senior position in the palace) was appointed chief of the Kavikara Maduwa. Ramolaka Adikarama is poet and he has written a poem called "Srungalakarya". Some people believe the tradional Kandyan Vannams were written by Ranmolaka Adikarama. Initially the Kandyan Vannams were only meant for purposes of singnig, and as such, it is assumed that the dramatic aspects were included at a later period.

(Kulatilake, 1974, pp 258 -270).

The original Kandyan musical system does not exist in Sri Lanka at present. Only certain parts prevail. A Vannam is a colourful descriptive song accompanied by a solo dance which describes the movement of an animal like the elephant, monkey, rabbit, peacock, etc. From the inception, there are 18 Vannams in the Kandyan tradition, still all Vannams are performed by dancers. The eighteen Vannams are "Grahaka (ග්‍රාහක)", "Gajaga (ගජගා)", "Thuraga (තුරගා)", "Uraga (උරගා)", "Mushaladi (මුෂලඩි)", "Ukusa (උකුසා)", "Wairodi (වෛරෝඩි)", "Hanuma (හනුමා)", "Mayura (මයුරා)", "Saula (සැවුලා)", "Sinharaja (සිංහරාජ)", "Naiadi (නෛඅඩි)", "Kirala (කිරලා)", "Eradi (ඊරඩ්)", "Surapathi (සුරපති)", "Ganapathi (ගණපති)", "Udara (උදාර)", "Asadrusa (අසදෘශ)"," Nairatha (නෛරත)". A Vannama consists of seven items seven parts i.e. "thalaya (තාලය)", "deum beat "(බෙර පදය)", rhythm , " Thanama (notation for the verse), "කවිය, (verse)", "Kasthirama (කස්තිරම)", "Siru Maruwa (සීරුමාරුව)", "Adauwa (අඩඋව)".

<div align="right">(Pieris, 2009, pp 88 – 130)</div>

In addition to Vannam there are some other dance styles related to different drum rhythms and songs in Kandyan traditional music. "Mangalam Natuma", "Wattam", "(Hath Pada", "Asne Natuma" are some of these.

The "Gete Beraya" or the "Magul Bera" was the main drum used by Kandyan traditional rhythms. The generic terms of Kandyan tradition drum rhythms are "Thath (තත්)", "Jith (ජිත්)", "Thon (තොං)" and "Nn (නං)". The other rhythms are based on these generic terms. There were two hundred and twelve rhythmic styles classified under different patterns called "Vandamanam", "Sural", "Adau", "Abina" in Kandyan drum rhythms. The Kandyan traditional drum rhythms are frequently used with different dancing patterns such as Vannams and other rituals.

<div align="right">(Karunarathne, 2008, pp 33- 40)</div>

Although the Gete Beraya is the main drum in the Kandyan tradition, it sometime is played together with the Daula, Thammattama and other wind instruments. Then this ensemble

called "Pancha Turya Nadaya". In Pancha Thurya Nadaya, five different sounds have to be included. To complete the Pancha Turya Nadaya the following instruments have to be included.

Atata – Drums with one face – e.g. "Rabana", Ekasbera

Vitata – Two face drums – e.g. "Gete Bera", "Udekki"

Vitataya – Instruments in which strings are stretched – e.g. "Veena"

Ghana – Metal percussion instruments – e.g. "Talampota"

Susiriya – wind instruments – e.g. "Horanawa", "Sak", "Combuwa"

(Suryasena,2004, pp 77)

It is difficult to find the reasons for the disappearance of the Veena from Sri Lanka during this period. The Veena went out of fashion because of the low keyed note it produced in comparison to drums.

The drums have been used for different situations and it can be classified under three main headings.

- As a communication device for public administration – e.g. Announcement of Royal decree, martial drums, drums of victory
- For rituals – e.g. "Thovil", "Bali"
- For other sociological activities – "Magul Bera", Rhythms related to dirge, Kandy Perehara, and morning and evening services at Buddhist temples.

(Karunarhtna, 2008, pp 193 – 210)

The tempo and the pitch of the above rhythm are always fast compared to other rhythms and was vigorously played by the drummer. It is difficult to write and explain the musical styles

of all these drum rhythms, because the artistes used his own styles and experience when they played the tune.

Panegyrics, Martial Ballads, Kolmura Kavi (කෝල්මුර)" Traditional hereditary verses, " (Upath Kavi) උපත්ති කවි" Verses related to birth stories of deties, " (Graha Upath Kavi)" Planetary songs, "Sirasa Pada kavi", Worship stanzas, "Yadini" and "Yathika", verses of beseech, "Octets, "Kannalau", Entreat, "Sahali" were introduced during the period of the king "Sri Weeraparakrama Narendrasinghe" (1707-1729). The king was a lover of music and encouraged the introduction of different musical occasions in the palace. A team of poets called "Kavikara Maduwa" was sponsored by the king and it comprised musicians from Sri Lanka and India. Ganithalankara and Alagnayidu were two musicians from South India who frequently participated in Kavikara Maduwa.

(Wijewikrama, 2009, pp137)

It is important to say that the kingdoms of Kotte and Kandy existed at the same time.

Although the panegyrics were popular during the Kandiyan period, the first panegyric was written during the Kotte period i.e. "Parakumba Siritha" which was written for king "Maha Parakumba VI". The last panegyric was written for Ahale Pola Maha Adikarama (an officer of the last king of Sri Lanka). The other panegyrics were written for kings "Rajasinghe I", "Senarath", "Rajasinghe II", "Sri Weera Parakrama Narendra Singhe", and "Sri Wickrama Rajasinghe".

2.1.4.3.1 Sabaragamuwa Vannams:

It is difficult to find the fundamental resources for the Sabaragamuwa Vannams. There was no support given by the ancient rulers for the development of these Vannams. Artistes believe these Vannams started during the Kandy or Kotte periods.

A description about the Sabaragamuwa Vannams was included in the "Vadankusa Rathnamalaya" (an ancient book), written during the Kandyan period. Although a detailed description about the Sabaragamuwa Vannams were included in Vadankusa, the authors of Vannams were not clearly mentioned. There is evidence to confirm that certain verses of these Vannams were written by educated persons.

(Pieris, 2005, pp 164 – 165)

There are many theories regarding the Sabaragamuwa Vannams. Different scholars have placed different arguments about the total number Sabaragamuwa Vannams, i.e. 18 Vannams for Sabaragamuwa, according to E.P.Delgoda, 31 Vannams for Sabaragamuwa, according to Kirialle Gnavimala Thero (a Buddhist monk) and Mahawalathanne Bandara, 36 Vannanms according to V. P. Aberathna, and 26 Vannams according to Prof. Mudiyanse Thennakoon.

(Rajapakshe, 2006, pp283 – 291)

The list of Sabaragamuwa Vannams is as follows; "Grahaka (ග්‍රාහක)", " Naga Gajaga (නාග ගජගා)", "Anila (ඇනිලා)", "Saula (සැවිලා)", "Ananda (ආනන්ද)", "Hanuma (හනුමා)", "Sinhanadi (සිංහනාදි), "Uraga (උරගා)", "Kirala (කිරලා)", "Kudiradi (කුදිරාදි)", "Viradi (විරාදි)", "Kidura (කිඳුරා)", "Udara (උදාර)", "Koula (කොවිලා)", " Thisara (තිසර)", "Musala (මුසලා)", "Mayura (මයුරා)", "Ukusa (උකුසා)", "KadambaP akshi (කදම්භ පක්ෂි)", "Manduka (මණ්ඩුක)", "Kokila (කෝකිල)", "Demala Viradi (දෙමළ විරදි)". The authors of these Vannams have chosen names of animals to name these Vannams. Although they have used names of animals for the Vannams, the verses of these Vannams do not explain the movement of the animal. Some of the names of Sabaragamuwa Vannams are similar to those of the Kandyan tradition. The drum rhythms and dancing styles of these two Vannam forms are completely different. The features of the Sabaragamuwa Vannam are drum rhythms "Thanama", Verses, "Kalasama" and "Adawa".

(Rajapakshe, 2006, pp289 – 294)

"Daula (දවුල)", (a drum) is the main percussion instrument in the Sabragamuwa tradition. It is still widely used in all Buddhist ceremonial functions and is played with Thammattama and Horanawa. The generic drum rhythm words of Daula is similar to "Gateberaya" (the

drum used in Kandayan tradition) and "Yak Beraya" (the drum used in low country tradition) i.e. "Thath", "Jith", "Thon" "Nun".

Some of the other Daul rhythm styles are "Magul Bera", "Alankara", "Pujapada", "Atawattam", and "Sural". In addition to these rhythms, "Thalam" and "Saudam" are also played by the Daula together with verses and dances.

(Rajapakshe, 2006, pp 1- 10)

It is possible to give a comparison between the Kandyan, Low Country and Sabaragamuwa Vannams.

Similarities;

- All Vannams were used for singing at the early stage.
- Similar timing intervals ("Thala Rupa") were used.

    E.g. 3+4, Timing Interval used in;

    Naiadi Vannama – Kandyan Tradition

    Nalu Geethika Thalama – Low Country Tradition

    Ananda Vannama – Sabaragamuwa Tradition

- Dancing was based on timing interval and drum rhythm.
- Verses were included.
- Singing styles were explained using a "Thanama".
- Rituals were not included
- It was a classical dancing style.

Dissimilarities

- The main purpose of Kandyan and Sabaragamuwa tradition Vannams are for entertainment, but the Low Country Tradition Vannams for ritualistic purposes.

- Kandyan and the Sabargamuwa Tradition Vannams attempt to explain the movement of an animal or similar event. But the Low Country Tradition Vannams explain the power of God Vishnu.

- The Kandyan and Sabaragamuwa Tradition Vannams emphasized timing intervals but Low Country Tradition emphasized "Viritha" (the metrical pattern).

- Kandyan and Sabaragamuwa Tradition Vannams are not related to rituals.

- The following table(refer table 2.2) compares the different styles of singing, dancing and drum rhythms of three different traditions.

Kandyan Tradition Vannams	Low Country Tradition Vannams	Sabargamuwa Vannams
The Vannama consists of Berapadaya Thanama Verse Kastirama Sirumaruwa Aduwa	The Vannama consists of Berapadaya Thanama Verse Irattiya	The Vannama consists of Daul Padaya Thanama Verse Kasthirama Adauwa

Table 2.2 – Different styles of singing, dancing and drum rhythm of the Kandyan, Low Country and Sabaragamuwa tradition Vannams

There is an increased South Indian influence on the development of the Low Country and Kandyan musical systems of Sri Lanka. The Mathsama Gee Pada Viritha has been widely used in other poetic styles such as the panegyrics and martial ballads; it is assumed that it also brought to Sri Lanka from South India.

The "Sandesha Kawya" (messenger poems) written during the Kotte period have certain features of folk songs styles in the metrical pattern and the structure. Therefore, the stand that the folk songs of Sri Lanka originated during the Kotte period, might be taken. However different researchers have given disparate arguments on folk songs. For example;

The origin of folk songs is not known. The language and its usage vary period to period. The old folk songs of the ancient period may have been replaced by the new folk songs in the current period.

<div align="right">(Ratnapala, 1995, pp 92 – 95)</div>

"Sinhalese folk music came in contact, during Kandyan times, and perhaps earlier, with the music of South India, and, deriving inspiration from it, developed on its own lines".

<div align="right">(Sarathchandra, 1968, pp12)</div>

A detailed discussion of folk songs in Sri Lanka, have been included in the section on main attributes of Sinhala Music.

2.1.5 British Colonial Period (1815AD – 1948AD)

2.1.5.1 Influence of Western music

The development of Western music in Sri Lanka was the outcome of the British Colonial period (early 19th Century). The upper middle class and upper class citizens of the country took to western music at its early stages and later it was introduced to the school curriculum as a subject. The Symphony Orchestra of Sri Lanka is one of the oldest western music orchestras in South Asia. The Symphony Orchestra of Ceylon staged its first public performance of Western music, dance and drama at the Ladies' College hall on 13th September 1956. The chairman of the panel was Richard Weerasooriya. Galle Face Hotel

resident orchestra was another popular orchestra that was conducted by Hussain Mohamed during the same period.

(Sunday Times, 2007, February 25)

It is difficult to find fundamental resources about the evolution of western musical events in Sri Lanka. Students trained in Western musical and were presented for examinations conducted by British Institutions and consequently they too became music teachers (piano, violin guitar, etc.)

2.1.5.2 Influence of Baila music

Wally   Bastian, the maestro of Baila music in the early 1940s, had changed the original styles of Baila and included certain features of Western music., for example "Hai hui babi archi ge bicycle eka", "Nona mage nurse nona", "Yaman bando wesak balanda", "Nondi simaiya", "Mama kussi amma sera" follow Western styles of Baila music. Although Baila was subject to much criticism initially, later in 1940, the great Sinhala poet Anada Rajakaruna wrote a poem called "Rata Daya Samaya Pilibada Udara Adahas Sahitha Baila Sindu", where he included a number of patriotic songs to Baila rhythms.

(Ariyarathna, 1985, pp 12 - 71)

This trend was followed by the Baila music composers and singers who later, composed a number of Baila songs based on these rhythms. "Wada Baila" or Baila competitions were also arranged and various Baila musicians sang in these competitions.

2.1.5.3 Influence of folk drama

Quite a number of musical features such as poems, drum rhythms and dramas were included in the ancient "Kolam" drama presentation. "Kolam" was a folk drama performed in the Southern regions (Ambalangoda, Mirissa, Benthara etc.) of Sri Lanka. It is assumed that the "Kolam drama had been introduced about five hundred years ago. The author of "Lowada Sagara" (an ancient admonitory poetic work) has used the words "Palagiya Wani Bahuru **_Kolam_**", where there is indication of a genre like Kolam had been present during his time.

The word Kolam introduced to Sinhala had its origin in the Tamil language, where the term connotes something artistic but different from drama.

(Pieris, 2009, 30-33)

Certain old verses of Kolam drama are conserved in the British Museum in manuscripts. For example;

"කව්යෙන් අසන් කව්

උපදෙස් රැගෙන කී කව්

බෙලෙන් සරස කව්

කියන් බඩදරු කෝලං කව්"

(Sarathchandra, 1968 , pp 90)

Some of the old Kolam manuscripts available at National Museum Sri Lanka, had been written around 1895.

A Kolam staging usually lasted about a week. And each night's performance begins at about nine o'clock at night, with the presentation of an array of masked dancers (usually Kolam dancers wore masks) representing characters drawn from various sources and not connected to any particular story, and ends with the enactment of a story or two.

There were usually two drummers, and a Horanawa player who played, occasionally, the tune being sung by the narrator and his chorus. The narrator sings a line and the chorus repeats it. After singing the invocatory stanzas (written in Sanskrit) for the gods, the narrator sings another set of verses for Buddha, Dhamma and Sangha. Next the narrator explains the descriptions about the each Kolam, in verse, as it is presented on the stage.

(Sarathchardra , 1968, pp 60 – 67)

Usually Kolam dancers wore masks when they played. Therefore it looked like a masked play. At the early stages the drama commenced at nine o'clock at night and continued until dawn of the following day. A Kolam session usually lasted about a week and on each day a different story was staged. Some of the stories were "Sadakiduru" , "Gotimbara", and "Maname". The entire story was enacted accompanied by verses sung to characteristics tunes. With the development of new audio visual medium, the Kolam dramas are rarely presented. Even when presented, it is limited to a few minutes. For example "Jasaya and Lenchina (ජසයා සහ ලෙන්චිනා)" is a popular Kolam drama presented by most of the local television channels nowadays.

A popular Kolam verse is as follows;

"අන බෙර   කාරයෙක්

සමග හේවා   කාරයෙක්

යුග සෙබල   දෙදෙනෙක්

සමග ලන්දේසි නෝන්නා   යුගලක්"

(Sarathchadra, 1968, pp 95)

"Nadagam" was another musical feature in ancient Sri Lanka. There were two types of Nadagams; "Kavi" (verses) Nadagam and "Sindu song Nadagam. Kavi Nadagam is a folk play that consists of a number verses with certain similarities to Kolam drama. The metrical patterns of the verses in Kavi Nadagam were simple and close to the grammatical rules of Sinhala poetry. The language used in these verses was old and based on the styles of the verses of Kolam drama. These verses and the "Thanama" (the notation of the verse) were recited by a narrator and his chorus, and is very similar to the singing style of Vannams. It is believed that Nadagam was introduced to Sri Lanka from South India, during the last hundred years, where it was some kind of street drama.

(Sarathchandra, 1968, pp 80 – 83).

The Kavi Nadagams were composed based on famous folk and Jahthaka stories, for example "Sadakiduru Jathakaya", "Maname Kathawa", "Maha Paduma Jathkaya", Chula Paduma Jathakaya" and "Swarnathika Kathawa". Most of these stories are of Buddhist origin called "Jathaka Katha". The "Sadakiduru Kavi Nadagama" was written based on the poem called "Sadakiduruda Kavya" written by "Vilgammula Sangaraja" (a Buddhist monk) in the thirteen century. One of the stanzas and its Thanama from Sadakiduru Kavi Nadagama is as follows;

Thanama-

    "Thanina- Tham Danina – Tham Danina Tham Danina"

Verse-

    "නිල් වරල් සිකිපිල් ලෙසින් හෙලමින් සුරත් ගතියේ   මනා

     ලොල් උදුල් සපු මල් දමින් ගෙනෙමින් සුරල් ගත   ලේපනා

    හෙල් සුනිල් එපලොල් මලින් සොබමන් රුවින් අමුණා   ගෙනා

    විලි සිහිල් මහනෙල් සමන් එකුසුම් වඩමි ගෙල   ලාගෙන"

(Pieris, 2009, pp 153)

Although the Kavi Nadagam originated in Southern Sri Lanka, it was later disseminated throughout the country. But these Kavi Nadagams are not staged in Sri Lanka today.

The "Sindu Nadagama" was a lyrical play consisting largely of verses and songs. The verses were to Tamil metrical forms, and they were chanted in the absence of a beat. A large number of meters included in a Nadagama were commonly known as "Kavi Raga". The verses in the "Sindu Raga" were sung according to a certain beat. These verses were known as "Thala Raga". When compared with Indian classical music Thala Raga has certain

features of "Bilawal", " Yaman", "Kafi" and "Kamaj" Ragas. "Uruttu" was a special part of a song in a Nadagama which is included to enhance the creative significance of the song. Usually the beat of an Uruttu was doubled. Some melodies of Nadagam songs had been borrowed from Catholic Church music, "Kantaru". Although many different melodies were used in Nadagam songs, most of these melodies were based on folk song styles. "Maddala"(a South Indian drum still used in Carnatic music in India), and Horanawa (an wind instrument) were initially used in Nadagam songs. Later, the Harmonium, violin and the flute came to be used in Nadagam songs.

(Sarathchandra, 1968, pp 110 – 120)

The Nadagama was a form of dramatic entertainment and can be considered as folk opera, and this can be considered a landmark event in the music history of Sri Lanka. The first author of Nadagama was Pallipu Singhno, a blacksmith. Apart from this author, the other authors are not known, while only the names of a few producers are preserved in the oral tradition. For example, "Eugine", "Balastanta Nadagama", "Brumford" all three Nadagamas are attributed to Christian Perera. Nadagamas became popular about the beginning of the nineteenth century and they were considered folk opera. It was popular along the western coast of the Sri Lanka, from Chilaw in the North, and right down to places like Thangalle in the South. There is no evidence to show that it extended to the up-country villages in Sri Lanka. Even at present Nadagams are performed in predominantly Roman Catholic Villages, during the festive seasons.

(Saratchandra, 1968, pp 95 – 99)

"Sokari" is folk drama with considerable musical features in the early and mid nineteenth century. It was very popular in the Up-Country and "Vanni" regions of Sri Lanka. In the low country it was rarely performed. The music basically depends on the drum rhythms and the sound produced by wind instruments. The "Geta Bera" and the "Horanawa" were used in the up-country areas, while the "Daula" was used in the Vanni areas to produce the drum rhythms. The play Sokari varies with the different versions of the story in different parts of the country. Some of the characters too have different names. Sokari is still played in

villages around Kandy. But the modern Sokari play has been considerably changed by the people. Sokari is usually performed on the threshing floor or Kamatha after the harvesting season.

(Sarathchandra, 1968, pp84 – 85)

There was only one distinct melody followed by the verses of Sokari. There are large number of verses in any Sokari play, and most of them are now available in print form and are sung accordingly. The five different types of verses sung in a Sokari play i.e. "Namaskara", soloka", "Sana"," Anishtup" and "Daru Nalavili" (Lullaby) were sung according to the same melody and along with a three beat tempo. "Geta Bera" and the Horanawa were used in most instances as instruments, the "Bummadiya" (a drum made by clay) was also used in certain instances in up-country regions. "Thalampota" (a pair of cymbals) was used to measure time.

(Pieris, 2009, pp 115 – 118)

2.1.5.4 Influence of India

The first "Nurthi" (Stage Drama) was staged in 1876 in Colombo was directed by dramatist musician, D. Bartholomew. It was very popular and later a number of Nurthis (dramas) staged in Colombo city. The music of all these Nurthis (dramas) was composed by local music directors, following South Indian Ragadari Music. Proctor, John de Silva made his debut into drama in 1884 and staged a number of dramas in the Colombo city. The music of his dramas also followed the South Indian classical musical tradition. In the early 1900s, a historic musical event took place, i.e. a team of Indian musicians came to Sri Lanka. This team was known as "Parsi Theater". The members of the team were student of the Hindustani School of Music. In Colombo, musical dramas they presented had a great influence on our local musicians and dramatists who decided to use North Indian Ragadari music in their dramas. John De Silva invited a musician, Pandit Vishvanthlij , who came to Sri Lanka with the "Parsi Theater" to direct music in his dramas. He was responsible for the composition of music for over forty dramas for John De Silva.

(Kuruppu, 1969)

The music of the early Nurthi was composed on South Indian Classical music. The instruments used were violins, "Dhol" (for rhythms) and the metal percussion instrument called "Metal Triangle". The "Sruthi" or the scales were maintained by using a special wind instrument which was made out of goat's bladder. It was continuously produced a specific sound. Later this instrument was replaced by the harmonium. After the arrival of the "Parsi Theater" the Dhol was replace by the Tabla and the sruthi was produced by the harmonium. Violins were still used to play high octave pieces.

(Sarathchandra, 1968, pp133 -136)

2.1.5.5 Gramophone Era

The introduction of the Gramophone was another important musical event in Sri Lanka. The early 1900's is known as the Gramophone era because the first gramophone arrived in Sri Lanka in1903. Most gramophones were manufactured in European countries and were imported to Sri Lanka. Although these Gramophones were expensive items, they were a mandatory item at wedding receptions and other gatherings. The early gramophone records were pressed for Nurthi (drama) songs because they were a popular type of songs at that period. This was the usual practice in the production of gramophone records and this practice was repeated continuously for 25 years. Rukmani Devi, K. K. Rajalakshmi, and Latheef Bhai were popular artistes. Most of the songs extolled the virtues of the Buddha, and they were sung to Ragadari melodies. Since, at that time most of the lyrics for gramophone records were written by Buddhist monks the theme was always Buddhist in nature. This trend in lyric writing changed with Ananda Samarakoon who wrote and sang love songs and songs praising the natural beauty of the country. In addition to these Sinhala records, certain other records were also imported by the companies which included classical Indian music as well as English and Tamil songs.

(Ariyarathne, 1986, pp 130 - 147)

A remarkable development in the music field occurred in the 1930s and 1940s. The great Indian poet and a musician "Rabeendranath Tagore" visited Sri Lanka in 1922. After his

arrival Ananda Samarakoon and his colleagues, W.D. Makuloluwa, A. Athukorala, Molligoda, Sunil Santha, E.Samaradiwakara went to "Shanthi Nikethen" of Rabindranath Tagore to learn music. This has opened the path for the dawn of a new era in the music of Sri Lanka."Sinhahala Jana Sammatha Kawya" (a collection of folk songs) was published by W. A. De Silva and G. P. Malalasekara in 1935.

<div align="right">(Kulathilake, 1991, pp40)</div>

In 1934, the great poet Rabindranath Tagore once again visited to Sri Lanka and established a music school – Sri Pali at Horana. He himself introduced a North Indian musical style called "Bangalle Style" (Rabindra Geetha) to Sri Lanka. It may be the main reason for the development of a North Indian Classical music system in Sri Lanka.

<div align="right">(Weerawardana, 2010, pp 20)</div>

North Indian Classical music system (Hindustani music) was introduced to Sri Lanka with arrival of the great Indian poet Rabindranath Togore. A number of musicians (for example W.B. Makuloluwa, Ananda Samarakoon, and etc.) entered the school of music in India to pursue classical Indian music and they returned to the motherland and introduced it to others. There was a lot of South Indian influence on our old Sinhala musical system, but it was replaced by the Hindutani music paradigm. What some people call as "Sinhala Classical Music", it is not ours, it was borrowed from North India.

2.1.6 Main attributes of Sinhala Music

Folk music is heritage of any country. It is simple, direct and the real natural expression of the nation. It can be easily acquired by the any member group of the country. It relates with thieir thoughts, religion, profession and environment.

"Every nation, every region that has a distinct language and distinct culture of its own has a rich treasure of its own particular folk songs. It is the base of the development of art music of a country"   (Rathnajankar, n.d. cited in Hela Gee Maga, 1962, p.2)

When consider Sinhala music, it is mainly developed on folk music and traditional percussion rhythms. Folk music can be further divided into two forms i.e. rural songs and literate songs. The present day music of Sri Lanka based on part of the musical paradigms of Hindustani, Western and Folk songs of Sri Lanka. But Sinhala music is folk songs and traditional percussion rhythms only. Other parts are not ours; we have borrowed from other traditions.

<div align="right">(Makuloluwa, 1962, pp1 – pp6)</div>

Various researches have been made on the collection, classification, and musical attributes such as melodies and rhythms of folk songs and music.

Poems such as "Guththila Kawya", "Sadakiduru Kawya" and "Kusa Jathaka Kawya" written during the late Kotte period, have some features of the styles of folk songs. The " Wessanthara Jathaka Kawya", "Vidura Jatahaka Kawya", "Pthini Halle" are considered lyrics of folk songs. Most of these poems were written during the period of Kandy.

<div align="right">(Nanayakkara, 1998, pp32 – 39)</div>

The Sinhala "Jana Kav)" or folk songs are classified under eight headings such as songs related to various stories, occupations, lullabies, panegyrics, admonitory songs, amorous verses, "Seth Kavi" (benedictory verses) and "Vas Kavi" (opprobictory verses). The poems, "Vidura Da Kawya", "Mahabinikmana Kawya", "Yasodarawatha", "Muwa Jathaka", "Devadatha Varuna" are to be considered as folk songs related to various stories. The verses of these poems were written in concise, dramatic and repetitive Sinhala. Agriculture was the main occupation of a majority of the ancient Sri Lanka. Some folk songs are directly related to the agricultural industry. The Weeding verses (Nelum Kavi), Adaharaya (plough man's call), Watch hut songs, Harvesting songs, Threshing songs, Kurahkan kavi are some of the songs related to the agricultural industry. Boatmen or Fishermen's songs, Carters song, Miners song, Potter's songs are some of the songs related other occupations. Fishing is an occupation and the fishermen's songs relate to that. In ancient Sri Lanka the main transportation methods were bullock carts and different types of boats. The carters and the boatmen's songs are included in this category. Although Panegyrics were considered folk

songs, they were written by educated persons. Admonitory songs were written for all categories of the nation such as the young and the old always providing an advice to them. Love songs are the main type of admonitory songs.

<div align="right">(Nanayakkara, 1998, pp8 – 32)</div>

When collecting and classifying folk songs the classifier can classify them according to his own view. A classification scheme is provided by Rathnapala as follows;

- Verses that relate to dawn of, departure from and marriage

    Verses that relate to birth

    Verses that relate to marriage

    Verses of challenge ("/Thanchi Kavi/තහන්චි කව්")

    Poruwa verses

    Verses that relate to death

    Wessanthra Halle

- Chants that relate to birth
    Tales that relate to birth of gods
    Tales that relate to birth of planets
    Tales that relate to devils
    Tales that relate to birth of temples and devalas

- Incantations related to rituals

    Incantations associated with gods

    Incantations associated with planets

    Incantations associated with devils

    Incantations recited in instances of disease and etc.

- Folk songs that relate to agriculture

  Songs of the watch hut

  Songs of the Chena

  Kurakkan Kavi (කුරක්කන් කවි)

  Quatrain for rain

  The ploughman's call ("Adaharaya (අඩහැරය) "

  Threshing floor songs

  The weeding song

  Lyrics of sickle

  Mat weavers song

- Songs related to various occupations

  Boatman's song

  Carter's song

  Miner's song

  Wasp-honey collecting song

  Cotton ginners' song

  Blacksmith's song

- Quatrains

  Quatrains for elephants

  Paddy quatrains

  Competitive quatrains (verses of challenge)

  Chew of Betel quatrains

- Admonitory songs

  Admonitory songs on household life

  Moralising/ admonitory songs with a moral

  Songs with a religious moral

- Enigmatic verses (Riddles)

  Verses associated with religious exhortations

  Verses associated with remedies and cures

  Verses associated with the nature

- Verses associated with historical or semi-historical events

  Restrictive verses

  Verses by "Gajaman Nona (ගජමන් නෝනා)" and "Anderay (අඬහැරය)"

  Verses associated with hearsay and gossip

  Verses extolling historical characters or personnel

  (Rathnapala, 1995, pp 92 – 127)

The features of the above two classification schemes are almost similar, but the second classification scheme has been done in detail and further it can be extended to support when new knowledge is available.

Rhythm is an important aspect of folk songs in any country. For example the following Sinhala folk song was sung by fishermen, when the net tied down with a long rope, is then dragged ashore by a group of men tugging at the rope like a tug of war. The leader sings a solo, and the fishermen repeat the chorus. At the last end of the net they increase the tempo

or the rhythm of the song. But some of the words of the song are meaningless.

<div align="center">(Sekara, 2001, pp 69 – 72)</div>

"ඒ - ලා   එලම්බා

එල්ලෙයි   ඒලම්බා

හෙළ හෙලෙයි   හෙලෙයියා

අත ගහපන්   හෙලෙයියා

වමට වෙන්ඩ   හෙලෙයියා

හිතට අරන්   හෙලෙයියා

තවත් ටිකක්   හෙලෙයියා

හෙළ හෙලයි   හෙලෙයියා

විග විගහට   හෙලෙයියා

අත ගහපන්   හෙලෙයියා

සෑම දෙවියන්   හෙලෙයියා

අරන් වරෙන්   හෙලෙයියා

දෙවි පිහිටෙන්   හෙලෙයියා

ගී කියලා   හෙලෙයියා

අම්බාවෙන්   හෙලෙයියා

දෑල ඇදලා   හෙලෙයියා

ගොඩ කරලා   හෙලෙයියා

<div align="right">(Sekara, 2001,pp 69)</div>

The rhythm of the folk song always relates to the occupation. The rhythm is used to avoid the tedium of the repetitive work they performed when they did their work.

If it is so, a detailed analysis has to be performed to identify a possibility to classify Sinhala music based on the musical attributes.

2.1.6.1 Studies to identify musical attributes of Sinhala verses:

The concept of "Mathra" is the base of the Sinhala Thal system. The time taken to pronounce a character of a verse is called a "Mathra". There are two types of Mathras i.e. " Lagu " and " "Guru". In Sinhala to pronounce certain characters one need a short time in comparison to other characters. The short time slots are known as "Lagu" and the long time slots are known as "Guru". For Lagu here is only one time interval while the Guru needs two time intervals. In ancient Sinhala verses there are two types, i.e. "Sivpada" (quatrains) and " Gee" (songs) or "Gee Viritha". Quatrains and songs both have four lines. In Sivpada(quatrains) there is an equal number of Mathras, but in songs this varies. For example;

"රැගත් සුරා පිරු   වෙතින්

සුගත් තඹුරු පෙති   විලසින්

පුවත් නොදැන බමන   ගතින්

නටත් අයෙක් සුරා   මතින්"

The above quatrain has 12 Mathras in each line

"නම්වූ නොමින්   අන්

බුදුනුදු වනත ගුණ   ගන

සරණ දෙව් දෙව්   මුදුන්

මිණිතර තොයින්   උතුමා"

(Sekara, 2001, pp 142 -147)

The Mathra intervals of this song are as follows;

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1st Line	8 Mathras
2nd Line	11 Mathras
3rd Line	10 Mathras
4th Line	11 Mathras

When there is an equal number of Mathras in a quatrain it is easy to sing, because it is based on the same rhythmic value.

A poem is a continuously flowing sound. Mathra is used to measure the sound. The sound generated by a quatrain (when it is recited) can be divided into four intervals. A line of the verse (quatrain) is part of it. Further, a line can also be divided into groups of Mathras called "Matra Kati" (මාත්‍රා කට්ටි). For example,

"මේ සතර - නම කර - මේ සසර දුරු කර"

In this verse, there are four groups in the line, and four Mathras in a single group.

(Sekara, 2007, pp149 – 151)

The beat is another important feature of a verse. The beat of a verse can be produced by clapping or by tapping the table with one's hand. The beat is always produced when the first Matra of the Mathra group is started.

(Sekara, 2007, pp 151)

The idea can be explained using the above example.

මේ ස ත ර | න ම ක ර | මේ ස ස ර | දු රු ක ර
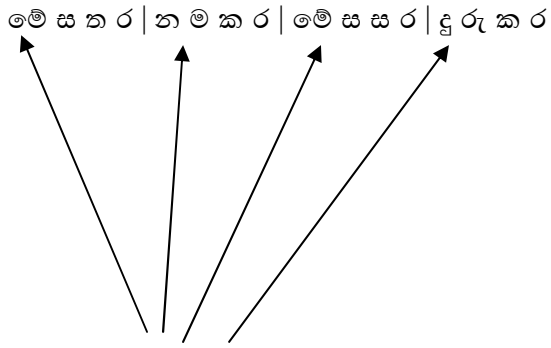
Arrows show the time intervals of beat. Singer claps or uses the "Thalampota" to produce a sound when these characters are produced.

"Thitha (තිත)" is the base of the Sinhala "Thal (තාල්)" or the drum rhythm system. The "Thit (තිත්)" system is easily played by a "Thalampota" (small hand cymbal) system. The "Gata Bera", "Thamattama", "Daula", "Udekki", and "Bummadi" are Played to the Thitha produced by the "Thalampota".

There is an unequal number of Mathra in a Gee (song). But it can be transformed into an equal number of Mathras in each and every line. Then its features are similar to a quatrain. This rule was mentioned in the "Elu Sandas Lakuna". (Elu Sandas Lakuna is the oldest text on Sinhala grammatical rules).

(Sekara, 2007, pp147 – 148)

The following example shows the transformation of a Sigiri graffiti equal to the Mathras of a song.

" බුදුල්මි සියොව

 ආමි සිගිරි බැලීමි

 බැලූ බැලූ බොහෝජන

 ගී ලියුවෙන් නොලිමි"

(Rathnasekara, 2001,pp 16)

The Mathras of the above verse are as follows;

1st Line   7 Mathras

2nd line   11 Mathras

3rd Line   10 Matras

4th Line   11 Matras

The following notation shows the notation transformed into equal Mathras

X බු දැල් මි	සී යො ව -	ආ මි සී ගිරි	බැ ලී මි -
බැ ලු බැ ලු	බෝ හෝ ජ න	ගී ලී යු වෙන්	නො ලී මි -

Characters are written in bold show two Matras.

<p style="text-align:center">(Rathnasekara, 2001, pp 16 – 21)</p>

Although the general rule of the quatrain is a number equal of Mathras in all four lines, some of the quatrains have been violated. But it is sung by transforming them into equal numbers. For example;

කළුවන් කළු රුවයි අපෙ ගම   මදින්නා

මන්දි නැතුව   රා   හැමටම   බෙදන්නා

එන එන කැකුළු මල් නෑරම   තලන්නා

දෙව්යෝ රැක දෙන්න අපෙ ගම   මදින්නා

In this quatrain the Mathras are as follows;

1st Line   18 Matras

2nd Line   17 Matras

3rd Line   18 Matras

4th Line   18 Matras

The quatrain with an equal number of Mathras the quatrain is based on the Samudra Gosha Gee Viritha.

The "Samudragosha Viritha" (සමුද්‍රගෝෂ විරිත) with 18 Mathras is another "Gee Viritha" (ගී විරිත) to which verses are written. This has been initially described by the author of the "Elu Sadas Lakuna" (එළු සදැස් ලකුණ) text. Some of the folk songs are based on these style.

(Sekara, 2007, pp151 – 153)

 "Nawa Viritha" (නව විරිත) is a new style of verses used by modern poets. Although it completely violates the rules given in "Elu Sades Lakuna", these lyrics produced a new style of songs and can be sung melodiously. For example;

"වැලි තල අතරේ හෙමිහිට ගලනා - නේරංජන නදියේ - ගයා හිස

වැඩ හිඳ බුදුවුනු දා තිලෝහිමි - මොක්සුව ලද මොහොතේ - සමාධි භාවනා"

There are 28 Mathras in this song and it is considerably larger than any ordinary verse. The lyric of the song was composed by Chadra Rathna Manawasinghe and Pandit Amaradeva composed music and sang the song.

(Sekara, 2007, 155 – 156)

2.1.6.2 Research done on attributes of the rhythms of Sinhala music

Although there were different drum rhythm systems used by the dancers of Kandyan, Low Country and Sabaragamuwa traditions, originally there was no separate system to describe each. The "Tit" system was used by the Kandyan dances, but there was no proper method that other dancers followed. Because of this difficulty most of the drum rhythms played by the ancient drummers and dancers from the Low country and Sabaragamuwa were not recorded. The the "Tit" system was based on 32 "thals" or rhythms and 7 time measuring system. It was confusing and complicated also. The musicologists W.B. Makuloluwa and Vincent Somapala managed to overcome the difficulties of the "Tit" system and now it is used by Kandyan, Low Country and Sabaragamuwa dancers and drummers as well.

(Kulathilake, 1991, pp41)

"Tit" system, an alternative name was given for the beat system in Western music. "Thal" system is an alternative name given to the "Tit" system. The "Thalapota" is used to produce the sound in the "Tit" system. There are two different sounds, called "Thith" and "Thaei" that can be generated by the "Thalampota". The "Thith" is symbolized using the sign "∧" and "Thaei" is symbolized using "/ ".

Therefore, either / or ∧ symbol shows the starting point of the beat.

(Makuloluwa, 1962,pp 59 – 68)

There are 3 basic Thals. i.e.

Different patterns on Single Beat

Examples:

"Sulu Thani Tita (සුළු තනි තිත)" - The Mathra pattern is;

/
1   2

"Madum Thani Tita(මැදුම් තනි තිත)" – The Mathra pattern is;

/
1 2 3

"Maha thani Tita(මහ තනි තිත)" – The Mathra pattern is;

/
1 2 3 4

Different patterns on Double Beat

"Sulu Madum Detita(සුළු මැදුම් දෙතිත)" – The Mathra pattern is;

Λ	/
1 2	3 4 5

"Sulu Maha Detita (සුළු මහා දෙතිත)" – The Mathra pattern is;

Λ	/
1 2	3 4 5 6

" (Madum Maha Detita(මැදුම් මහා දෙතිත)" – The Mathra pattern is

Λ	/
1 2 3	4 5 6 7

Drum rhythms can also be mixed with the above beat patterns. A rhythm can be played to a different tempo. There are three tempo values i.e. "Vilamba Laya" (Low), "Madya Laya" (Medium) and "Drutha Laya" (High). For example;

Beat – Sulu Thani Tita

Tempo – Vilamba Laya

The rhythms is;

/ 1　　2 දෝ මී	/ 　3　4 කි ට	/ 　5　6 ත　ක	/ 7　8 දෝ මී

The same rhythm can be played in Madya Laya (medium tempo)

/ 1　　　2 දො මී කිට	/ 3　　　4 ත ක　 දො මී	/ 5　　　6 දො මී කිට	/ 7　　　8 ත ක　 දො මී

When it is played in Drutha Laya (high tempo)

/ 1　　　　2 දොමීකිට තකදොම්	/ 3　　　4 දොමීකිට තකදොම්	/ 5　　　　6 දොමීකිට තකදොම්	/ 7　　　　8 දොමීකිට තකදොම්

Therefore in Sinhala music the "Thal System" is based on three attributes, i.e. the beat, the rhythm and the tempo. Songs can be mixed with "thal" system.

It is difficult to use this notation scheme for the verses that do not follow a beat. Some of the Sinhala poems and folk songs do not follow a beat. For example, the following Carter's Song does not follow a beat.

මලේ මලේ ඔය නාමල නෙලා   වරෙන්

අත්ත බිඳෙයි පය බුරුලෙන් තබා   වරෙන්

කැලනි ගගේ ඔරු යනවා බල   වරෙන්

සාදු කර දී ඔරුවක නැඟී   වරෙන්

It is difficult to classify the folk songs of Sinhala based on the musical attributes or its melodies, because same verse is sung differently in different parts of the country.

(Makuloluwa, 1962, pp 1)

The research performed by the musicologist, W. B. Makuloluwa has done together with Vincent Somapala and clearly explained the scientific backgraound of Sinhala music's rhythm system. There are certain difficulties of using the available octave system (North Indian or Western) used in Sinhala verses. This attribute is a common phenomenan in the folk songs of other countries.

The octave system used in Hindustani and the Western music paradigms is vital and universally accepted. Therefore, it is an important issue to use the elements of Hindustani or Western musical paradigms to develop our own musical system, rather depends on the pure Indian or Western classical music.

As explained, folk music is heritage of any country. It is essentially simple, direct and the real natural expression of the nation. It can be easily acquired by the any member group of the country. It relates with their thoughts, religion, profession and environment. It is easy to use a conceptual frame work such as either industry, occupation, place, incident or event to classify Sinhala music (songs).

In conclusion it might be said that, the provenance of Sri Lankan music extends from pre-historic times up to the present. Historical evidence supports the theory that the music of Anuradhapura, Plonnaruwa. Dambadeniya, Kotte and Kandy periods had an advanced musicological basis. The Sandesha poetry of the Kotte period and the Vannams, Martial Ballads, Panegyrics and benedictory songs of the Kandy period continue to exist even in the present day. There is evidence to prove that most of this music had their origin in South India.

A landmark event in the history of Sri Lankan music took place in 1882. This was the arrival of the Parsi Drametic Club of India in Sri Lanka and their staging of a series of Indian dramas through a period of over one month. The music of these dramas was mostly of North Indian origin and they left a lasting impression in the minds of Sri Lankan dramatists. While the music that existed at that time in Sri Lanka had a Carnatic base the influence of north Indian music brought about by the dramas of the Parsi Club had a lasting effect. The pioneering exponent of Sri Lankan drama John de Silva was so impressed by the North Indian music that had caught on among the dramatic elite of that period that he went to the extent of setting up a theatre where the music was essentially North Indian origin.

The trend towards North Indian Ragadari music was strengthened with the arrival of Maha Kavi Rabindranath Tagore on our shores. From that period onwards the intense relationship of Sri Lanka music with that of North India was confirmed.

The seventies decades saw a marked influence of Western music on Sinhala musical compositions. The Western influence could mostly be seen in film music as well as choral music. As such, it is evident that the Sinhala music currently practiced is heavily influenced by North Indian and Western musical elements.

It is essential that all the factors above are taken into consideration when developing a classification of Sinhala music. Nevertheless, in the absence of adequately reliable source material on ancient Sri Lankan music, it is somewhat of an onerous task to include that period in the classification of Sinhala music. In the development of a digital library it is necessary that the singing and playing of that period is included. But in the absence of live samples of musical rendering and singing of that period this becomes somewhat of a difficult exercise. As such this music could be included only in there literary form.

This is a problem that militates even in the instance of folk music. The reason being that the same lyric is sung from region to region to different tunes. As such, to render justice to these genres of music, it is essential that they are included in a digital library.

Therefore in the classification of Sinhala music, all these factors have to be accommodated in the digital library such that the necessary information is retrievable as and when required.

2.2 Literature review of digital music libraries and related technologies

2.2.1 Digital music libraries implemented in the world

The digital music libraries were initially developed for academic purposes. Later, some other forms of digital music libraries such as the music libraries connected to Internet radio stations and the digital music collections which supplied with PDAs (Personnel Digital Assistants) were developed. In all these systems collections of digital music pieces are linked to a computer system or any other electronic device, but it is difficult to classify all these under digital music libraries. The main limitation of this system is the facilities included to retrieve information from the library. They merely served as Online Public Access Catalogues (OPACs). Therefore, these systems can be classified as digital music storage media rather than digital music libraries.

A digital library always differs from a digital music library. A digital music library is a domain specific library which has live musical items, that can be searched and retrieved according to the user requirements. A digital music library developed for Sinhala music is a special kind of a musical store because it supports only Sinhala music. Prior to the implementation of such a library, it is wise to do a study of the related technologies to understand the basic disciplines of the subject.

2.2.1.1 "VARIATIONS" Digital Music Library

"VARIATIONS" is a digital music library implemented by the University of Indiana, Unities States in association with William and Gayle Cook music Library in the late 1990s. The University has improved the software package by releasing a number of versions; currently version 3 has been released. More than 1500 students who have join the School of Music in Indiana university follow undergraduate and post- graduate courses. The university wanted to develop an on-line library system for their students to access various types of musical materials such as operas, songs, instrumental music, jazz, rock, students' assignments and other course work. Initially the "VARIATIONS" provided access to the library through the computers implemented at their library. Now it has been extended to access individual computers of students through the Internet.

(Dunn, Mayer, 1999, pp12 -19)

The Indiana University library uses MARC (Machine Accessible Record) metadata record to store items of music. It was implemented by linking with NOTIS LMS software system. The reason for using the same software was that the users were familiar with the existing system. They conducted research to implement the on-line library searching and retrieving music clips linked to the current system. The early audio source materials of the library were on different types of analog and digital formats such as LP records, cassette tapes, open reel tapes, and compact discs. The original source files were digitized based on Windows NT-based client computers with the assistance of Sound Forge XP (supplied by Sonic Foundry) and Disc-to-Disk (supplied by Microsoft) software systems. During the early days the de facto standard for the digital sound format was Microsoft's WAV. The digitized sound clips were stored on an IBM RS/6000 AIX Server. That was an archive server to store the original copies of the music files, while a playback server was used as a cache server in which all recently played musical files are stored which provides direct service to the client computers in order to improve the performance. The playback server was an IBM RS/6000 59H system with 120GB of SCSI hard disk storage. The server was connected to a 155Mbps ATM communications link. The software which links the archive and playback server was developed by the university. The information retrieval system called VARIATIONS

Retrieval System (VRS) was installed on playback server. A CGI (Common Gateway Interface) Script was used to get the music clips from the archive server. The retrieved music clip was passed to the client's machine to play. Originally, Windows NT Pentium based PCs were located in the music library. To run the sound files, high quality sound cards, headphones and some additional sound editing software were installed on the client computers. The music player software for the client computers were developed by the university by Visual C++. In addition to these, software systems on the client machines word processing, e-mailing, spreadsheet software packages were also installed.

(Dunn, Mayer, 1999, pp12 -19)

2.2.1.2 "MELDEX" Digital Music Library

The MELDEX digital music library was initiated by the University Waikato, New Zealand. The project was initiated to store collections of folk songs (9,354 folk songs) which were divided into geographical regions (Chinese, German, Irish and North American). Different audio formats such as WAV, MIDI and Audio Interchange File Format (AIFF) were used and searching was performed through the World Wide Web. The project was started to measure and analyze the usage of folk songs and the research conducted throughout a year since 1st April 2000 to 31st March 2001. In the initial digital library system the data could be retrieved using three ways: i.e. entire collection of songs by the title and Melodic query or textual query. Melodic queries were submitted by either uploading (posting) a short recording of song or played notes, or by providing a Uniform Resource Locator (URL) to such a recording. Textual queries were matched against the songs metadata such as title or author and lyrics. The MELDEX digital library is now attached to the university on line digital library system which was developed using the "GREENSTONE" software.

(McPherson, Bainbridge, 2002)

2.2.2 The influences of Client Server technologies to implement digital music libraries

The most common architecture for the Internet is the client-server architecture. Client-server architectures always attempt to balance the processing between the client and server by maintain logic. Basically, client server architecture applications are developed based on three

different logics. i.e. data access logic, presentation logic and application logic. In client server applications the client accepts the user requests and performs the application logic that produces that produces database requests that are transmitted to the server. The server software accepts the database requests, performs the data access logic and transmits the results to the client. The client software accepts the results and presents them to the user. Further, the client server technology has been improved as a 3 tier client server solution. In the 3 tier solution, two types of servers (i.e. database server and application server) have been introduced. In this case, the software on the client computer is responsible for presentation logic, an application server is responsible for the application logic, and a separate database servers is responsible for the data access logic and data storage. If the solution has been developed using Relational Databases, the data access logic is SQLs (Structure Query Language).

(McFadden, et al.,1999, pp 301 -303)

The present music digital library software is developed on client server technologies. Web browser is the client level software. It is possible to develop the domain specific digital library for Sinhala music using Relational Database technologies or XML based data storage technologies.

2.2.3 Organization, Classification and Information Retrieval Techniques in libraries

Traditional classification schemes are based on either hierarchical or enumerative schemes. For example, the Dewey Decimal Classification scheme is an enumerative scheme with hierarchical features developed by Melvin Dewey in 1876. In late 19th Century Library Congress Classification Scheme (LCC) was developed for the Library of Congress library which again is an enumerative scheme with hierarchical features. These two classification schemes are general classification schemes and are widely used in libraries in the world. These classification schemes were developed to provide a formal or orderly access to the materials kept on the shelves. The materials kept on the shelves or in files are arranged in a single order. Most of the items can be requested by author, title, subject or form, but they can

be organized by only one of these at a time. This linear arrangement has certain limitation on the classifier.

(Taylor, 2006, pp 391 – 394)

The most popular library classifications schemes such as DDC and LCC, are both are linear or in other words uni-dimensional, later some other works was done to introduce different classification schemes such as faceted classification schemes. Ranganathan introduced his classification schemes in the early 1930s called Colon Classification scheme. This is a faceted classification scheme.

"A faceted classification scheme differs from either hierarchical or enumerated schemes. It does not assign fixed slots to subjects in sequence, but uses clearly defined, mutually exclusive and collectively exhaustive aspects, properties, or characteristics of a class or specific subject".

(Taylor, 2006, pp 394)

The Colon Classification Scheme, the first faceted classification system was developed by an Indian librarian Ranganathan. In his classification scheme, each facet must have a distinctive notation. For example, consider the following classification notation.

"J, 381; 4: 5. 42' N70

This is for a book on the eradication of virus in rice plants in Japan, 1971. The punctuation marks are used for the following purposes.

, (comma)   personality

; (semicolon)   matter

: (colon)   energy

. (period)   space

' (apostrophe)   time

Therefore, the above example can be explained as;

J   agriculture   (main subject)

381   rice plant   (personality)

4   virus disease   (matter)

5   eradication   (energy)

42   Japan   (space)

N70   1970s   (time)"

<div align="right">(Taylor, 2006, pp 395)</div>

After the colon classification scheme was introduced, some other faceted classification schemes were introduced by other professional librarians. The faceted classification schemes are widely used in on-line information retrieval systems such as e-commerce applications where specific attributes are applicable to all products.

The main feature of the faceted classification scheme is, separating subjects into their component parts and allowing access through one or more of those parts, which will be decided by the user. This feature is easily used for on-line searching and browsing.

It is easy to develop a classification scheme for domain specific digital libraries by carefully analyzing different subject areas of the particular discipline. Some library professionals have provided guidelines on how to develop simple user owned classification schemes. The success of a classification scheme depends on the following factors.

- **"It must be inclusive as well comprehensive** – It means the entire knowledge of the subject must have been taken into account.

- **It must be systematic** – it must be so arranged that each aspect of a subject can be considered as a separate, yet related, part of the scheme, and it must be so arranged that new topics and aspects can be added in a systematic manner.

- **It must be flexible and expansible** – it must be constructed so that any new subject in its knowledge area may be inserted without dislocating the general sequence of classification.

- **It must employ terminology that is clear and descriptive, with content meaning for both the user and the classifier** - it is required to arrange a schedule and an index for the user as well as the classifier to understand the significance of the arrangement."

<div align="right">(Taylor, 2006, pp 396 - 397)</div>

The term 'metadata' is used to describe a digital item (document, object, image, software). Metadata is "data about data", it is the "structured" information links with a particular information resource (i.e. the collections). Here the term "structured" has been used to explain the bibliographic information. For example the bibliographic information on a book or any other written document is author, title, and etc. Metadata might also comprise some information about each bibliographic item such as who compiled it and when. When identifying the metadata about the digital library the following questions automatically arise.

- "Where does the metadata come from?
- How will the metadata affect display, search and maintenance of the digital library?
- Does metadata need any extra processing before use?
- Does metadata affect the activities performed by the users?
- Will it be able to display the metadata?
- Is metadata private to the domain or is it shareable with others?
- Will it be able to migrate the metadata to another software?"

<div align="right">(Witten, et al., 2003, pp 286)</div>

Before the term 'metadata' came to be used, AACR2 (Anglo American Cataloging Rules – 2nd Revisions) was used to describe items in a collection. AACR provided rules for description and headings which provided access points to items in a library. These rules were developed to be used for the presentation of cards for manual catalogues. MARC (MAchine-Readable Cataloging) is the standard used by most of the libraries that describe items in an electronic catalogue. MARC is a comprehensive and detailed standard the usage of which is carefully controlled by Library of Congress (LC). MARC records are complex and they are developed based on the AACR2, and are mainly for the cataloguing of printed materials. When integrated library management systems were developed began using different MARC standards. There was a practical problem raised when exchanging library records between different library software systems. To overcome the difficulty LC has developed a standard way of sharing between libraries using XML (eXtensible Markup Language) that is known as MARCXML. Although the concepts have been defined, MARC and MARCXML can only be handled by professional librarians.

(Witten, et al., 2003, pp 288 - 294)

To understand the concepts used in the MARC record was difficult to learn and a time consuming task, as it had many complex fields. The domain specific digital libraries which is being developed on Web Based technologies needed a simplified metadata record to work without the involvement of professional librarians. Dublin Core initiative has been created to develop standard electronic materials.

"Dublin Core (DC) is a set of metadata elements that are designed specifically for non-specific use. It is intended for the description of electronic materials such as a Web page or site, which will almost certainly not receive a full MARC catalog entry. The result of collaborative effort by a large group of people, Dublin Core (DC) is named for Dublin Ohio, where the first meeting was held in 1995. It received the approval of ANSI (American National Standards Institute) in 2001. Although MARC standard comprises hundreds of metadata elements DC standard limited to 15 elements. This is useful and easy to use in domain specific digital libraries without the involvement of a professionally qualified librarian".   (Witten, et al., 2003, pp 294)

The Dublin Core metadata standards details are as follows; (Table 2.4)

Metadata	Definition
Title	The name given to the resource by the creator
Creator	The person or organization primarily responsible for the intellectual content of the resource.
Subject	The topic of the resource
Description	A textual description of the content of the resource
Publisher	The entity responsible for making the resource available
Contributor	A person or organization (other than the creator) who is responsible for making a significant contribution to the intellectual content of the resource
Date	A date associated with the creation or availability of the resource
Type	The nature or the genre of the content of the resource
Format	The physical or digital manifestation of the resource
Identifier	An unambiguous reference that uniquely identifies the resource within a given context
Source	A reference to a related resource, and the nature of its relationship
Language	The language of the intellectual content of the resource
Relation	A reference to a related resource, and the nature of its relationship
Coverage	Spatial locations and temporal durations

	characteristics of the content of the resource
Rights	Information about rights held in the resource

Source: (Witten, et al., 2003, pp 294)

Table 2.3 - Dublin Core Metadata Standard

3. Methodology

It is a qualitative research formulated based on the following questions.

1. What is the nature of the expansion of music in Sri Lanka in the past?

2. Is the music practiced in Sri Lanka in the past in use at present?

3. How has Sri Lankan music expanded in today's context?

4. How is all this treated under a unified classification?

5. How is the coding system relevant to that classification system developed?

6. Are the past, present and future needs of Sri Lankan music accommodated by that classification?

7. How is this classification employed in the digital medium?

8. How is a framework operated in the digital medium developed to meet user needs?

In order to answer the research problems, the methodology of the research can be formulated in clear, measurable and achievable/manageable terms. The methodology of the study is given below;

1. The history of music of Sri Lanka was trace using literary and archeological sources. This was done in order to get a complete picture of the type of music available from the ancient times, development of music, musical instruments used, and also the foreign influences which impacted the indigenous music.

2. A detailed comparative study was conducted to identify the music practiced in Sri Lanka in the past which continoues to be used at present. It was achieved by investigating musicological and ethno musicological texts, other researches relevant to this study, articles published on news papers and magazines.

3. A study of musicological texts, other researches relevant to this study, reliable websites, magazines and news papers was carried out to understand the expansion of present day of music of Sri Lanka.

4. An examination of internationally accepted classification schemes such as Dewey Decimal Classification (DDC), Library of Congress Classification (LCC) and Universal Decimal Classification (UDC) to identify a suitable knowledge structure to classify Sinhala music. This was implemented in order to identify an appropriate classification structure which could be utilized to develop a subject analysis and thereby develop a classification scheme for Sinhala music.

5. A study of the levels and the branches of Sinhala music was carried out to develop a detailed classified coding scheme. This was to identify the hierarchical expansions in order to develop the classification structure. Based on the hierarchy of the classification scheme, a coding scheme has been compiled to classify the present day music of Sri Lanka. Further, the study was extended to explain the knowledge structure to apply with the coding scheme.

6. A discussion of how to expand the knowledge structure to present new knowledge of Sinhala music by considering appropriate modifications to be applied to the knowledge structure together with coding scheme was considered necessary.

7. To enhance the usability of a knowledge structure in terms of user accessibility, it was decided to combine it with the metadata elements of Dublin Core imitative to

describe individual music pieces. Dublin Core initiative has identified the most important bibliographical elements to describe individual item/sources for digital libraries. It is an internationally accepted standard.

8. A study to identify the user requirements of the digital library was implemented prior to the design of the framework. In this regard different graphical models were used. Further, the flat record was normalized to remove the data anomalies and identify the files to be implemented on the relational database. Data dictionary entries, database creation scripts, algorithms for the catalogues and the details of data file maintenance were included to the framework of the digital library.

4. Subject Classification and Knowledge Representation of Sinhala Music

4.1 Subject Classification of Sinhala Music

The subject classification of Sinhala music has been done based on the analysis of the litreture review and the information provided by experts in the field. The discussions carried out with the experts are given in Appendix B.

Detailed analysis and references related to the subject classification of Sinhala music are iven in the literature review.

Classification of Sinhala music:

There are two main divisions:

1. **Folk songs (ජන ගී)**
2. **Traditional percussion rhythms (පාරම්පරික බෙර වාදන)**

Folk songs:

      1.1 Rural Songs (ගැමි ගී)

      1.2 Literate Songs (සේ ගී)

Rural songs:
(1.1.1 to 1.1.14)

1.1.1   Verses related to *dawn of, departure from and marriage* (ද්වාරකර්ම හා සම්බන්ධ කවි)
     (1.1.1.1 to 1.1.1.3)

1.1.1.1   Verses related to birth (උපත හා සම්බන්ධ කවි)

1.1.1.2   Verses related to marriage (විවාහය හා සම්බන්ධ කවි)
           (1.1.1.2.1 and 1.1.1.2.2)

           1.1.1.2.1 Verses of challenge (තහන්චි කවි)

           1.1.1.2.2 "Poruwa verses" (පෝරුවේ කවි)

1.1.1.3   Verses related to death (මරණය හා සම්බන්ධ කවි)
           (1.1.1.3.1)

           1.1.1.3.1 "Wessanthra Halle" (වෙස්සන්තර හැල්ල)

1.1.2   Chants related to birth (උපත් කතා සම්බන්ධ කවි)
         (1.1.2.1 to 1.1.2.5)

         1.1.2.1 Tales related to birth of gods (දේව උපත් කතා)

         1.1.2.2 Tales related to birth of planets (ග්‍රහ උපත් කතා)

         1.1.2.3 Tales related to devils (යක්ෂ උපත් කතා)

         1.1.2.4 Tales related to birth of temples and "Devalas" (පන්සල් සහ දේවාල උපත් කතා)

         1.1.2.5 Tales related to any other events (වෙනත් සිද්ධීන් සම්බන්ධ කතා)

1.1.3   Incantations related to rituals (යාතු කර්ම සම්බන්ධ කවි)
         (1.1.3.1 to .1.1.3.4)

         1.1.3.1 Incantations associated with gods (දේවියන් පිළිබඳ යාතු කර්ම)

         1.1.3.2 Incantations associated with planets (ග්‍රහයන් පිළිබඳ යාතු කර්ම)

         1.1.3.3 Incantations associated with devils (යක්ෂයන් පිළිබඳ යාතු කර්ම)

         1.1.3.4 Incantations recited in instances of disease etc. (ලෙඩ රෝග අවස්ථාවන්හිදී කරනු ලබන යාතු කර්ම)

1.1.4   Folk songs related to agriculture (කෘෂිකර්මාන්තය සම්බන්ධ ජන ගී)
(1.1.4.1 to 1.1.4.9)

1.1.4.1 Songs of the watch hut (පැල් කවි)

1.1.4.2 Songs of the Chena (හේන් කවි)

1.1.4.3 "Kurankan Kavi" (කුරක්කන් කවි)

1.1.4.4 Quatrains for rain (වැහි සිව්පද)

1.1.4.5 The ploughman's call (අඩහැරය)

1.1.4.6 Threshing floor songs (කමත් කවි)

1.1.4.7 The weeding songs (නෙලුම්)

1.1.4.8 Lyrics of the sickle (දෑකැති වාරම්)

1.1.4.9 Mat Weavers songs (පැදුරු මාලයේ කවි)

1.1.5 Songs related to various occupations

(1.1.5.1 to 1.1.5.6)

1.1.5.1 Boatman's song (පාරු කවි)

1.1.5.2 Carter's song (කරත්ත කවි)

1.1.5.3 Miner's song (පතල් කවි)

1.1.5.4 Wasp-honey collecting song (බඹර කපන කවි)

1.1.5.5 Cotton ginner's song (කපු කටින කවි)

1.1.5.6 Blacksmith's song (යකඩ තැළීම සම්බන්ධ කවි)

1.1.6 Quatrains (සී පද)

(1.1.6.1 to 1.1.6.4)

1.1.6.1Quatrains for elephants (ඇත් සී පද)

1.1.6.2 Paddy quatrains (සසඳ සී පද)

1.1.6.3 Competitive quatrains (තරග සී පද)

1.1.6.4 Chew of Betel quatrains (බුලත් තහංචිය)

1.1.7 Admonitory Verses (උපදේශ කවි)

  (1.1.7.1 to 1.1.7.3)

1.1.7.1Admonitory songs on household life (ගේ දොර ජීවිතය පිළිබඳ උපදේශ කවි)

1.1.7.2 Moralising admonitory songs (ගුණ ධර්ම පිළිබඳ උපදේශ කවි)

1.1.7.3 Songs with a religious moral (ආගමික උපදේශ කවි)

1.1.8 Enigmatic Verses (Riddles) (තේරවිලි කවි)

  (1.1.8.1 to 1.1.8.3)

    1.1.8.1 Verses associated with religious exhortations (ආගමික උපදේශ)

    1.1.8.2 Verses associated with remidies and cures (වෙද හෙද කම්)

    1.1.8.3 Verses associated with nature (ස්වභාවධර්මය හා සම්බන්ධ)

1.1.9 Verses related to folk games (ජන ක්‍රීඩා සම්බන්ධ කවි)

  (1.1.9.1 to 1.1.9.9)

1.1.9.1Verses related to "Mee Sellama" (මී සෙල්ලම සම්බන්ධ කවි)

1.1.9.2 Verses related to "Olinda' Game" (ඔලිඳ කෙලිය සම්බන්ධ කවි)

1.1.9.3 Verses related tug o war with horns (අඟ කෙලිය)

1.1.9.4 Verses related to the competition involving hurling of coconuts (පොර පොල් කෙලිය)

1.1.9.5 Verses of the swing (උන්විලි වාරම්)

1.1.9.6 Verses related to the stick dance (ලී කෙලිය)

1.1.9.7 Verses related to the cobra dance (නයි සෙල්ලම)

1.1.9.8 Verses related to the pot dance (කලගෙඩි වාරම්)

1.1.9.9 Verses related to "Mewara Keliya" (මෙවර කෙලිය)

1.1.10 Explanatory Verses (විස්තරාත්මක කව්)

   (1.1.10.1 to 1.1.10.2)

   1.1.10.1 Verses with pseudo alliterations (තෙතඟු)

   1.1.10.2 Descriptive verses (ටීකා)

1.1.11 Amorous verses (අනුරාගී කව්)

   (1.1.11.1 to 1.1.11.3)

   1.1.11.1 Lover's verses (පෙම් කව්)

   1.1.11.2 Verses of lament (විරහ කව්)

   1.1.11.3 Erotic verses (රති කව්)

1.1.12 Verses related to nature and its denizen (ස්වභාව ධර්මය පිළිබඳ කව්)

1.1.13 Satirical verses (උපහාස කව්)

1.1.14 Verses from folk drama (ගැමි නාටක සම්බන්ධ කව්)

(1.1.14.1 to 1.14.4)

1.1.14.1 Kolam drama verses (කෝලම් නාටක කවි)

1.1.14.2 Sokari drama verses (සොකරි නාටක කවි)

1.1.14.3 Nadagam drama verses (නාඩගම් ගී)

1.1.14.4 Puppet drama verses (රූකඩ කවි)

Literate songs are divided into 3 categories. Explained under headings (1.2.1 to 1.2.3)

1.2.1Classical Songs (ශාස්ත්‍රීය ගායනා)

(1.2.1.1 to 1.2.1.3)

1.2.1.1Songs of the Kandyan tradition (උඩරට සම්ප්‍රදායට අයත් ගී)

(1.2.1.1.1 to 1.2.1.12)

1.2.1.1.1 Panegyrics (ප්‍රශස්ති ගී)

1.2.1.1.2 Martial ballads (හටන් කවි)

1.2.1.1.3 Traditional hereditary verses (කෝල්මුර කවි)

1.2.1.1.4 Verses related to birth stories of deities (දේව උපත් කතා)

1.2.1.1.5 Planetary songs (ග්‍රහ උපත් කතා)

1.2.1.1.6 "Madupure" verses (මඩුපුරේ කවි)

1.2.1.1.7 "Sirasa Paada" verses (සිරස පාද කවි)

1.2.1.1.8 Worship Stanzas (නමස්කාර ගාථා)

1.2.1.1.9 Verses of beseech (යාදිනි)

1.2.1.1.10 Octets (අෂ්ටක)

1.2.1.1.11 Entreat (කන්නලව්)

1.2.1.1.12 "Sahalli (rap)" (සැහැලි)

1.2.1.2 Classical songs of the Low Country Tradition (පහත රට සම්ප්‍රදායට අයත් ගී)

(1.2.1.2.1 to 1.2.1.9)

1.2.1.2.1 Verses related to birth stories of deities (දේව උපත් කතා)

1.2.1.2.2 Verses of constellation (ග්‍රහ උපත් කතා)

1.2.1.2.3 "Madapure Kavi" (මඩපුරේ කවි)

1.2.1.2.4 "Sirasa Pada" verses (සිරස පද කවි)

1.2.1.2.5 Worshipful stanzas (නමස්කාර ගාථා)

1.2.1.2.6 Verses of beseech (යාදිනි)

1.2.1.2.7 Octets (අෂ්ටක)

1.2.1.2.8 Entreat (කන්නලව්)

1.2.1.2.9 "Sahali" (සැහැලි)

1.2.1.3 Classical songs of the Sabaragamuwa tradition (සබරගමුව සම්ප්‍රදායට අයත් ගී)

(1.2.1.3.1 to 1.2.1.3.9)

1.2.1.3.1 Verses related to birth stories of deities (දේව උපත් කතා)

1.2.1.3.2 Verses of the constellation (ග්‍රහ උපත් කතා)

1.2.1.3.3 "Madapure Kavi" (මඩපුරේ කවි)

1.2.1.3.4 "Sirasa Pada" verses (සිරස පාද කවි)

1.2.1.3.5 Worshipful stanzas (නමස්කාර ගාථා)

1.2.1.3.6 Verses of beseech (යාදිනි)

1.2.1.3.7 Octets (අෂ්ටක)

1.2.1.3.8   Entreat (කන්නලව්)

1.2.1.3.9 Sahali" (සැහැලි)

1.2.2 Messenger Verses ("Sandesha Kavya")

(1.2.2.1 to 1.2.2.4)

1.2.2.1 "Salalihini Sandeshya" (සැළලිහිනි සංදේශය)

1.2.2.2 "Parevi Sandeshya" (පරෙවි සංදේශය)

1.2.2.3 "Gira Sandeshya" (ගිරා සංදේශය)

1.2.2.4 "Hansa Sandeshaya" (හංස සංදේශය)

1.2.3 Songs related to traditional dance (පාරම්පරික නැටුම් සම්බන්ධ ගයනා)
(1.2.3.1 to 1.2.3.3)

1.2.3.1 Songs related to the "Kandyan" traditional dance
(1.2.3.1.1 to 1.2.3.1.10)

1.2.3.1.1 "Kandyan Vannam" (උඩරට වන්නම්)
(1.2.3.1.1.1 to   1.2.3.1.1.18)

1.2.3.1.1.1 "Grahaka" (ග්‍රාහක)

1.2.3.1.1.2 "Thuraga" (තුරගා)

1.2.3.1.1.3 "Uraga" (උරගා)

1.2.3.1.1.4 "Mushaldi" (මුෂලදී)

1.2.3.1.1.5 "Ukusa" (උකුසා)

1.2.3.1.1.6 "Wairodi" (වෛරොඩී)

1.2.3.1.1.7 "Hanuma" (හනුමා)

1.2.3.1.1.8 "Mayura" (මයුරා)

1.2.3.1.1.9 "Sawla" (සව්ලා)

1.2.3.1.1.10 "Sinharaja" (සිංහරාජ)

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1.2.3.1.1.11 "Naiadi" (නෙඅඩ්)

1.2.1.1.1.12 "Kirala" (කිරලා)

1.2.1.1.1.13 "Erodi" (ඊරොඩ්)

1.2.1.1.1.14 "Surapathi" (සුරපති)

1.2.1.1.1.15 "Ganapathi" (ගණපති)

1.2.1.1.1.16 "Udara" (උදාර)

1.2.1.1.1.17 "Asadrusha" (අසදෘශ)

1.2.1.1.1.18 "Bairatha"

1.2.3.1.2 Songs related to marriage rituals (විවාහ සම්බන්ධ ගී)

1.2.3.1.3 "Thalam" (තාලම්)

1.2.3.1.4 "Saudam" (සව්දම්)

1.2.3.1.5 "Udakki Kavi" (උඩැක්කි කවි)

1.2.3.1.6 "Pantheru Kavi" (පන්තේරු කවි)

1.2.3.1.7 "Sath Sathi Kavi" (සත් සති කවි)

1.2.3.1.8 "Suvisi Vivarana Kavi" (සුවිසි විවරණ කවි)

1.2.3.1.9 "Kawtham" (කෞතම්)

1.2.3.1.10 Other songs related to the Kandyan tradition dance (උඩරට සම්ප්‍රදායේ අනිකුත් ගයනා)

1.2.3.2 Songs related to Low Country traditional dance (පහතරට සම්ප්‍රදායේ ගයනා)

(1.2.3.2.1 to 1.2.3.2.3)

1.2.3.2.1 Low country "Vannam" (පහත රට වන්නම්)

(1.2.3.2.1.1 to 1.2.3.2.1.32)

1.2.3.2.1.1 "Shuda Thalaya" (ශුද්ධ තාලය)

1.2.3.2.1.2 "Kondanachi Thalaya" (කොන්දචි තාලය

1.2.3.2.1.3 "Thala Raga Thalaya"(තාල රාග තාලය)

1.2.3.2.1.4 "Vishnu Thalaya"(විෂ්ණු තාලය)

1.2.3.2.1.5 "Eshwara Thunda Thalaya" (ඊශ්වර තාලය)

1.2.3.2.1.6 "Soda Wedchi Thlaya" (සොඳ වෙදිචි තාලය)

1.2.3.2.1.7 "Nalachchi Thalaya" (න්ල්ලාචි තාලය)

1.2.3.2.1.8 "Upakari Thlaya" (උපකාරි තාලය)

1.2.3.2.1.9 "Lalitha Raga Thalaya" (ලලිත රාග තාලය)

1.2.3.2.1.10 "Mini Bamba Thalaya" (මිණි බඹ තාලය)

1.2.3.2.1.11 "Ganga Dandaka Thalaya" (ගංගා දණ්ඩක තාලය)

1.2.3.2.1.12 "Nalu Gethi Thalaya" (නළු ගීති තාලය)

1.2.3.2.1.13 "Minibada Thalaya" (මිනිබ්බඩ තාලය)

1.2.3.2.1.14 "DandakaThalaya" (දණ්ඩක තාලය)

1.2.3.2.1.15 "Nalu Geethika Thalaya" (නළු ගීතිකා තාලය)

1.2.3.2.1.16 "Anura Danda Thalaya" (අනුරා දණ්ඩක තාලය)

1.2.3.2.1.17 "Behdha Kamala Thalaya" (බේධ කමලා තාලය)

1.2.3.2.1.18 "Gangakara Thalaya" (ගන්ගාකර තාලය)

1.2.3.2.1.19 "Dandaka Raga Thalaya" (දණ්ඩක රාග තාලය)

1.2.3.2.1.20 "Ghateekara Thalaya" (සටීකාර තාලය)

1.2.3.2.1.21 "Hanumantha Thalaya" (හනුමන්තා තාලය)

1.2.3.2.1.22 "Mattiya Mattah Thalaya" (මට්ටියා මට්ඨ තාලය)

1.2.3.2.1.23 "Wasantha Thalaya" (වසන්ත තාලය)

1.2.3.2.1.24 "Kamala Geethika Thalaya" (කමල ගීතිකා තාලය)

1.2.3.2.1.25 "Bhawadi Thalaya" (භාවාදී තාලය)

1.2.3.2.1.26 "Brahma Raga Thalaya" (බ්‍රහ්ම රාග තාලය)

1.2.3.2.1.27 "Hasthi Thalaya" (හස්ති තාලය)

1.2.3.2.1.28 "Hima Kula Thalaya" (හිම කුල තාලය)

1.2.3.2.1.29 "Raga Thalaya" (රාග තාලය)

1.2.3.2.1.30 "Behri Thodi Thalaya" (බෙරිතොදී තාලය)

1.2.3.2.1.31 "Lalitha Raga Thalaya" (ලලිත රාග තාලය)

1.2.3.2.1.32 "Solladhi Thalaya" (සොල්ලාදී තාලය)

1.2.3.2.2 Low Country Saudam (පහත රට සව්දම)

(1.2.3.2.2.1 to 1.2.3.2.2.10)

1.2.3.2.1.1 "Vishunu Saudama" (විෂ්ණු සව්දම)

1.2.3.2.1.2 "Kandakumara Saudama" (කන්දකුමාර සව්දම

1.2.3.2.1.3 "Nagraha Saudama" (නාගරාග සව්දම)

1.2.3.2.1.4 "Pathini Saudama" (පතිනි සව්දම)

1.2.3.2.1.5 Thatha Saudama" (තාත්තා සව්දම)

1.2.3.2.1.6 "Devol Saudama" (දෙවොල් සව්දම)

1.2.3.2.1.7 "Gurulu Saudama" (ගුරුළු සව් සව්දම)

1.2.3.2.1.8 Eshwara Saudama" (ඊශ්වර සව්දම)

1.2.3.2.1.9 "Edurudiga Saudama" (එදුරුදිග සව්දම)

1.2.3.2.1.10 "Sinharaja Saudama" (සිංහරාජ සව්දම)

1.2.3.2.3 Low Country Thalam (පහත රට තාලම්)

1.2.3.3 Songs related to the Sabaragamuwa traditional dance (සබරගමුව සම්ප්‍රදායේ නැටුම්)

(1.2.3.3.1 to 1.2.3.3.3)

1.2.3.3.1 "Sabaragamuwa Vannam" (සබරගමුව වන්නම්)

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(1.2.3.3.1.1 to 1.2.3.3.1.10)

        1.2.3.3.1.1 "Grahaka Vannama" (ග්‍රාහක වන්නම)

        1.2.3.3.1.2 "Gajaga Vannama" (ගජගා වන්නම)

        1.2.3.3.1.3 "Uraga Vannama" (උරගා වන්නම)

        1.2.3.3.1.4 "Anila Vannama" (අනිලා වන්නම)

        1.2.3.3.1.5 "Ukusa Vannama"(උකුසා වන්නම)

        1.2.3.3.1.6 "Kiduru Vannama" (කිඳුරු වන්නම)

        1.2.3.3.1.7 "Udara Vannama" (උදාර වන්නම)

        1.2.3.3.1.8 "Thisara Vannama" (තිසර වන්නම)

        1.2.3.3.1.9 "Viradi Vannama" (විරාදී වන්නම)

        1.2.3.3.1.10 "Sinhanadi Vannama" (සිංහනාඩි වන්නම)

    1.2.3.3.2 "Saudam" (සෞදම්)

    1.2.3.3.3 "Thalam" (තාලම්)

Traditional Percussion Rhythms:

    2.1 Kandyan Percussion Rhythms (උඩරට සම්ප්‍රදායේ බෙර වාදන)

    2.2 Low country percussion rhythms (පහත රට සම්ප්‍රදායේ බෙර වාදන)

    2.3 Sabaragamuwa percussion rhythms (සබරගමුව සම්ප්‍රදායේ බෙර වාදන)

2.1 Kandyan Percussion Rhythm (උඩරට සම්ප්‍රදායේ බෙර වාදන/ පහත දක්වා ඇති පස්වර්ගයම)
   (2.1.1 to 2.1.5)

    2.1.1 Kandyan rhythms based on singing (ගායනය පාදකකොට)

    2.1.2 Kandyan rhythms based on dance (නර්තනය පාදකකොට)

    2.1.3 Kandyan rhythms of Invocatory significance (පූජාර්ථයෙන් කෙරෙන)

    2.1.4 Kandyan rhythms related to dramatic situations (නාට්‍යමය අවස්ථා)

2.1.5 Kandyan rhythms related to "Magul Bera" & "Mala Bera" (මගුල්/ මළ බෙර)

2.2 Low country percussion rhythms (පහත රට සම්ප්‍රදායේ බෙර වාදන/ පහත දක්වා ඇති පස්වර්ගයම)
 (2.2.1 to 2.2.5)

   2.2.1 Low Country rhythms based on singing (ගායනය පාදකකොට)

   2.2.2 Low country rhythms based on dance   (නර්තනය පාදකකොට)

   2.2.3 Low country rhythms of Invocatory significance (පූජාර්ථයෙන් කෙරෙන

   2.2.4 Low country rhythms related to dramatic situations (නාට්‍යමය අවස්ථා)

   2.5.5 Low country rhythms related to "Magul Bera" & "Mala Bera" (මගුල්/මළ බෙර)

 2.3 Sabaragamuwa percussion rhythms සබරගමුව සම්ප්‍රදායේ බෙර වාදන/ පහත දක්වා ඇති පස්වර්ගයම)

 (2.3.1 to 2.3.5)

   2.3.1 Sabaragamuwa rhythms based on singing (ගායනය පාදකකොට)

   2.3.2 Sabaragamuwa rhythms based on dance (නර්තනය පාදකකොට)

   2.3.3 Sabaragamuwa rhythms of Invocatory significance   (පූජාර්ථයෙන් කෙරෙන)

   2.3.4 Sabaragamuwa rhythms related to dramatic situations (නාට්‍යමය අවස්ථා)

   2.3.5 Sabaragamuwa rhythms to "Magul Bera" & "Mala Bera" (මගුල්/ මළ බෙර)

Appendix F provides a list of classified Sinhala Folk Songs.

4.2 Knowledge Representation of Subject Classification of Sinhala Music

Knowledge is defined in different ways. Knowledge can be defined as "facts and relationships about a domain that can be used to solve problems within the domain". Since the problem space consists of nodes and links, each node is a sub goal or step, to the final solution. (Townsend, 1988)

The subject hierarchy of Sinhala music classification is developed by utilizing the style used in Dewey Decimal Classification Scheme. The problem space is defined based on a hierarchical structure. The hierarchy is a pattern which is almost similar to a "Tree". An outline of the tree diagram is mentioned in figure 4.1.

The common features of each level was identified and named using a specific term for the levels. The details of the levels are as follows;

Sinhala Music

Level 1/Paradigm ⟹   **Folk Songs**

Level 2/Broad Application ⟹   **Rural Songs**   **Literate Songs**

Level 3/Specific Application ⟹   **Verses from folk drama**   ……….

Level 4/Genre ⟹   **Verses from Kolam drama**   **Verses from Sokari drama**   **Verses from Nadagam drama**

Level 5/Rituals & Performing Arts ……….   ……………   ……..

Level 6/Terpsichorean   ……….   ………….   ……..
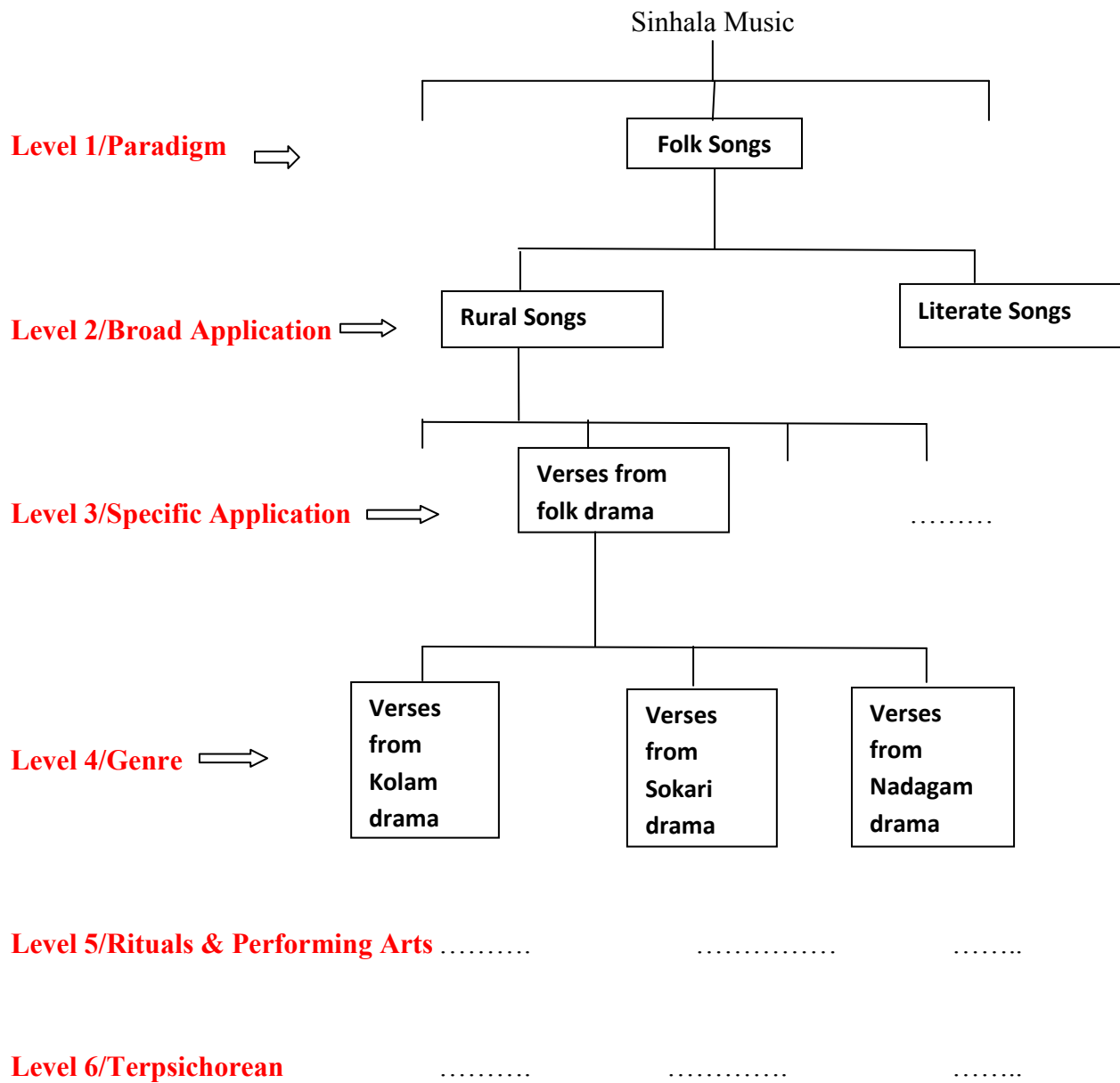
Key

  Nodes – mentioned in bold

  Links – mentioned in lines

Figure 4.1 - An outline of the tree diagram of categorization of Sinhala music

Level 1 deals with Paradigm (considered whether the music based on to a major category of Sinhala music)

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Level 2 deals with Broad Application (considered each paradigm has been divided into broad application areas)

Level 3 deals with Specific Application (considered the levels classified in the level 2 has been included into a specific application area)

Level 4 deals with Genre (considered a particular style of the music has been considered into this level)

Level 5 deals with Rituals/Performing Arts (considered whether the particular music element belongs to a ritual or performing art)

Level 6 deals with Terpsichorean (considered whether the music belongs to drama music)

The knowledge representation method of the subject "Classification of Sinhala music" is one method of knowledge representations. The subject classification of Sinhala music is organized on a knowledge structure. It follows on a "hierarchical field". Following example shows the graphical representation of the knowledge structure to classify "Verses of Kolam Drama". (Figure 4.2)

Level 1/Paradigm $\Longrightarrow$ | Folk Songs |

Level 2/Broad Application $\Longrightarrow$ | Rural Songs |

Level 3/Specific Application $\Longrightarrow$ | Verses from folk drama |

Level4/Genre $\Longrightarrow$ | Verses from Kolam Drama |
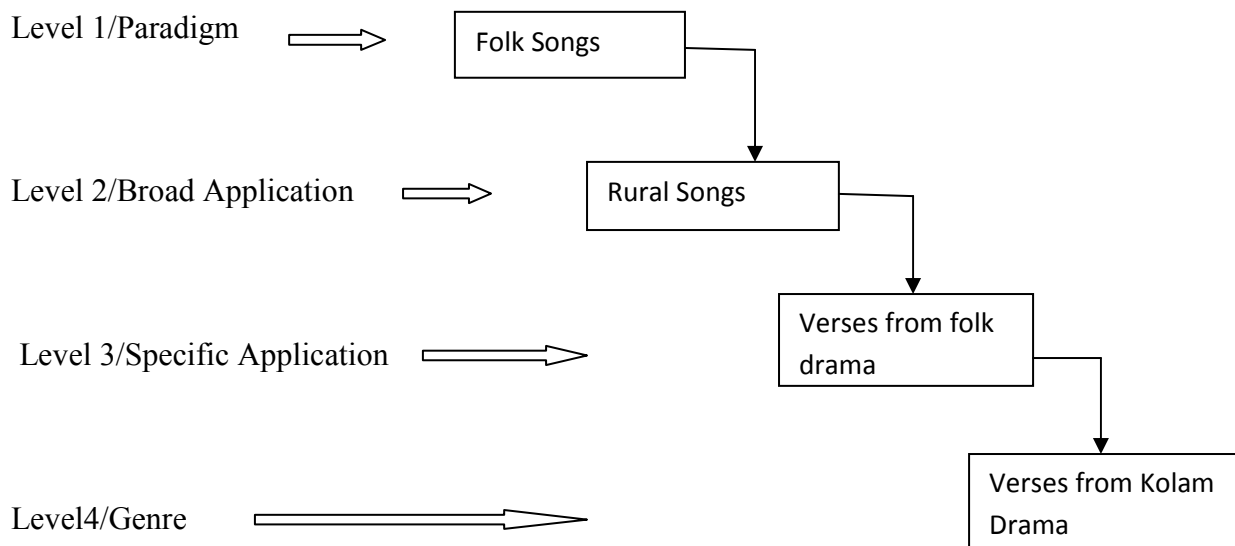
Figure 4.2 Example of Knowledge representation method for Verses from Kolam Drama

The above classification is represented by 'subject headings' or key words' as follows:

Folk Songs/Rural Songs/Verses of Folk Drama/Verses of Kolam Drama

The graphical representation of the knowledge classification for Nadagam drama is given in figure 4.3.

Level 1/Paradigm $\implies$ | Folk Songs |

Level 2/Broad Application $\implies$ | Rural Songs |

Level 3/Specific Application $\implies$ | Verses from folk drama |

Level4/Genre $\implies$ | Verses from Nadagam Drama |
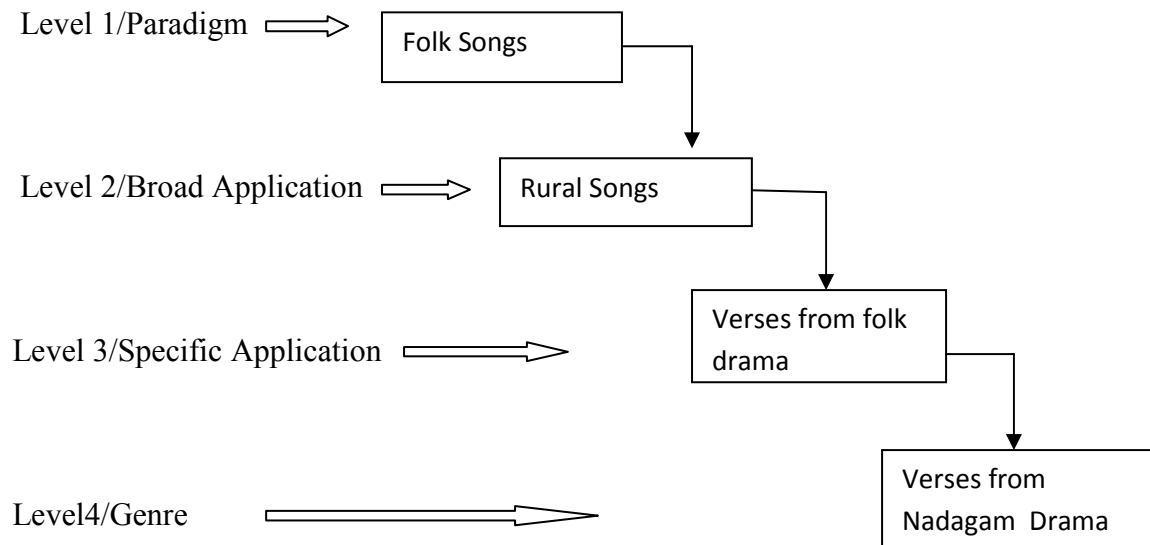
Figure 4.3 Example of Knowledge representation method for Verses from Nadagam Drama

The above classification is represented by 'subject headings' or key words' as follows:

Folk Songs/Rural Songs/Verses from folk drama/Verses from Nadagam Drama

5. Coding system and Knowledge Representation

5.1 Introduction

All subject classification systems have a notation to reperesent subject divisions. The DDC and the UDC use Arabic numerals and decimals while the LCC uses letters of Eglish alphabet. A digital library needs a coding system to make it operational. Hence a coding system is developed in order to make the knolwdge structure complete and system operational.

A certain logic has been followed in the proposed coding system. It is based on the tree model architecture. It consists of nodes. There are two types of nodes i.e. parent nodes and leaf nodes. When a node has *children* at the lower level they are named parent nodes. When a node does not have *children* they are denoted leaf nodes.

Each node has two types of codes i.e. specific code and the classification code. The specific code always relates to the particular branch while the classification codes relates to the parent node and leaf node. A sample of specific nodes is mentioned in table 5.1. A sample of classification codes is included in the tree diagram, refer figure 5.1.

Level of the classification scheme	Name given for the level	Range of the Specific Code
Level 1	Paradigm	A-Z
Level 2	Broad Application	1-9
Level 3	Specific Application	01-99
Level 4	Genre	a-z
Level 5	Rituals/ Performing Arts	A-Z
Level 6	Terpsichorean	01-99

Table 5.1 – Range of the specific code relevant to level of the classification scheme

Sinhala Music

Level 1/Paradigm

Art Music (A)

A

Folk Songs(F)

F

Percussion Rhythms (R)

R

Level 2/Broad Application

Rural Songs (1)

F/1

Literate Songs(2)

F/2

Level 3/Specific Application
....

Verses from folk drama (15)

F/1/15

....

Level 4/Genre

Verses from Kolam drama (a)

F/1/15/a

Verses from Sokari drama (b)

F/1/15/b

Verses from Nadagam drama (c)

F/1/15/c

Level 5/Rituals & Performing Arts ....

Level 6/Terpsichorean   ....
          ....

Key

Specific codes are given in blue

Classification codes are given in red

Figure 5.1 - A sample of classification codes is included in the tree diagram

The coding system applied in this study follows a hierarchical pattern, so that any information seeker interested in making use of this system needs only to identify the process involved and proceed conveniently further. On the other hand the coding system has a direct relationship with the knowledge structure. In the above diagram (figure 5.1) the classification codes are mentioned in red. It can also be represented using a graphical representation of knowledge structure. An example is included in figure 5.2.

Level 1/Paradigm ⟹ Folk Songs (F)

Level 2/Broad Application ⟹ Rural Songs (F/1)

Level 3/Specific Application ⟹ Verses from folk drama (F/1/15)

Level4/Genre ⟹ Verses from Nadagam Drama (F/1/15/c)
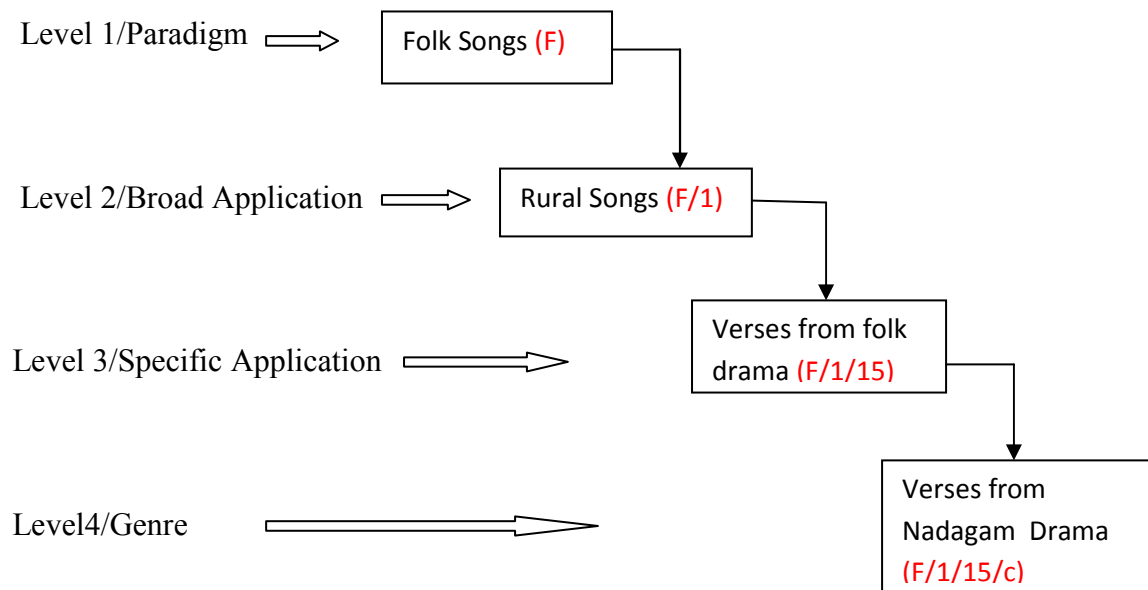
Figure 5.2 Example of Knowledge representation together with the classification code for Verses from Nadagam Drama

Final classification code is written as (F/1/15/c)

Detail list of all classification codes treated in the present study are listed below.

5.2 Level 1 / Paradigm Codes

Refer table 5.2 for level 1 / Paradigm codes

Category	Code
Folk Songs	F
Traditional Percussion Rhythms	R

Table 5.2 – Level 1 / Paradigm Codes

5.3 Level 2 / Broad Application Codes

Refer table 5.3 for level 2 / Broad Application codes

Category	Code
Rural Songs	F/1
Literate Songs	F/2
Kandyan Percussion Rhythms	R/1
Low Country Percussion Rhythms	R/2
Sabaragamuwa Percussion Rhythms	R/3

Table 5.3 – Level 2 / Application Codes

5.4 Level 3 / Specific Application Codes

Each level 2 code further divided into sub classified codes.

Refer table 5.4 for level 3 codes for rural songs.

Category	Code
Verses related to dawn of, departure from and marriage	F/1/01
Chants Related to birth	F/1/02
Incantations related to rituals	F/1/03
Folk songs related to agriculture	F/1/04
Songs related to various occupations	F/1/05
Quatrains	F/1/06
Admonitory songs	F/1/07
Enigmatic verses	F/1/08
Verses associated with historical or semi-historical events	F/1/09
Songs related to folk games	F/1/10
Explanatory verses	F/1/11
Amorous verses	F/1/12
Verses related nature and its denizen	F/1/13
Satirical verses	F/1/14
Verses from folk drama	F/1/15

Table 5.4 - Rural Songs (level 3 code)

Refer table 5.5 for level 3 codes for literate songs.

Category	Code
Ancient classical songs	F/2/01
Messenger verses	F/2/02
Songs related to traditional dance	F/2/03

Table 5.5 – Literate Songs (level 3 code)

Refer table 5.6 for level 3 codes for traditional Kandyan Percussion Rhythms

Category	Code
Kandyan rhythms based on singing	R/1/01
Kandyan rhythms based on dance	R/1/02
Kandyan rhythms with invocatory significance	R/1/03
Kandyan rhythms related to dramatic situation	R/1/04
Kandyan rhythms related to "Magul Bera"	R/1/05

Table 5.6 – Traditional Kandyan Percussion Rhythms (level 3 code)

Refer table 5.7 for level 3 codes for traditional Low Country Percussion Rhythms

Category	Code
Low country rhythms based on singing	R/2/01
Low country rhythms based on dance	R/2/02
Low country rhythms with invocatory significance	R/2/03
Low country rhythms related to dramatic situation	R/2/04
Low country rhythms to "Magul Bera"	R/2/05

Table 5.7- Traditional Low Country Percussion Rhythms (level 3 code)

Refer table 5.8 for level 3 codes for traditional Sabaragamuwa Percussion Rhythms

Category	Code
Sabaragamuwa rhythms based on singing	R/3/01
Sabaragamuwa rhythms based on dance	R/3/02
Sabaragamuwa rhythms with invocatory significance	R/3/03
Sabaragamuwa rhythms related to dramatic situation	R/3/04
Sabaragamuwa rhythms related to "Magul Bera"	R/3/05

Table 5.8 – Traditional Sabaragamuwa Percussion Rhythms (level 3 code)

5.5 Level 4 / Genre Codes

All Level 3 codes have been further divided into sub classification codes

Refer table 5.9 for level 4 codes for Verses Related to Dawn of, Departure from and Marriage

Category	Code
Verses related to birth	F/1/01/a
Verses related to marriage	F/1/01/b
Verses related to death	F/1/01/c

Table 5.9 – Verses Related to Dawn of, Departure from and Marriage (level 4 code)

Refer table 5.10 for level 4 codes for Chants Related to Birth

Category	Code
Verses in the tales related to the birth of gods	F/1/02/a
Verses in the tales related to the birth of planets	F/1/02/b
Verses in the tales related to the birth of devils	F/1/02/c
Verses in the tales related to the birth of temples and 'devalas'	F/1/02/d
Verses in the tales related to the birth of any other events	F/1/02/e

Table 5.10 – Verses Related to Chants Related to Birth (level 4 code)

Refer table 5.11 for level 4 codes for Incantations Related to Rituals

Category	Code
Incantations associated with gods	F/1/03/a
Incantations associated with planets	F/1/03/b
Incantations associated with devils	F/1/03/c
Incantations recited in instances of decease and bereavement.	F/1/03/d

Table 5.11 – Incantations Related to Rituals (level 4 code)

Refer table 5.12 for level 4 codes for Folk Songs Related to Agriculture

Category	Code
Songs of the watch hut	F/1/04/a
Songs of the chena	F/1/04/b
Kurrakkan Kavi	F/1/04/c
Quatrains for rain	F/1/04/d
The ploughman's call ("Adaheraya")	F/1/04/e
Threshing floor songs	F/1/04/f
The weeding song	F/1/04/g
Lyrics of the sickle	F/1/04/h
Mat weavers songs	F/1/04/i

Table 5.12 – Folk Songs Related to Agriculture (level 4 code)

Refer table 5.13 for level 4 codes for Songs Related to Various Occupations

Category	Code
Boatman's song	F/1/05/a
Carter's song	F/1/05/b
Miner's song	F/1/05/c
Wasp-honey collecting song	F/1/05/d
Cotton ginners song	F/1/05/e
Blacksmith's song	F/1/05/f

Table 5.13 – Songs Related to Various Occupations (level 4 code)

Refer table 5.14 for level 4 codes for Quatrains

Category	Code
Quatrains for elephants	F/1/06/a
Paddy quatrains	F/1/06/b
Competitive quatrains (verses of challenge)	F/1/06/c
Chew of Betel quatrains	F/1/06/d

Table 5.14 – Quatrains (level 4 code)

Refer table 5.15 for level 4 codes for Admonitory Songs

Category	Code
Admonitory songs on household life	F/1/07/a
Moralising admonitory songs with moral	F/1/07/b
Songs with a religious moral	F/1/07/c

Table 5.15 Admonitory Songs (level 4 code)

Refer table 5.16 for level 4 codes for Enigmatic Verses (Riddles)

Category	Code
Verses associated with religious exhortations	F/1/08/a
Verses associated with remedies and cures	F/1/08/b
Verses associated with nature	F/1/08/c

Table 5.16 – Enigmatic Verses (level 4 code)

Refer table 5.17 for level 4 codes for Verses Associated with Historical or Semi-Historical Events

Category	Code
Restrictive verses ("Kadaim Kavi")	F/1/09/a
Verses of "Gajaman Nona" and "Anderay"	F/1/09/b
Verses associated with hearsay and gossips	F/1/09/c
Verses extolling historical characters or personnel	F/1/09/d

Table 5.17 – Verses Associated with Historical or Semi-Historical Events (level 4 code)

Refer table 5.18 for level 4 code for Verses Related to Folk Games

Category	Code
Verses related to "Mee Sellama"	F/1/10/a
Verses related to "Olinda Game"	F/1/10/b
Verses related to tug of war of horns	F/1/10/c
Verses related to coconuts hurling competition	F/1/10/d
Verses of the swing	F/1/10/e
Verses related to stick dance	F/1/10/f
Verses related to cobra dance	F/1/10/g
Verses related to the pot dance	F/1/10/h
Verses related to "Mewara Kelliya"	F/1/10/i
Hand drum verses	F/1/10/j

Table 5.18 – Verses Related to Folk Games (level 4 code)

Refer table 5.19 for level 4 codes for Explanatory Verses

Category	Code
Verses with a pseudo alliterations ("Thethangu")	F/1/11/a
Descriptive verses ("Teeka")	F/1/11/b
Pandal verses	F/1/11/c

Table 5.19 – Explanatory Verses (level 4 code)

Refer table 5.20 for level 4 codes for Amorous Verses

Category	Code
Lovers' verses	F/1/12/a
Verses of lament	F/1/12/b
Erotic verses	F/1/12/c

Table 5.20 – Amorous Verses (level 4 code)

Refer table 5.21 for level 4 codes for Verses from Folk Drama

Category	Code
Kolam drama verses	F/1/15/a
Sokari drama verses	F/1/15/b
Nadagam drama verses	F/1/15/c
Puppet drama verses	F/1/15/d

Table 5.21 Verses from Folk Drama (level 4 code)

Refer table 5.22 for level 4 codes for Ancient Classical Songs

Category	Code
Songs of the Kandyan tradition	F/2/01/a
Classical songs of the low country tradition	F/2/01/b
Classical songs of the Sabaragamuwa tradition	F/2/01/c

Table 5.22 Ancient Classical Songs (level 4 code)

Refer table 5.23 for level 4 codes for Messenger Verses ("Sandesha Kawya")

Category	Code
"Selalihini Sandeshaya"	F/2/02/a
"Parevi Sandeshaya"	F/2/02/b
"Gira Sandeshaya"	F/2/02/c
"Hansa Sandeshaya"	F/2/02/d

Table 5.23 – Messenger Verses (level 4 code)

Refer table 5.24 for level 4 codes for Songs Related to Traditional Dance

Category	Code
Songs related to the "Kandyan" traditional dance	F/2/03/a
Songs related to Low Country traditional dance	F/2/03/b
Songs related to Sabaragamuwa traditional dance	F/2/03/c

Table 5.24 – Songs Related to Traditional Dance (level 4 code)

5.6 Level 5 / Rituals and Performing Arts Codes

Some of the level 4 codes are further divided sub classified codes

Refer table 5.25 for level 5 code for Verses Related to Marriage

Category	Code
Verses of challenge ("Thahandi Kavi")	F/1/01/b-A
Poruwa verses	F/1/01/b-B

Table 5.25 – Verses Related to Marriage (level 5 code)

Refer table 5.26 for level 5 code for Songs of the Kandyan Tradition

Category	Code
Panegyrics	F/2/01/a-A
Martial ballads	F/2/01/a-B
Traditional hereditary verses ("Kolmura Kavi")	F/2/01/a-C
Verses related to birth stories of deities	F/2/01/a-D
Planetary songs	F/2/01/a-E
Madapure verses	F/2/01/a-F
Sirasa pada verses	F/2/01/a-G
Worship Stanzas	F/2/01/a-H
Verses of entreaty	F/2/01/a-I
Octets	F/2/01/a-J
Beseech	F/2/01/a-K
Sahalli	F/2/01/a-L

Table 5.26 – Kandyan Tradition (level 5 code)

Refer table 5.27 for level 5 code for Songs of the Low Country Tradition

Category	Code
Panegyrics	F/2/01/b-A
Martial ballads	F/2/01/b-B
Traditional hereditary verses ("Kolmura Kavi")	F/2/01/b-C
Verses related to birth stories of deities	F/2/01/b-D
Planetary songs	F/2/01/b-E
Madapure verses	F/2/01/b-F
Sirasa pada verses	F/2/01/b-G
Worship Stanzas	F/2/01/b-H
Verses of entreaty	F/2/01/b-I
Octets	F/2/01/b-J
Beseech	F/2/01/b-K
Sahalli	F/2/01/b-L

Table 5.27 – Low Country Tradition (level 5 code)

Refer table 5.28 for level 5 code for Songs of the Sabaragamuwa Tradition

Category	Code
Panegyrics	F/2/01/c-A
Martial ballads	F/2/01/c-B
Traditional hereditary verses ("Kolmura Kavi")	F/2/01/c-C
Verses related to birth stories of deities	F/2/01/c-D
Planetary songs	F/2/01/c-E
Madapure verses	F/2/01/c-F
Sirasa pada verses	F/2/01/c-G
Worship Stanzas	F/2/01/c-H

Verses of entreaty	F/2/01/c-I
Octets	F/2/01/c-J
Beseech	F/2/01/c-K
Sahalli	F/2/01/c-L

Table 5.28 – Songs of the Sabaragamuwa Tradition (level 5 code)

Refer table 5.29 for level 5 code for Songs Related to Kandyan Traditional Dance

Category	Code
Kandyan Vannam	F/2/03/a-A
Songs related to marriage rituals	F/2/03/a-B
Thalam	F/2/03/a-C
Saudam	F/2/03/a-D
Udekki Kavi	F/2/03/a-E
Pantheru Kavi	F/2/03/a-F
Sath Sathi Kavi	F/2/03/a-G
Suvisi Vivarana Kavi	F/2/03/a-H
Kawtham	F/2/03/a-I
Other songs related to Kandyan tradition	F/2/03/a-J

Table 5.29 – Kandyan Tradition Dance (level 5 code)

Refer table 5.30 for level 5 code for Songs Related to Low Country Traditional Dance

Category	Code
Low country Vannam	F/2/03/b-A
Low Country Saudam	F/2/03/b-B
Low Country Thalam	F/2/03/b-C

Table 5.30 – Songs to Low Country Traditional Dance (level 5 code)

Refer table 5.31 for level 5 code for Songs related to Sabaragamuwa Traditional Dance

Category	Code
Sabaragamuwa Vannam	F/2/03/c-A
Saudam	F/2/03/c-B
Thalam	F/2/03/c-C

Table 5.31 – Songs Related to Sabaragamuwa Traditional Dance (level 5 code)

5.7 Level 6 /Terpsichorean Codes

Some of the level 5 codes are further divided sub classified codes

Refer table 5.32 for level 6 codes for Kandyan Vannam

Category	Code
Grahaka	F/2/03/a-A/01
Thuraga	F/2/03/a-A/02
Uraga	F/2/03/a-A/03
Mushaladi	F/2/03/a-A/04
Ukusa	F/2/03/a-A/05
Wairodi	F/2/03/a-A/06
Hanuma	F/2/03/a-A/07
Mayura	F/2/03/a-A/08
Sawla	F/2/03/a-A/09
Sinharaja	F/2/03/a-A/10
Naiadi	F/2/03/a-A/11
Kirala	F/2/03/a-A12
Erodi	F/2/03/a-A/13
Surapathi	F/2/03/a-A/14

Ganapathi	F/2/03/a-A/15
Udara	F/2/03/a-A/16
Asadrasha	F/2/03/a-A/17
Bairatha	F/2/03/a-A/18

Table 5.32– Kandyan Vannam (level 6 code)

Refer table 5.33 for level 6 codes for Low Country Vannam

Category	Code
Shudha Thalaya	F/2/03/b-A/01
Kondanachi Thalaya	F/2/03/b-A/02
Thala Raga Thalaya	F/2/03/b-A/03
Vishnu Thalaya	F/2/03/b-A/04
Eshwara Kunda Thalaya	F/2/03/b-A/05
Sodha Wechchi Thalaya	F/2/03/b-A/06
Nalachchi Thalaya	F/2/03/b-A/07
Upakari Thlaya	F/2/03/b-A/08
Lalitha Raga Thalaya (Raga Kamala)	F/2/03/b-A/09
Mini Badha Thalaya	F/2/03/b-A/10
Gana Dhandaka Thalaya	F/2/03/b-A/11
Nalu Gethi Thlaya	F/2/03/b-A/12
Minibadha Thalaya	F/2/03/b-A/13
Dhandakha Thalaya	F/2/03/b-A/14
Nalu Geethika Thalaya	F/2/03/b-A/15

Anura Dandakha Thalaya	F/2/03/b-A/16
Bedha Kamala Thalaya	F/2/03/b-A/17
Gangakara Thalaya	F/2/03/b-A/18
Dhadhaka Raga Thalaya	F/2/03/b-A/19
Ghateekara Thalaya	F/2/03/b-A/20
Hanumantha Thalaya	F/2/03/b-A/21
Mattiya Matti Thalaya	F/2/03/b-A/22
Wasantha Thalaya	F/2/03/b-A/23
Kamala Geethika Thalaya	F/2/03/b-A/24
Bhawadhi Thalaya	F/2/03/b-A/25
Brahma Raga Thalaya	F/2/03/b-A/26
Hasthi Thalaya	F/2/03/b-A/27
Hima Kula Thalaya	F/2/03/b-A/28
Raga Thalaya	F/2/03/b-A/29
Behri Thodi Thalaya	F/2/03/b-A/30
Lalitha Raga Thalaya	F/2/03/b-A/31
Solladhi Thalaya	F/2/03/b-A/32

Table 5.33 – Low Country Vannam (level 6 code)

Refer table 5.34 for level 6 code for Low Country Saudam

Category	Code
Vishnu Saudama	F/2/03/b-B/01
Kandakumara Saudama	F/2/03/b-B/02
Nagraha Saudama	F/2/03/b-B/03
Pathini Saudama	F/2/03/b-B/04
Thatha Saudama	F/2/03/b-B/05
Devol Saudama	F/2/03/b-B/06
Gurulu Saudama	F/2/03/b-B/07
Eshwara Saudama	F/2/03/b-B/08
Edurudiga Saudama	F/2/03/b-B/09
Sinharaja saudama	F/2/03/b-B/10

Table 5.34 – Low Country Saudam (level 6 code)

Refer table 5.35 for level 6 codes for Sabaragamuwa Vannam

Category	Code
Grahaka Vannama	F/2/03/c-A/01
Gajaga Vannama	F/2/03/c-A/02
Uraga Vannama	F/2/03/c-A/03
Anila Vannama	F/2/03/c-A/04
Ukussa Vannama	F/2/03/c-A/05
Kidura Vannama	F/2/03/c-A/06
Udara Vannama	F/2/03/c-A/07
Thisara Vannama	F/2/03/c-A/08
Viradi Vannama	F/2/03/c-A/09
Sinhanadi Vannama	F/2/03/c-A/10

Table 5.35 – Sabaragamuwa Vannam (level 6 code)

6. Data Architecture for the Knowledge Structure

6.1 Introduction

The internationally accepted classification schemes such as Dewey Decimal Classification (DDC), Library of Congress Classification (LCC) and Universal Decimal Classification (UDC) have been analyzed. UDC is used for scientific and technical libraries therefore UDC is difficult to apply to classify music oriented subjects. DDC and LCC both are developed on hierarchical and enumerated features. DDC22 includes classes for its disciplines; class 700 is allocated for Arts & Recreation. Number 780 is used for music, further numbers 781 − 788 are given for the divisions related to music. Sub divisions are allocated for each division. For further details refer Appendix A.

The LCC scheme is used in smaller academic and public libraries. Character M is given for Music and books on music. Subclasses M, ML and MT are reserved for Music, Literature on music, and Instruction on music respectively. Subclass M is further divided into division which is related to disciplines in music. For further details refer Appendix A.

The two classification schemes (DDC& LCC) and its subdivisions are western music biased; it can only be used to classify Western music. Therefore a new classification scheme is required to classify Sinhala music, and as such, it was developed by considering the features of DDC. The DDC's classes and its divisions are categorized in a hierarchical manner. This feature has been utilized to develop the new scheme.

A detailed subject analysis was performed to understand the evolution of Sinhala music. (Refer literature review for further information). An outline of the categorization of subject

headings of Sinhala music is included in chapter 4. It is a hierarchical classification based on a "Tree Architecture" and the height of the tree is divided into 6 levels.

The common features of each level was identified and named a specific term for the levels. The details of the level are as follows;

Level 1 deals with Paradigm (considered whether the music based on to a major category of Sinhala music)

Level 2 deals with Broad Application (considered each paradigm has been divided into broad application areas)

Level 3 deals with Specific Application (considered the levels classified in the level 2 has been included into a specific application area)

Level 4 deals with Genre (considered a particular style of the music has been considered into this level)

Level 5 deals with Rituals/Performing Arts (considered whether the particular music element belongs to a ritual or performing art)

Level 6 deals with Terpsichorean (considered whether the music belongs to drama music)

The knowledge representation of subject classification of Sinhala music was described using a knowldeg structure called "hierarchcial field". Further, the hierarchical field developed was used to discuss its suitability to represent a coding scheme.

6.2 Relational Data Model to Store the Knowledge Structure

It is required to find a suitable data structure to store the knowledge structure in the digital medium. Relational data model has been selected for this purpose because of following reasons;

- Relational database consists of collection of relations. Relation is a two dimension table with no repeating data groups. Relation is similar to some extent a "flat" file records. (Elmasri, et al.,2002).

- When choosing a data model such as Object Oriented or Relational Database Systems, a record based structure of data is appropriate to Relational Database Management Systems (RDBMS), and also that their main processing requirements center on the storage and retrieval of data. Such applications cannot easily be adapted to an object-oriented implementation without losing many benefits of using RDBMS for data storage. (Bennett, et al.,2007).

- Database technologies used by other institutions for digital music libraries, for example University of Indiana in USA has implemented a digital music library called VARIATION, It is implemented on Relational Databases which supports to store music developed by students for their assignments, workshops and music developed by the academics of the university. (Dunn,1999)

Therefore the hierarchical pattern knowledge structure is transformed into a flat record. The fields in the knowledge structure then become the fields in the flat record. It consists of six main fields to store the appropriate classification codes in the classification hierarchy. Each field in the knowledge structure has been given a name to uniquely identify related field. The names given for the fields are Main Entry, Theme, Motif, Specialization, Tradition, and Personality respectively.

The summary of the classification scheme to be stored in the knowledge structure is as follows;

Level 1/ Paradigm Codes, stored in the Main Entry field.

Level 2/ Broad Application Codes, stored in the Theme field.

Level 3/ Specific Application Codes, stored in the Motif field.

Level 4/ Genre Codes, stored in the Specialization field.

Level 5/ Rituals and Performing Arts Codes, stored in the Tradition field.

Level6/ Terpsichorean Codes will be stored in the Personality field.

For further information on the flat record of proposed knowledge structure, refer Figure 6.1 for the proposed knowledge structure.

Paradigm		Broad Application		Terpsichorean	
F		F/1		F/2/03/a-A/01	
A		F/2		F/2/03/a-A/02	
		F/3		….	
		A/1		F/2/03/3/-A/19	
		A/2		….	
		A/3		A/3/01/c-B/01	
		A/4		A/3/01/c-B/02	

Main Entry	Theme	Motif	Specialization	Tradition	Personality

Specific Application		Genre		Rituals/Perf. Art	
F/1/01		F/1/01/a		F/1/01/b-A	
F/1/02		F/1/01/b		F/1/01/b-B	
F/1/03		…..		….	
…..		F/1/02/e		F/2/01/a-L	
F/1/15		…..		….	
F/2/01		F/3/03/e		F/2/01/c-H	
…….		A/1/01/a		….	
A/1/01		A/1/06/a		F/3/02/b-B	
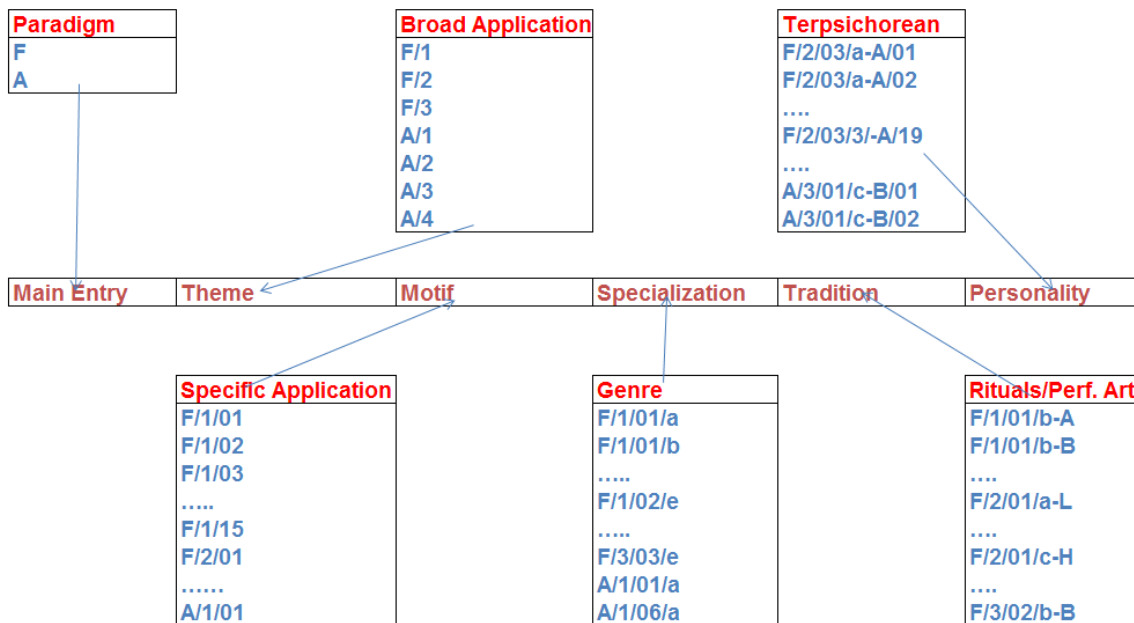
Figure6.1   Proposed Knowledge Structure in the Form of a Flat Record

The classification scheme and the proposed knowledge structure are flexible for future requirements. New classification codes can be created and stored in the knowledge structure. In the classification hierarchy 6 maximum levels are included. Further, it can be divided into more levels. This will be decided by the classifier. In such a situation, for the additional classification levels, the knowledge structure needs to be extended. It is possible to implement same by adding a new field to the right hand side of the knowledge structure. Refer figure 6.2 for further clarifications.

Main Entry	Theme	Motif	Specialization	Tradition	Personality

New Fields can be added here

New Codes can be created and included to this fields
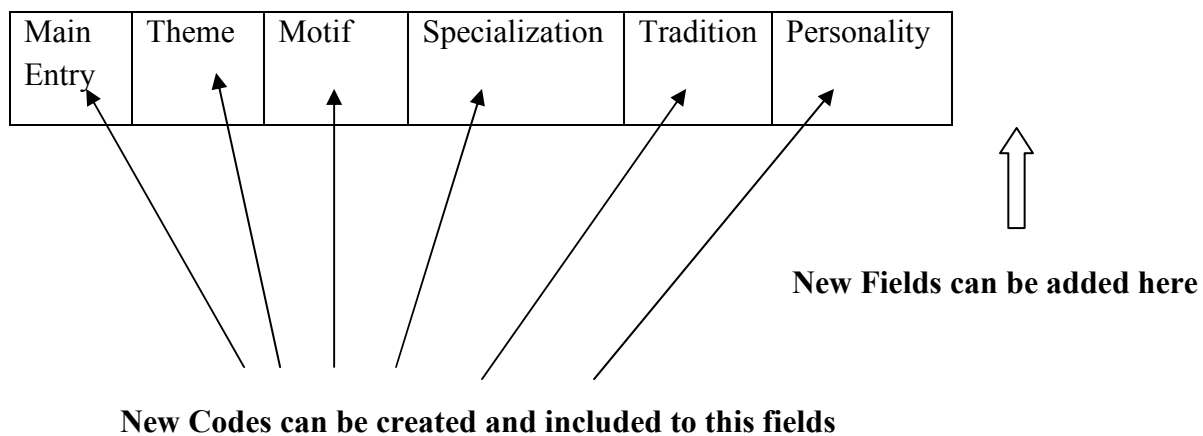
Figure 6.2 Possibility for the extension of new knowledge in the Knowledge Structure

Since the classifier needs a new classification level i.e. beyond classification code 6, a new field might be added to the knowledge structure. Therefore, the structure or the framework of the digital library must have facilities to that end.

The following example shows how the Flat Record is applied to store different classification codes relevant to the applications.

The code for Kolam Drama Verses (F/1/15/a) is as follows;

F	F/1	F/1/15	F/1/15/a	Null	Null

It is an important requirement to provide bibliographic tools (which also known as retrieval tools) include bibliographies, indexed, catalogues, findings, aids, registers, bibliographic databases, and search engines. Since all records are digitized and available online, sometimes there is a possibility to access the needed information directly. But experts believe and realized that there must be some kind of control and some way to have preliminary information (e.g. title, author, date, subject keywords and etc.) before the information seeker attempts to find a particular information package.   (Taylor, 2006)

As a result a number of metadata standards have been created for digital on libraries. The term metadata is defined as "An encoded description of an information package (e.g. an AACR2 record encoded with MARC, a Dublin Core record, etc.); the purpose of metadata is to provide level of data at which choices can be made as to which information resources one wishes to view or search, without having to search massive amount or irrelevant full text" (Taylor, 2006).

In this regard, Dublin Core metadata elements have been selected. "Dublin Core (DC) is a set of metadata elements that are designed specifically for non-specific use. It is intended for the description of electronic materials such as a Web page or site, which will almost certainly not receive a full MARC catalog entry. The result of collaborative effort by a large group of people, Dublin Core (DC) is named for Dublin Ohio, where the first meeting was held in 1995. It received the approval of ANSI (American National Standards Institute) in 2001. Although MARC standard comprises hundreds of metadata elements DC standard limited to 15 elements. This is useful and easy to use in domain specific digital libraries without the involvement of a professionally qualified librarian". (Witten, et al., 2003, pp 294) Refer table 6.1 for the data elements introduced by Dublin Core.

Metadata	Definition
Title	The name given to the resource by the creator
Creator	The person or organization primarily responsible for the intellectual content of the resource.
Subject	The topic of the resource
Description	A textual description of the content of the resource
Publisher	The entity responsible for making the resource available
Contributor	A person or organization (other than the creator) who is responsible for making a significant contribution to the intellectual content of the resource
Date	A date associated with the creation or availability of the resource
Type	The nature or the genre of the content of the resource
Format	The physical or digital manifestation of the resource
Identifier	An unambiguous reference that uniquely identifies the resource within a given context
Source	A reference to a related resource, and the nature of its relationship
Language	The language of the intellectual content of the resource
Relation	A reference to a related resource, and the nature of its relationship
Coverage	Spatial locations and temporal durations characteristics of the content of the resource
Rights	Information about rights held in the resource

 Source: (Witten, et al., 2003, pp 294)

Table 6.1- Metadata elements introduced by Dublin Core

In addition to the Dublin Core data elements, three additional attributes have been identified to be included in the library, i.e. "Recording Studio", "Music Director", "Lyric Writer". Since the original source file is stored on either CD ROM or DVD ROM, it is important to

provide the details about the recording studio because it may be important to obtain additional information about the recording studio for further clarification of recording information. The details about the music director and the lyric writer are two important data elements for the musical items.

Final data elements to be stored in the digital media are included in figure 6.3. (Next page)

Identifier
Main Classification Code
Main Entry
Theme
Motif
Specialization
Tradition
Personality
Title
Artiste/Creator
Lyric Writer
Music Director
Publisher
Subject
Date
Description
Contributor
Type
Format
Source
Original Language
Relation
Coverage
Rights
Recording Studio

Figure 6.3 - information for the proposed digital music library.

Key for the figure 6.3

Fields related to knowledge structure are given in red,

Fields related to Dublin Core initiative are given in green

Fields related to newly introduced are given in purple

Field included to uniquely identify a record is given in black

Field included to final classification code is given in blue

For the sake of simplicity the following encoding has been affected for the names given in the fields of the knowledge.

Field 1 or the Main Entry field is labeled as Level 1 code.

Field 2 or the Theme field is labeled as Level 2 Code.

Field 3 or the Motif field is labeled as Level 3 Code.

Field 4 or the Specialization field is labeled as Level 4 Code.

Field 5 or the Tradition field is labeled as Level 5 Code.

Field 6 or the Personality field was labeled as Level 6 Code.

Adding a description field together with the level codes would be more meaningful, this is included in figure 6.4 (next page). The Identifier is the unique numeric code to identify each field, and it will be automatically incremented when a new musical item is added. The main classification code in relation to the musical item is included next in blue. Codes relevant to the classification levels together with a code description are included in red. The data elements borrowed from Dublin Core are mentioned in green. The data element given in purple is the additional data element included in the list.

Identifier
Main Classification Code
Level 1 Code
Level 1 Code Description
Level 2 Code
Level 2 Code Description
Level 3 Code
Level 3 Code Description
Level 4 Code
Level 4 Code Description
Level 5 Code
Level 5 Code Description
Level 6 Code
Level 6 Code Description
Title
Artiste/Creator
Lyric Writer
Music Director
Publisher
Subject
Date
Description
Contributor
Type
Format
Source
Original Language
Relation
Coverage
Rights
Recording Studio

Figure 6.4 - information for the proposed digital music library after the perform the map

Further, to enhance data management capabilities, the following additional key attributes or indexes can further be included to the above record. (Table 6.2)

Name of the attribute	Purpose
Artiste Code	An index value for the artist, to organize the details about artists separately.
Lyric Code	An index value for the Lyric writer, to organize the details about oneself separately.
Director Code	An index value for the music director to organize the details about oneself.
Publisher Code	An index value for the publisher, to organize the details about oneself.

Table 6.2 – Additional key attributes for the database

Final metadata elements for the music digital library are mentioned in figure 6.5 and it is named by Extended Flat Record (EFR). Additionally included metadata elements (indexes) are included in the background yellow.

Identifier
Main Classification Code
Level 1 Code
Level 1 Code Description
Level 2 Code
Level 2 Code Description
Level 3 Code
Level 3 Code Description
Level 4 Code
Level 4 Code Description
Level 5 Code
Level 6 Code
Level 6 Code Description
Title
<mark>Artiste Code</mark>
Artiste/Creator
<mark>Lyric Code</mark>
Lyric Writer
<mark>Director Code</mark>
Music Director
<mark>Publisher Code</mark>
Publisher
Subject
Date
Description
Contributor
Type
Format
Source
Original Language
Relation
Coverage
Rights
Recording Studio

Figure 6.5 – Extended Flat Record (EFR) with additionally included indexes.

6.3 Extended Flat Record Structure to store the knowledge structure and finalized metadata elements

Final data elements mentioned in figure 6.6 is condensed as follows to be described as a data structure.

Identifier	Main Classification Code	Relevant Classification Codes	Metadata elements from Dublin Core & newly introduced data elements

Artiste

Lyric Code

Lyric writer

Director Code.

Music Director

Level 1 Code   Publisher Code

Level 1 Code description   Publisher

Level 2 Code   Subject

Level 2 Code Description   Date

Level 3 Code   Description

Level 3 Code Description   Contributor

Level 4 Code   Type

Level 4 Code Description   Format

Level 5 Code   Source

Level 5 Code Description   Original Language

Level 6 Code   Relation

Level 6 Code Description   Coverage

Rights

Recording Studio

Figure 6.6 Extended Flat Record (EFR) of data elements to be stored in the digital library

Final data elements for the digital library are given in figure 6.7.

Identifier
Main Classification Code
Level 1 Code
Level 1 Code Description
Level 2 Code
Level 2 Code Description
Level 3 Code
Level 3 Code Description
Level 4 Code
Level 4 Code Description
Level 5 Code
Level 6 Code
Level 6 Code Description
Title
Artiste Code
Artiste/Creator
Lyric Code
Lyric Writer
Director Code
Music Director
Publisher Code
Publisher
Subject
Date
Description
Contributor
Type
Format
Source
Original Language
Relation
Coverage
Rights
Recording Studio

Figure 6.7 - Finalized Extended Flat Record (EFR) System

6.4 Extended Flat Record Encoding System

The bibliographic metadata included in the Extended Flat Record System can be further explained in terms of the manner it should be stored in the digital medium. In such situations, a detailed analysis of the data elements in the finalized extended flat record is to be performed. This will give a clear picture about the fields and will be useful for the end users, authorized library staff and computer programmers. The analysis comprises a detailed list of encoded field names, categorization of sub fields, and a calling system for field numbers. Encoded field names are used in computer programs and the SQL (Structured Query Language) quarries. Sub fields are important for the information seekers when retrieving information from the library. Field numbers are used to specify the required fields to be included in the catalogues. For further information refer Table 6.3.

6.5 Data Dictionary Entries

Data dictionary entries provide full detailed description of all data elements of Extended Flat Record System. Data elements are labeled using the encoded names. Refer table 6.4 (page 122 – 128).

Field Number	Data Element	Sub field	Encoded Name
1	Identifier		Identifier
2	Main Classification Code		Main_Classification_Code
3	Level 1 Code		Level_1_Code
3 - 1	Level 1 Code Description	Sub field of field 3	Level_1_Code_Description
4	Level 2 Code		Level_2_Code
4 - 1	Level 2 Code Description	Sub field of field 4	Level_2_Code_Description
5	Level 3 Code		Level_3_Code
5 - 1	Level 3 Code Description	Sub field of field 5	Level_3_Code_Description
6	Level 4 Code		Level_4_Code
6 - 1	Level 4 Code Description	Sub field of field 6	Level_4_Code_Description
7	Level 5 Code		Level_5_Code
7 - 1	Level 5 Code Description	Sub field of field 7	Level_5_Code_Description
8	Level 6 Code		Level_6_Code
8 - 1	Level 6 Code Description	Sub field of field 8	Level_6_Code_Description
9	Title		Title
10	Artiste Code		Artiste_Code
10 - 1	Artiste/Creator	Sub field of field 10	Artiste
11	Lyric Code		Lyric_Code
11 - 1	Lyric Writer	Sub field of field 11	Lyric_Writer
12	Director Code		Director_Code
12 - 1	Music Director	Sub field of field 12	Music_Director
13	Publisher Code		Publisher_Code
13 - 1	Publisher	Sub field of field 13	Publisher
14	Subject		Subject
15	Date		Date
16	Description		Description
17	Contributor		Contributor
18	Type		Type
19	Format		Format
20	Source		Source
21	Original Language		Original_Language
22	Relation		Relation
23	Coverage		Coverage
24	Rights		Rights
25	Recording Studio		Recording_Studio

Table 6.3 Extended Flat Record (EFR) Encoding System

The following table (table 6.4), provides a description of data elements of Extended Flat Record System.

Table 6.4 Data Dictionary Entries of Extended Flat Record

Attribute Name	Meaning	Domain Definition
Identifier	A unique identification number for the record stored in the music master file. It will be auto incremented when a new entry to the file is appended.	Number : size 7 Range :0000001 to 9999999
Main_Classification_Code	Complete classification code. Although 13 characters are needed to write the complete classification scheme, additional 7 characters are included for future purposes.	Alpha numeric : Size 20 Range: A to Z/9/99/z-Z/99
Leve_ 1_ Code	First component of the classification codes to be included this attribute	Character : Size 1 Range : A to Z
Level_ 2_ Code	Second component of the classification codes to be included in this attribute	Alphanumeric: Size 3 Range: A/1 to Z/9

Level_ 3_ Code	Third component of the classification codes to be included in this attribute	Alphanumeric: Size 6 Range: A/1/01 to Z/9/99
Leve_ 4_ Code	Fourth component of the classification codes to be included in this attribute	Alphanumeric: Size 8 Range: A/1/01/a to Z/9/99/z
Level_ 5_Code	Fifth component of the classification codes to be included in this attribute	Alphanumeric: Size 10 Range: A/1/01/a-A to Z/9/99/z-Z
Leve_ 6_ Code	Sixth component of the classification codes to be included in this attribute	Alphanumeric: Size 13 Range: A/1/01/a-A/01 to Z/9/99/z-Z/99
Artiste_ Code	A unique code to identify the artistes separately. The code first character always start with A	Alpha Numeric : Size: 5 Range: AA001 to AZ999
Lyric_Code	A unique code to - identify the artistes separately. The first character of the code always starts with L.	Alpha Numeric: Size: 5 Range: LA001 to LZ999
Director_Code	A unique code to identify the artists separately. The code first character always start with D	Alpha Numeric: Size: 5 Range: DA001 to DZ999

Publisher_Code	A unique code to identify the artistes separately. The first character of the code always starts with P	Alpha Numeric: Size: 5 Range: PA001 to PZ999
Level_ 1_ Code_Description	The description of the first component of the classification scheme	Character: Size: 100 Range: describes the content using appropriate words
Level_ 2_ Code_ Description	The description of the second component of the classification scheme	Character: Size: 100 Range: describes the content using appropriate words
Level_ 3_ Code _Description	The description of the third component of the classification scheme	Character: Size: 100 Range: describes the content using appropriate words
Level_ 4_ Code_ Description	The description of the fourth component of the classification scheme	Character: Size: 100 Range: describe the content using appropriate words
Level_ 5_ Code_ Description	The description of the fifth component of the classification scheme	Character: Size: 100 Range: describe the content using appropriate words
Level 6_Code_ Description	The description of the sixth component of the classification scheme	Character: Size: 100 Range: describe the content using appropriate words
Artiste (Creator)	Main artiste of the vocal or the instrumental piece. In	Character : Size 50 Range : only use 26 characters in the alphabet

	group music, include the leader's name. When including the name first include the last name of the artiste. E.g. Name of the artist is "Nanda Malini", will be included as "Malini Nanda"	
Music_Director	The music director for the musical element. When including the name, first include the last name of the music director. E.g. Name of the music director Premasiri Kemadasa, will be included as "Kemadasa Premasiri".	Character: Size 50 Range: only use 26 characters of the alphabet
Publisher	The publisher of the musical element. Include the name as it is, which is mentioned in the original source file. For example, a publisher name mentioned on a CD	Character: Size 50 Range: only use 26 characters of the alphabet

	as "Torana Record Bar", use the same without modifying.	
Lyric_Writer	The lyric writer of the song. First include the writer's last name and then the first name. E.g. a lyric writer's name is Hemasiri Halpita include it as Halpita Hemasiri.	Character: Size 50 Range: only use 26 characters of the alphabet.
Title	The title should be extracted either from the manual source (CD or the DVD ROM) or else from a digital resource such as a MP3 format item, obtain it from the tag included with the digital music. If no source materials classifier will decide the title of the piece.	Character: Size 25 Range: only use 26 characters of the alphabet.
Date	The date can be obtained from the original CD or DVD cover, otherwise it will be available in the tag in a digital	Date: yyyy/mm/dd

	resource. If not such data classifier will decide the date.	
Description	Any additional information regarding the vocal or instrumental music	Character : Size 100
Contributor	If any person/s regarding the intellectual content of the music	Character: Size 50
Subject	Subject name is included here for example fisherman's song	Character: Size 30
Type	The type of file i.e. audio or video	Character: Size 10
Format	The file type of the music. E.g. MP3 or WAV or etc.	Character: Size 10
Source	The details about the second resource type whether digital or analog format.	Character: Size 30
Original_Language	The original language of the song	Character: Size 10
Relation	If any other related material is available, details of some	Character: Size 50
Rights	Rules and conditions pertaining to storing in a digital library	Character: Size 100

Coverage	The time taken to play the music completely	Character: Size 10
Recording_Studio	The studio that performed the original recording	Character: Size 25

Table: 6.4The data dictionary entries

6.6 Implementation of Extended Flat Record on Relational Database

The relational data model is used as the main structure in Relational Database Management Systems (RDBMS). A relation is a two-dimensional table that has single-valued entries. An entry consists of a number of columns. Entries in a given column are all of the same kind and a column has a unique name. No two rows have the same data entries; therefore each row must be uniquely identified by a key attribute (primary key). There are no repeating groups in a row.

The data structure mentioned in figure 6.7 must satisfy all requirements of the relational data model. Therefore the relational data model is suitable to implement the data structure given in figure 6.7.

It is required to refine the data elements in the extended flat record system to remove the problem of data anomalies such as insertion, deletion and updating when designing a database. It reduces the complications of data maintenance of the database. The procedure for removal of data anomalies is known as normalization. The normalization procedure is achieved in 5 different levels. For the simplicity, for this research the normalization has been done up to 3 levels. "Most industry experts normalize up to the third normal form. They

believe normalization have done beyond 3 rd normal form makes too many relations into the database and it would be reduced the performance." (Kroenke, 1992, pp 199 – 200)

The transformation of first 3 normal forms is as follows;

6.6.1 First Normal Form Results

The first normal form can be achieved by removing all repeating groups of the un-normalized dataset. Although figure 6.7 is in the un-normalized format no groups are repeated. Therefore, it is already in the first normal form.

6.6.2 Second Normal Form Results

Once an un-normalized data set has been converted into first normal form (1NF) the resulting data sets are then revised further for them to be upgraded to the second normal form (2NF) by removing of all partial functional dependencies. Partial functional dependence is where a column is not wholly-dependent on the primary key i.e. the column is dependent on part of the primary key. Thus partial functional dependencies may only occur in data sets that have more than one primary key attribute (i.e. a compound key).

The data in figure 6.7 are already in the second normal form.

6.6.3 Third Normal Form Results

It is required to remove the transitive/hidden dependencies between non-key attributes. A transitive dependency exists where one or more non-key columns are more/wholly dependent on another non-key column rather than on the designated primary key(s).

The highlighted data elements in the figure 6.7 show hidden dependencies and when it has been removed the results are mentioned in relations 1 to 11. All relations are included in figure 6.8.

Identifier
Main_Classification_Code
Level_1_Code
Level_2_ Code
Level_3_Code
Level_4_Code
Level_5_Code
Level_6_Code
Title
Artiste_Code
Lyric_Code
Director_Code
Publisher_Code
Subject
Date
Description
Contributor
Type
Format
Source
Original_Language
Relation
Rights
Coverage
Recording_ Studio

Relation 1

Level_ 1_Code
Level_ 1_ Code_ Description

Relation 2

Level_2_Code
Level_2_Code_Description

Relation 3

Figure 6.8 – Normalized Relations of the proposed digital library (Contd.)

Level_3_Code
Level_3_Code_ Description

Relation 4

Level_4_Code
Level_4_Code_ Description

Relation 5

Level_5_Code
Level_5_Code_Description

Relation 6

Level_6_Code
Level_6_Code_Description

Relation 7

Artiste_ Code
Artiste

Relation 8

Lyric_Code
Lyric_Writer

Relation 9

Director_Code
Music_ Director

Relation 10

Figure 6.8 – Normalized Relations of the proposed digital library (Contd.)

Publisher_Code
Publisher

Relation 11

Key

Primary Keys are given in red.

Foreign keys are given in bold italics.

Figure 6.8 – Normalized Relations of the proposed digital library

6.6.4 Name the third normal form tables

It is required to replace the relation number format (i.e. relations 1 to 11) by meaning full identifies because these identifiers will be used by the RDBMS to create tables. Table is the term used by the RDBMS instead of relation. Refer table 6.5 for the table names.

Name of the Relation	Identifier or the table name used by RDBMS
Relation1	Master Music File
Relation2	Code1 File
Relation3	Code2 File
Relation4	Code3 File
Relation5	Code4 File
Relation6	Code5 File
Relation7	Code6 File
Relation8	Artiste File
Relation9	Lyric File
Relation10	Music Director File
Relation11	Publisher File

Table 6.5-Table names used by RDBMS

The required tables have already been identified for the database. Further, two additional attributes or fields have to be added to the Master Music File, to implement links to the sheet music and live music stored in the data achive. (Refer section 6.8 for further information about the storage of live music and sheet music files). These two additions do not violate the requirements of normalization. In other words, after adding these two data elements the status of Master Music File is still in 3rd normal form. **The two data elements are "Printed_Notes_Availability" and "Music_Link" and its types are identified as Varibale Character, size is 25 characters.**

After addition of two fields to the database, a brief description about the data tables (i.e.database schema) is as follows;

Master Music File {(**<u>Identifier</u>**, An unambiguous identification number),

(Main_Classification_Code, The complete classification code),

(*Level_1_Code*, Level 1 code in the classification scheme),

(*Level_2_Code*, Level 2 code in the classification scheme),

(*Level_3_Code*, Level 3 code in the classification scheme),

(*Level_4_Code*, Level 4 code in the classification scheme),

(*Level_5_Code*, Level 5 code in the classification scheme),

(*Level_6_Code*, Level 6 code in the classification scheme),

(Title, The title of the music piece),

(*Artiste_Code*, A unique code to identify the artiste or creator),

(*Lyric_Code*, A unique code to identify the lyric writer),

(*Director_Code*, A unique code to identify the music director),

(*Publisher_Code*, A unique code to identify the publisher),

(Contributor, A significant contribution to the intellectual

Content of the property),

(Date, The date of the original music file published),

(Subject, The topic of the resource)

(Description, Any other comment on the musical work),

(Type, The nature of the genre of the content of the resource),

(Format, The file format of the resource),

(Source, A reference to a second resource if available),

(Original Language, The original language of source),

(Relation, A reference to a related resource, and nature),

(Rights, Information about rights held in the resource),

(Coverage, The play time of the music piece),

(Recording_Studio, Recording studio involved for recording),

(Printed_Notes_Availability, Link to the sheet music stored in the data source),

(Music_Link, Link to the live music item stored in the data source)

}

Code 1 File {(**Level_1_Code**, Level 1 code in the classification scheme)

(Level_1_Code_Description, Description of Level 1 classification Code)}

Code 2 File {(**Level_2_Code**, Level 2 code in the classification scheme)

(Level_2_Code_Description, Description of level 2 classification code)}

Code 3 File {(**Level_ 3_Code**, Level 3 code in the classification scheme)

(Level_3_Code_Description, Description of level 3 classification code)}

Code 4 File {(**Level_4_Code**, Level 4 code in the classification scheme)

(Level_4_Code_ Description, Description of level 4 classification code)}

Code 5 File {(**Level_5_Code**, Level 5 code in the classification scheme)

(Level_5_Code_Description, Description of level 5 classification code)}

Code 6 File {(**Level_6_Code**, Level 6 code in the classification scheme)

(Level_6_Code_Description, Description of level 6 classification code)}

Artiste File {(**Artiste_Code**, An unique code to identify the artiste or creator),

(Artiste , The name of the artiste or the creator)}

Lyric File {(**Lyric_Code**, An unique code to identify the lyric writer),

(Lyric_Writer, Name of the lyric writer)}

Music Director File {(**Director_Code**, An unique code to identify the music director),

(Music_Director, Name of the Music Director)}

Publisher File {(**Publisher_Code**, An unique code to identify the publisher),

(Publisher, Name of publisher)}

Key –

Primary Key – given in Bold

Foreign Key – Mentioned in Bold Italics

Master Music File is used to store fields from knowledge structure and attributes from Dublin Core metadata. All data relevant to musical items are stored in this file. Information seekers use the master music file to obtain bibliographic information. Identifier is the primary key and the value to be included to the field is automatically increased by one when adding a new record. The foreign keys and the associated primary keys of the other files are assisted to improve the data integrity in the system when adding, deleting, and modifying data in the data files. However, foreign key implementation is optional and it can be decided by the librarian and the database administrator. But they have to reveal their decision at initial stage prior implementation of computer programs.

The summarized information of Master Music File in terms of bibliographic requirements is included in the next page. (Table 6.6)

Field No. from EFR	Name of the field	Relationship to the Knowledge Structure	Key Attribute
1	Identifier		Main Index
2	Main_Classification_Code		
3	Level_1_Code	Main Entry Field	Index
4	Level_2_Code	Theme Field	Index
5	Level_3_Code	Motif Field	Index
6	Level_4_Code	Specialization Field	Index
7	Level_5_Code	Tradition Field	Index
8	Level_6_Code	Personality Field	Index
9	Title		
10	Artiste_Code		Index
11	Lyric_Code		Index
12	Director_Code		Index
13	Publisher_Code		Index
17	Contributor		
15	Date		
14	Subject		
16	Description		
18	Type		
19	Format		
20	Source		
21	Original_Language		
22	Relation		
24	Rights		
23	Coverage		
25	Recording_Studio		
New field	Printed_Notes_Availability		
New field	Music_Link		

Table 6.6 – Master Music File in terms of Bibliographic Requirements

EFR 1 – Main Index (Primary Key of Master Music File)

EFR 3, 4, 5, 6, 7, 8, 10, 11, 12, 13 – Indexes (Foreign Keys of Master Music File)

Refer Apeendix C for typical SQL statements written in SQL standard 2 (SQL2) for the database creation.

6.7 Query Formulation (Bibliographic Information Retrieval) using the Knowledge structure:

The process of bibliographic information retrieval is known as Cataloguing in libraries. The term cataloguing is defined as "The process of creating surrogate records for information packages by describing the information package, choosing name and title access points, conducting subject analysis, assigning subject heading and classification numbers, and maintaining the system through which records are made available." (Taylor, 2006)

With the proliferation of digital repositories and internet based technologies, the above given definition for the term cataloging has to be broaden to satisfy the new requirements of the modern digital libraries. The main purpose of cataloging is, to facilitate for the users to obtain the required information package with in a limited time. To achieve this, the cataloging process includes setting standards and rules, indexing policies, metadata schemes and any other method for organization of information. Therefore, catalogues bridge the gap between users and information resources.

Linch (2000, pp 1-3) pointed out that there are three common approaches to searching in the digital environment: by surrogates, by socially-based data such as reviews and citations, and content-based computational techniques such as full text search. Later, Yee (2002, pp 3) has created a model based on the theories suggested by Linch to support above first two types of searches. (figure 6.9)
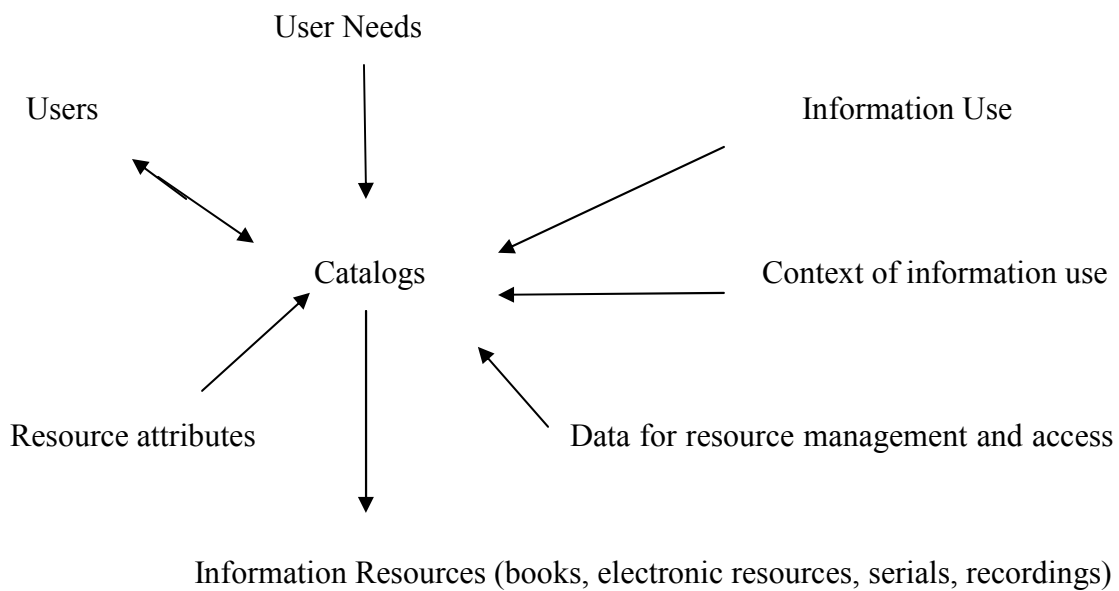
Figure 6.9 New Scope of catalogue

The catalogue used by Amazon.com is designed based on Yee's model. Amazon.com's catalogue provides user reviews, purchasing patterns, and user profile to facilitate searching and browsing.

When it comes to a domain specific digital library developed for Sinhala music, Yee's model can be utilized its features to formulate the search strategies. However designing catalogue for the domain specific libraries, cataloger has to pay more attention for the types of users, their needs, their use of information, attributes of the information and the possibility handle a catalogue. On the other hand the developed catalogue satisfies the basic requirements of cataloguing rules, standards, tools and procedures.

The access points also known as any word or phrase used to obtain information from a retrieval tool, explains the elements to be included to a catalogue. In traditional practice one access point is chosen as the main one. This is called the main entry. The other access points are called added entries.

Basically three components are required to complete a catalogue; a public access catalogue, a self list and authority file. Online catalogues usually contains these three components, but not always, sometime the authority files are not included.

These features have been considered to design the catalogue for this digital library. Two types of catalogues can be designed for the digital library, i.e. Online Public Access Catalogue (OPAC) and 'Power Catalogue' (PC).

6.7.1 OPAC

The OPAC is designed to satisfy the ordinary user's requirements. Its main entry is the identifier of the music item. OPAC consists of five different catalogues. The following table (table 6.7) provides full details of the OPAC. In the table 6.7 field numbers are given in bracket. Authority files are not considered for this study.

OPAC No.	Search Key	Type	Outtput
1	Identifier (1)	Main Entry	Main_classification_Code(2), Title(9), Artiste(10-1), Music_director(12-1), Lyric_Writer(11-1), Publisher(13-1), Printed_Notes_Availability, Music_Link
2	Artiste(10-1)	Added Entry	Main_Classification_code(2), Title(9), Identifier(1), Music_Directo(12-1), Lyric_Writer(11-1), Publisher(13-1), Printed_Notes_Availability, Music_Link
3	Music_Director(12-1)	Added Entry	Main_Classification_Code(2), Title(9), Identifier(1), Artiste(10-1), Lyric_Writer(11-1), Publisher (13-1), Printed_Notes_Availability, Music_Link
4	Lyric_Writer(11-1)	Added Entry	Main_Classification_Code(2), Title(9), Identifier(1), Artiste(10-1), Music_Director(12-1), Publisher(13-1), Printed_Notes_Availability, Music_Link
5	Title(9)	Added Entry	Main_Classification_Code(2), Identifier(1), Artiste(10-1), Music_director(12-1), Lyric_Writer(11-1), Publisher(13-1), Printed_Notes_Availability, Music_Link
6	Main_Classification_Code(2)	Added Entry	Identifier(1), Artiste(10-1), Music_director(12-1), Lyric_Writer(11-1),Title(9), Printed_Notes_Availability, Music_Link

Table 6.7 – Information about OPACs

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Further, refer Appedix D for the queries developed using SQL2 for OPAC retrieval.

6.7.2 Power Catalogue

The 'Power Catalogue' is used by the librarian and authorized persons. All queries for the Power Catalogue are formulated based on the knowledge structure stored in the Master Music File. Catalogue is webbed. It provides a service to satisfy special requirements of musicologists, musicians and researchers.

In Appendix E some examples are provided, which gives certain idea about query formulation based on the knowledge structure. Examples are developed some information stored in the outline of Music Mater File. (Table E.1).

6.8 Methodology to store live music and sheet music files in a data archive

The live music files and sheet music files are stored on a data archive. The details about the data archieve are explained in the next chapter (Technology Infrastructure). The data archive is designed to add, remove and rename different types of audio, video and sheet music files. The audio or video or sheet music files are linked to the database using appropriate links, which are stored in the Master Music File. The data archive is developed using a file server. A file server is generally a dedicated storage attached to a network environment. The operating system supplied with the file server includes file management software. It is responsible for managing directories, ordinary files and special files. Most of the contemporary operating systems maintain a hierarchical structure of a directory system. Users are allowed to read information in directory files but only the system is allowed to do any modification such as write, execute, delete or read the files. Users have been given privileges to handle the files such as read, write, delete or execute the files by the systems administrator.

These features are important when designing the data archive for the digital library. A directory hierarchy is developed to store the music pieces on the file server. The names for the directory hierarchy must tally with the names given in the classification scheme. The appropriate classification codes can be included in the directory hierarchy to identify it. The sample directories included in the Figure 9.22 provides an idea about the directory hierarchy used by the digital music library to store live music items and sheet music files.
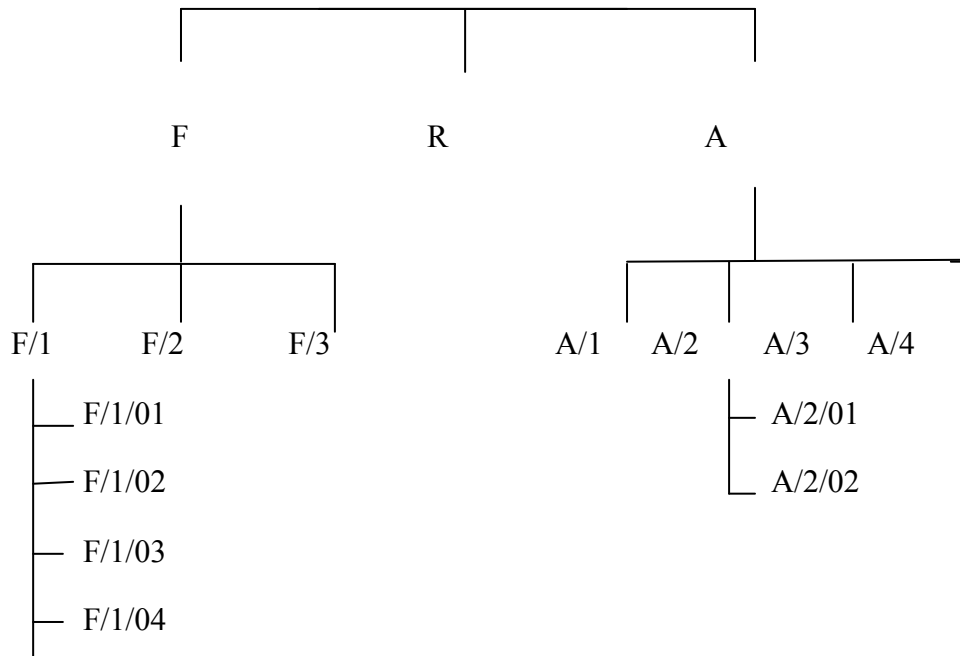
Figure 6.10 – Directory hierarchy used by data archived source (server) to store live & sheet music

The popular digital formats such as MP3, WAV, WMA, and MPEG-4 can be used as file formats to store music pieces in the digital library. All sheet music files are stored in HTML format. Conversion of analog music files (stored in tapes and old LP Records) into digital, is an another area to investigated and it has not been addressed here. This research has assumed that, all pre-prepared digital music files are already available. Sheet music in HTML format can also be stored in the data archive together with the digital music.

7. Conclusion, Suggestions and Guidelines for Future Research

The main purpose of this research is to develop a knowledge structure for Sinhala music with the intention of storing the files in the digital medium for it to be used effectively and efficiently. To satisfy the main goal, a knowledge structure has been developed as a classification scheme. The developed classification scheme is more valid if it supports representation of the entire subject knowledge of Sinhala music. However, it was difficult to be achieved, because of the lack of availability of literature related to the field.

There are numerous dimensions which have to be taken into consideration when characterizing the knowledge. In this research several characteristics of knowledge have been examined: classification, storage methodology, accessibility, and hierarchy. A detailed study has been performed to help understand the ethno musicological aspects of Sinhala music, later it has been transformed into a classification scheme in terms of effectively and efficiently storing in the digital medium. Further, the classification scheme has been introduced as a knowledge structure and has considered all aspects of its successfulness of future modifications such as extendibility for the new classified codes and the expandability for the addition of new schemes. The relational data model has been utilized to store the knowledge structure in the digital medium and the Relational Data Base Management system's SQLs (Structured Query Language) have been applied to drill down the knowledge for the specific requirements of the 'knowledge seekers'. The proposed digital library has significant features i.e. the file server and the directory hierarchy to store digital music pieces that will enhance the manageability of the overall digital library.

It is recommended that Open Source Software for the implementation such as LAMP (Linux, Apache, MySQL, PHP) for the digital library with the 'Samba' File Server for the music

archive be used, in order to reduce cost in terms of Hardware, and Software. Further, it is recommended that the digital library be used to connect Internet for unlimited user access.

Future research: suggestions

Although the digital library has been designed for specific file formats such as MP3, WMV, WMA, MPEG-4, further it can be extended further to support MIDI (Musical Instrument Digital Interface) file formats, then the users will be able to search a particular music file through the process of humming a particular tune of a song.

Develop a web based portal to store musical tunes, and other related topics such as theory of music, historical land marks in music, studies of musical instruments and appropriate facilities to include various comments of researchers as web blogs.

The development of programs where the cursor moves on sheet music displayed so that the student could identify the note played at a given moment.

Carry out an investigation to study of other knowledge representation methods such as semantic networks, frames to facilitate implementation of digital music library.

The above might be considered appropriate topics for further research.

The main limitations of this research

This research focuses the classification scheme to implement using the relational data model. It has not addressed the possibility of the other implementation methodologies for the same classification using Object Oriented Techniques.

Analog Digitization methodologies have not been discussed here since they are topics for different research and are not relevant in the present context and as such might be considered a constrain in this research.

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The developed classification code supports only the Sinhala folk songs and the music developed based on Hindustani melodies. It has not included the Western musical elements present, however necessary provision is provided for the addition of Sinhala songs based on Western musical innovations recent genre.

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Appendix A

Comparison of the division Music in the DDC, UDC and LCC (Table A.1)

DDC Scheme		UDC Scheme		LCC Scheme	
Decimal Number	**Description**	**Decimal Number**	**Description**	**Division Number**	**Description**
780-788	Music	**78**	**Music**	**M**	**Muisc**
780	Relation of music to other subjects	781	Theories of music	M1-M3	Music printed or copied in manuscript in the /United States or colonies before 1860
781	General principles and forms	782	Kinds of music	M5-1490	Instrumental music
782	Vocal music	783	Church music, sacred music, and religious music	M1495-2199	Vocal music
783	Music for single voices	784	Vocal music	M5000	Undefined compositions
784	Instrumental and instrumental ensembles and their music	785	Instrumental music, symphonic music, grouping of instruments and ensemble music		

DDC Scheme		UDC Scheme		LLC Scheme	
Decimal Number	Description	Decimal Number	Description	Division Number	Description
785	Ensembles with only one instrument per part	786	Music for individual instruments		
786	Keyboard, mechanical, electrophonic percussion instruments	787	Music for stringed instruments and stroked instruments		
787	String instruments, bowed stringed instruments	788	Music for wind instruments		
788	Wind instruments	789	Music for percussion instruments, music for mechanical musical instruments		

Table A.1 – Subject divisions of music in the DDC, UDC and LCC

A.1 DDC22 Edition:

Dewey Decimal Classification is the oldest and widely used classification in the world. The present twenty second edition (DDC22) is the latest edition published in 2003. It divides the world of knowledge hierarchically into ten divisions, which in turn is divided into ten sections, and so on. For the classification of music on the DDC22 system numbers 780 to 789 are used.

The sub category 781.6 (Traditions of music) is defined under the main sub heading 781 (General principles) and forms provides facilities to classify Folk music. Here, provision is available to classify areas like historical, geographic, person's treatment and general principles of folk music. The provision provided for folk music is mainly defined to classify origins of Western music. Such as folk music influenced by jazz. The folk music used in Sri Lanka is mainly based either on an industry or an occupation or to describe an event. It is difficult to use the DDC22 ed.'s category 781.6 to classify the folk music of Sri Lanka.

The divisions 782 and 783 divisions are further divided based on the musical concepts used in western music such as women's voices, children's voices and men's voices. The musical system used in Sri Lanka is more of an oriental form and such divisions are not directly applicable for the music of Sri Lanka.

The concepts used in western classical music such as symphonies, sonatas and similar disciplines and their ensembles are further explained and divided into sub headings, 784 and 785. Sinhala music is mostly of an oriental form and such divisions are not directly applicable to classify Sinhala music.

The divisions 785, 786, 787 and 788 are provided to list musical instruments used in light, western classical music. Although some of the musical instruments used in Sinhala music, and their ensembles are purely based on the principals of western music.

A.2 UDC Subject Divisions

Universal Decimal Classification (UDC) was developed in the late 1890s for scientific and technical subject classification. In UDC subject heading 78 is allocated for music.

The division 781 is used to classify the fundamental concepts of western music such as rhythms, harmony and melody and similar disciplines. These subject headings are further subdivided into 9 sub divisions based on the theories discussed in western music. The division 782, kinds of music is used to classify opera, operettas and pantomimes. The division 783 is further sub divided into 9 headings to explain areas of church music, choral services, litanies, psalms liturgical plays scared oratories Gregorian chant, Anglican chant and congregational songs. Similarly all other divisions are also classified based on the principals of western music. No divisions were included for the folk music and oriental forms of music.

A.3 LCC Subject Divisions

Library of Congress Classification (LCC) scheme was developed by the Library of Congress in late 1890s, divides the world of knowledge hierarchically into categories using letters of the English alphabet and then using Arabic numerals for further subdivisions. LCC has given class M for music. Further it has been divided into 3 subclasses such as;

Subclass M   Music

Subclass ML   Literate on music

Subclass MT   Instruction and study

Subclass ML is mainly used to classify the works performed in western music and subclass MT is defined to classify the different types of sheet music used in western music. In this classification scheme no facilities are included for the oriental form of music and related ensembles.

Divisions M1 to M3 are used to classify the musical works performed in the United States and its colonies. There is no subdivision included for other countries. M5 to M1490 are used to classify solo music, other large ensembles (e.g. orchestra music), dance music and electronic music. M1495 – 2199 are allocated for vocal music and classifies the different types of vocal music used in western music. M5000 is defined to allocate any other undefined compositions.

Comparison of these three schemes developed in the West show that the subject division provided are inadequate to classify all components of Sinhala music. Therefore, it is necessary to construct a detailed classification scheme for Sinhala music in order to create a digital music library.

Appendix B

Mr. V. Danawardana (BFA., MA) Chief Project Officer FineArts-(music),** Department of Aesthetic Education,** *National Institute of Education, Maharagama. He is a performer on the state dace group and a member of Sabaragamuwa tradition Gurukula. Discussion was held on 12/01/2011 at NIE. The discussion was electronically recorded.)*

He has pointed out the following important aspects;

1. Pointed out that, the main musical element of Sinhala music is folk songs. Traditional percussion rhythms can also be considered as a part of Sinhala music. Explained that art music is borrowed from other musical paradigms and advised not to include them under Sinhala music. Further, advised to include a provision for art music to satisfy future exigencies.

2. Accepted the produced classification scheme and its divisions and sub divisions and pointed out that there is no specific method of classifying Sinhala music.

3. Further advised to change the classification scheme provided for the percussion rhythms (which was developed based on the styles of drum rhythms), explained the difficulties of classifying complicated drum rhythms using its styles.

4. Introduced the new classification scheme of percussion rhythms developed by Karunarathna Bandara (which is mentioned in his research paper, i.e. "පහත රට බෙරවාදන සම්ප්‍රදාය (Low Country Percussion Tradition)". Suggested that the classification scheme t introduced to classify the drum rhythms of Kandyan, Low Country and Sabaragamuwa traditions be used.

5. Explained the features of literate songs, and advised as to which elements are to be considered when preparing a classification scheme of it.

6. Refined the classification scheme of rural songs and introduced two missing items (i.e enigmatic verses and explanatory verses).

Ms. Kumari Bandaranayake *(Haywood College music diploma, music instructor, poet, maintains a large collection of folk songs, and enthusiastic writer of folk songs, the discussion was held on 13/10/2011 at Naththaranpotha, Kandy. The discussion was electronically recorded).*

The classification scheme has been evaluated and the following issues were pointed out.

1. Accepted main divisions of Sinhala music i.e. folk songs and traditional percussion rhythms. Explained the irrelevance of including art music under Sinhala music because it has been borrowed from other music paradigms. Evidence provided to demonstrate inclusion of art music violates norms of essential Sinhala folk music.

2. Folk songs have been further classified under two main headings i.e. rural songs and literate songs that have been accepted and studied under the sub classifications of these headings.

3. The sub divisions of rural songs i.e., verses related to dawn of departure from and marriage, chants related to births, Incantations related to rituals, folk songs related to agriculture, songs related to various occupations, quatrains, admonitory songs, riddles, verses related to folk games, explanatory verses, amorous verses, verses related to nature and its denizen have been approved. Advised to change sub category of "quatrain", i.e. බුලත් විටෙ සිව්පද to බුලත් තහංචි. Advised to remove sub categories under "riddles", to be replaced with riddles. Explained irrelevance of the sub-division, "verses associated with historical or semi-historical events" since they do not come under the category of falk songs. Introduced two additional folk song types i.e. "පනා හැංගීම" and "හවරි හැංගීම", to be included under verses related to folk games. Explained that "Pandal verses (තෝරන් කව්)" were rather impromptu verses rather than folk songs and suggested they be removed.

4. Literate songs ("ලේ ගී") and their main headings have been further studied, and advised to include a new sub-category called "ශාන්ති කර්ම සම්බන්ද කව්" to Classical songs and explained their importance. Explained the difficulty of classifying the regional wise sub divisions related to classical songs and advised to remove it.

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Ms.S. A. Malani Chandralatha *(BA, MA) – Teacher Ministry of Education, Sinhala literati, the discussion was held on 13/10/2011 at Balagolla Kandy.*

She has pointed out following important issues;

1. Sinhala music is the folk songs of the people. It can be mainly classified under 8 headings i.e. explanatory verses, songs related to occupations, lullabies, admonitory verses, amorous verses, "සෙත් කව් (benedictory verses)" and "වස් කව් (was kavi)". The classifier has included most of these items except Seth and Was Kavi. But in the classification scheme a heading called Incantations related to rituals has been included. Therefore seth and was kavi can be included under that heading.

2. Explained the importance of enhancing the validity of the classification scheme by including a list of folk songs relevant to the classification scheme.

3. She advised that the headings relevant to art music be removed from the list. Further explained the validity of including only the folk songs and percussion rhythms in the classification scheme.

4. Examined the possibility of including the written forms of live music pieces together with sheet music in the classification scheme.

5. Advised that the sub classification scheme of classical songs included under literate songs be removed.

6. Examined the possibility of expansion of the classification scheme to include new knowledge.

Ms. Karuna Ratnayake *(BA, MA) - retired principal, enthusiastic writer on folklore, poet the discussion was held on 23/10/2011 at Ratmalana. The discussion was electronically recorded.)*

She has addressed the following issues;

Folk songs of Sri Lanka have been started during the Kotte period. The poems written in that period have to be classified using the classification scheme. There is only one heading called "messenger verses" in this classification scheme to classify all. It is difficult to include the poems other than messenger poems like "ගුත්තිල කාව්‍ය (Guthila Kawya)", "සඳකිඳුරු කාව්‍ය (Sadakiduru Kawya)", "කුස ජාතක කාව්‍ය (Kusa Jathaka Kawya)" under this heading. Therefore the heading provided to include messenger poems has to be changed to "සිංහල පද්‍ය සාහිත්‍ය (works on Sinhala Poetic Literature)".

In this classification, facilities are included to classify ancient folk poems like "වෙස්සන්තර හෑල්ල (Wessanthara Hella)", "යසෝදරා වත (Yasodara Watha)", "විදුර ජාතක කාව්‍ය (Vidura Jathaka Kawya) ", and "පතිනි හෑල්ල (Pathini Hella)". This is an advantage of the scheme.

In this classification scheme, facilities are not included to classify great poems like "කව් සිළුමිණ (Kaw Silumina)", "සසදාවත (Sasadawatha)", "මුවදෙව්දාවත (Muwadevdawatha)". But these poems do not have any features relevant to the folk songs. Therefore, their absence would not be a great disadvantage.

"Budugunalankaraya (බුදුගුණාලංකාරය)", "ලෝවැඩ සඟරාව" consist of certain features of styles of folk songs, but they do not directly belong to folk songs or great songs. In this classification scheme facilities are not included to classify this category.

Mr. S. Warnasinghe (BFA, MA, PgDip in Education in Education) – chief Project Officer (FineAtrs – Dancing) Department of Aesthetic Education, National Institute of Education.

Sinhala music can be mainly divided into two sections. They are,

i Folk songs

ii Literate Songs (සේ ගී)

Further, folksongs have been classified into 8 sub headings. These sub divisions are included in this report. The sub divisions of Literate Songs are also acceptable. Nevertheless these songs (literate songs) can be classified as those of greater traditions and minor traditions. Folk songs belong to the minor tradition. These of the great traditions are poetic works like "Muwadewdawatha" (මුවදෙව්දාවත), "Sasadawatha" (සසදාවත), "Kaw Silumina" (කව් සිළුමිණ), "Kawya Shekaraya" (කාව්‍ය ශේඛරය), and etc.

It is acceptable that works in the great traditions cannot be considered as folksongs. Therefore then it may not be included in a classification of this nature.

According to the traditional work like "Wessanthara Jathakaya" (වෙස්සන්තර ජාතකය), "Vidura Jathakaya" (විදුර ජාතකය), "Paththini Halle" (පත්තිනි හැල්ල) and etc. are included in classification of this nature. It would have been better if the poetic works like "Guththila Kawya" (ගුත්තිල කාව්‍ය), "Mahabhinikmana Kawya" (මහභිනික්මන කාව්‍ය) were included in this classification.

There is a belief that poetic works of Kotte era gave rise to folk songs. As such should not these works also have been included in this classification.

Appendix C

C.1 Entity Relationship Diagram

Entity Relationship Diagrams (ER Diagrams) are primarily used as a data modeling tool by the database designer. Although ER diagrams are generally used as a primary modeling tool for analyzing and modeling data, it can be used for a normalized set, thereby the designer is aware the relationships of all entities with the primary and the foreign keys. The facility is already available as a CASE (Computer Aided Software Engineering) tools which is supplied with most of the RDBMS. The other advantage of drawing such a diagram is used as an aid to identify the creation path of the tables in the database. (FigC.1)
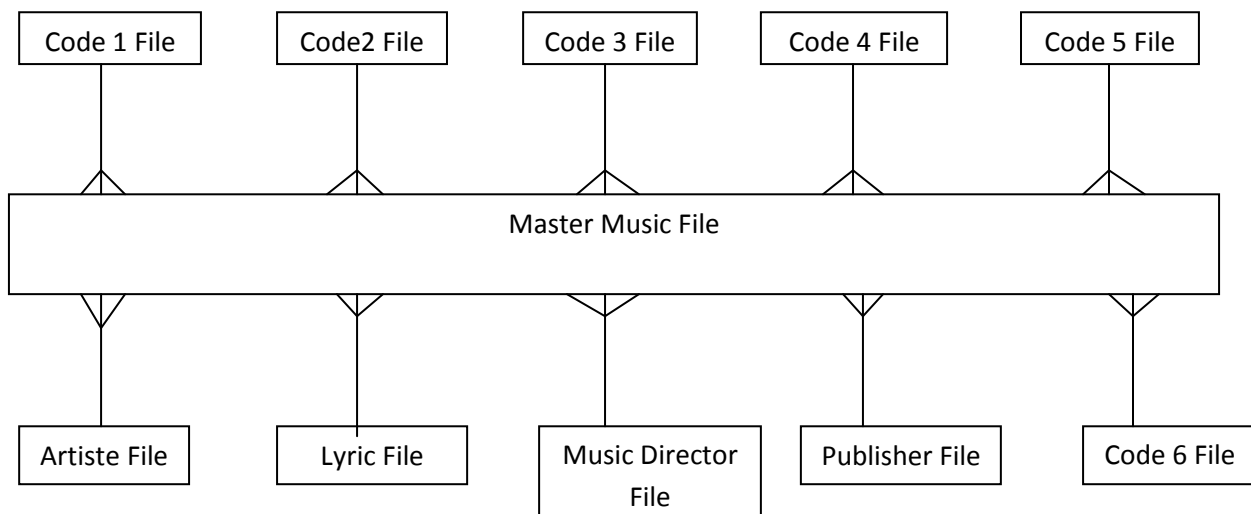
Figure C.1 – ER Diagram for the Normalized Relations

The following creation path is used to create the database using a RDBMS.

Code 1 File => Code 2 File => Code 3 File => Code 4 File => Code 5 File => Code 6 File => Publisher File => Music Director File => Lyric File => Artiste File => Master Music File

C.2 Definitions of attributes for the database

A data dictionary provides detailed descriptions about all the data elements used by the database. That is data about data. The details of data elements are used by the database administrator and application programmers to write computer programs. Definitions or data dictionary entries are already included in chapter 6.

C.3 Database Creation

The first step of the database implementation is, create the database. The following algorithm has been developed in the form of a DDL (Data Definition Language) script, to create the database. The DDL has been developed based on SQL Standard 2.

CREATE TABLE CODE 1 FILE (

| Level_1_Code | VARCHAR(1) | NOT NULL, |
| Level_1_Code_ Description | VARCHAR(100) | NOT NULL |

PRIMARY KEY(Level_1_Code);

CREATE TABLE CODE 2 FILE (

| Level_2_Code | VARCHAR(3) | NOT NULL, |
| Level_2_ Code_Description | VARCHAR(100) | NOT NULL |

PRIMARY KEY(Level_2_Code);

CREATE TABLE CODE 3 FILE (

| Level_3_Code | VARCHAR(6) | NOT NULL, |
| Level_3_Code_Description | VARCHAR(100) | NOT NULL |

PRIMARY KEY(Level_3_Code);

CREATE TABLE CODE 4 FILE (

Level_4_Code	VARCHAR(8)	NOT NULL,
Level_4_Code_ Description	VARCHAR(100)	NOT NULL

PRIMARY KEY(Level_ 4_Code);

CREATE TABLE CODE 5 FILE (

Level _5_Code	VARCHAR(10)	NOT NULL,
Level_5_Code_Description	VARCHAR(100)	NOT NULL

PRIMARY KEY(Level_5_Code);

CREATE TABLE CODE 6 FILE (

Level_ 6_ Code	VARCHAR(13)	NOT NULL,
Level_6_ Code_ Description	VARCHAR(100)	NOT NULL

PRIMARY KEY(Level_6_Code);

CREATE TABLE PUBLISHER FILE (

Publisher_Code	VARCHAR(5)	NOT NULL,
Publisher	VARCHAR(50)	NOT NULL

PRIMARY KEY(Publisher_Code);

CREATE TABLE MUSIC DIRECTOR FILE (

Director_Code	VARCHAR(5)	NOT NULL,
Music_Director	VARCHAR(50)	NOT NULL

PRIMARY KEY(Director_Code);

CREATE TABLE LYRIC FILE (

| Lyric_Code | VARCHAR(5) | NOT NULL, |
| Lyric_Writer | VARCHAR(50) | NOT NULL |

PRIMARY KEY(Lyric_Code);

CREATE TABLE ARTISTE FILE (

| Artiste_Code | VARCHAR(5) | NOT NULL, |
| Artiste | VARCHAR(50) | NOT NULL |

PRIMARY KEY(Artiste_Code);

CREATE TABLE MASTER MUSIC FILE (

Identifier	INT(7)	NOT NULL , AUTO INCREMENTED,
Main_Classification_Code	VARCHAR(13)	NOT NULL,
Level_1_Code	VARCHAR(1)	NOT NULL,
Level_2_Code	VARCHAR(3),	
Level_3_Code	VARCHAR(6),	
Level_4_Code	VARCHAR(8),	
Level_5_Code	VARCHAR(10),	
Level_6_Code	VARCHAR(13),	
Artist_Code	VARCHAR(5),	
Lyric_Code	VARCHAR(5),	
Director_Code	VARCHAR(5),	
Publisher_Code	VARCHAR(5),	
Title	VARCHAR(25)	NOT NULL,
Date	DATE,	
Subject	VARCHAR(30),	

Description	VARCHAR(100),	
Contributor	VARCHAR(50),	
Type	VARCHAR(10)	NOT NULL,
Format	VARCHAR(10)	NOT NULL,
Source	VARCHAR(30),	
Original_Language	VARCHAR(10),	
Relation	VARCHAR(50),	
Rights	VARCHAR(100),	
Coverage	VARCHAR(10),	
Printed_Notes_Availability	VARCHAR(25),	
Music_Link	VARCHAR(25)	NOT NULL,
Recording_Studio	VARCHAR(25),	

PRIMARY KEY(Identifier),

FOREIGN KEY(Level_1_Code) **REFERENCES** CODE 1 FILE(Level_1_Code)

FOREIGN KEY(Level_2_Code) **REFERENCES** CODE 2 FILE(Level_2_Code)

FOREIGN KEY(Level_3_Code) **REFERENCES** CODE 3 FILE(Level_3_Code)

FOREIGN KEY(Level_4_Code) **REFERENCES** CODE 4 FILE(Level_4_Code)

FOREIGN KEY(Level_5_Code) **REFERENCES** CODE 5 FILE(Level_5_Code)

FOREIGN KEY(Level_6_Code) **REFERENCES** CODE 6 FILE(Level_6_Code)

FOREIGN KEY(Artiste_Code) **REFERENCES** ARTISTE FILE(Artist_Code)

FOREIGN KEY(Lyric_Code) **REFERENCES** LYRIC FILE(Lyric_Code)

FOREIGN KEY(Director_Code) **REFERENCES** MUSIC DIRECTOR FILE

(Director_Code)

FOREIGN KEY(Publisher_Code) **REFERENCES** PUBLISHER FILE

(Publisher_Code));

Appendix D

Algorithms for the Open Public Access Catalogue (OPAC)

Refer table 6.2 in chapter 6 for the appropriate information for the following SQL statements. These statements are written using SQL2 standard.

OPAC No. 1

SELECT   M.Title, M.Main_Classification_Code, A.Artiste, P.Publisher, D.Music_Director,

L.Lyric_Writer, M.Printed_Notes_Availability, M.Music_Link

FROM Master Music File   M, Artiste File   A, Publisher File   P,

Music Director File   D, Lyric File   L

WHERE   M.Artiste_Code = A.Artiste_Code **AND**

M.Publisher_Code = P.Publisher_Code **AND**

M.Director_Code = D.Director_Code **AND**

M.Lyric_Code = L.Lyric_Code **AND**

M.Identifier = Get the identifier given by user;

OPAC No. 2

SELECT   M.Title, M.Main_Classification_Code, M.Identifier, P.Publisher, D.Music_Director,

L.Lyric_Writer

FROM Master Music File   M, Artiste File   A, Publisher File   P,

Music Director File   D, Lyric File   L

WHERE   M.Artiste_Code = A.Artiste_Code **AND**

M.Publisher_Code = P.Publisher_Code **AND**

M.Director_Code = D.Director_Code **AND**

M.Lyric_Code = L.Lyric_Code **AND**

M.Artiset = Get the Artiste Name given by user;

OPAC No.3

SELECT   M.Title, M.Main_Classification_Code, M.Identifier, A.Artiste, P.Publisher,

L.Lyric_Writer

FROM Master Music File   M, Artist File   A, Publisher File   P,

Music Director File   D, Lyric File   L

WHERE   M.Artist_Code = A.Artist_Code **AND**

M.Publisher_Code = P.Publisher_Code **AND**

M.Director_Code = D.Director_Code **AND**

M.Lyric_Code = L.Lyric_Code **AND**

M.Music_Director = Get the Music Director Name given by user;

The SQL statements for the catalogues OPAC No. 4 to OPAC No. 6 are based on above mentioned OPAC No.1 to OPAC No.3.

Appeddix E

Identifier	Level_1_Code	Level_2_Code	Level_3_Code	Level_4_Code	Level_5_Code	Level_6_Code	Main_Classification_Code	Title	Other Fields in the file
2000	F	F/1	F/1/05	F/1/05/a	Null	Null	F/1/05/a	……..	……..
2001	F	F/1	F/1/05	F/1/05/a	Null	Null	F/1/05/a	……..	……..
2002	F	F/1	F/1/05	F/1/05/b	Null	Null	F/1/05/b	……..	……..
2003	F	F/1	F/1/02	F/1/02/a	Null	Null	F/1/02/a	……..	……..
2004	F	F/1	F/1/02	F/1/02/b	Null	Null	F/1/02/b	……..	……..
2005	A	A/2	A/2/01	A/2/01/c	A/2/01/c-A	Null	A/2/01/c-A	……..	……..
2006	A	A/3	A/3/01	A/3/01/c	A/3/01/c-B	A/3/01/c-B/01	A/3/01/c-B/01	……..	……..
2007	F	F/2	F/2/03	F/2/03/a	F/2/03/a-A	F/2/03/a-A/02	F/2/03/a-A/02	"Verses of Thuraga Vannam"	……..

Table E.1 – Master Music File and Some Sample Records

Example 1

A knowledge seeker needs to get metadata about songs related to various occupations.

The classification code related to various occupations is F/1/05

This is a level 3 classification code. There are six different types of verses are classified under the songs related to various occupations. They are,

Boatman's song -Classification code is F/1/05/a

Carter's Song- Classification code is F/1/05/b

Miner's Song -Classification code is F/1/05/c

Wasp-honey collecting song-Classification code is F/1/05/d

Cotton ginner's song-Classification code is F/1/05/e

Blacksmith's song-Classification code is F/1/05/f

The query is formulated using the following SQL statement;

SELECT   *

FROM MASTER MUISC FILE

WHERE Level_3_Code = "F/1/05";

The output is the records related to the following identifiers. Refer table 6.9

Identifier(1)	Other Fields (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25)
2000	Fields related to a boatman's song
2001	Fields related to a boatman's song
2002	Fields related to a carter's song

Table E.2 Output of the Example1

Example 2

Since the knowledge seeker needs to get only the Carter's song metadata, the SQL will be developed based on the field "level 4 code" of the Master Music File, i.e.

SELECT *

FROM MASTER MUSIC FILE

WHERE Level_4_Code = "F/1/05/b";

Output is included in Table 6.10.

Identifier (1)	Other Fields (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25)
2002	Fields of Carter's song

Table E.3 –Output of the Example 2

Example 3

Since the knowledge seeker wants to get all rural song's metadata. The SQL statement is developed based on the field "level 2 code" of the Master Music File, i.e.

SELECT *

FROM MASTER MUSIC FILE

WHERE Level_2_Code = "F/1";

Output is given in Table 6.11

Identifier (1)	Other Fields (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25)
2000	Boatman's song
2001	Boatman's song
2002	Carter's song
2003	Verses in the tales related to the birth of gods
2004	Verses in the tales related to the birth of planets

Table E.4 – Output of Example 3

Example 4

A knowledge seeker wants to get metadata information about the Traditional stylized stage drama.

The code relevant to film music based on fiction is A/3/01/c-B/01

SELECT *

FROM MASTER MUSIC FILE

WHERE Level_6_Code = 'A/3/01/c-B/01';

The output is in Table 6.12

Identifier (1)	Other Fields (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25)
2006	Song related to traditional stylized stage drama

Table E.5 – Output of Example 4

Example 5

A Knowledge seeker wants to obtain metadata information such as song Identifiers, Artist Codes, and the date of the songs sung by singer 'Victor Ratnayake'. The query is;

SELECT M.Identifier, M.Artiste_ Code, M.Date

FROM Music Master File M, Artiste File F

WHERE M.Artiste_Code = A.Artiste_Code AND

      A.Artist = "Ratnayake Victor";

The output is in Table 6.13 (data needed to produce an output is not in the files)

Identifier, Artiste Code, Date

Identifier (1)	Artist_Code (10)	Date (15)

Table E.6 – Output of Example 5

උප ග්‍රන්ථ F

වර්ගී කරන ලද සිංහල ජන ගී එකතුවක් පහත දැක්වේ.

පැල් කවියක්

වර්ගීකරණ අංකය: F/1/04/a

පින්සලා මොනරු එති දහවල්	තිස්සේ
මල්සලා උරෝ කති ඒ අතු	අස්සේ
කල්බලා දුරුතු මස පුදින	දස්සේ
පල්තනා රකී නිදි නෑ ඇ	තිස්සේ

<div align="right">(නානායක්කාර, 1998, පිටුව 15)</div>

කරත්ත කවියක්

වර්ගීකරණ අංකය: F/1/05/b

බණේ කොහොම කිව්වත් පව් පල	දෙනවා
පිනේ අරුම නොසිතා අපි පහු	වෙනවා
ගොනෝ උබට කළ පව් දැන් පළ	දෙනවා
අනේ ගොනෝ ඇදපන් මීගමු	යනවා

<div align="right">(නානායක්කාර, 1998, පිටුව 16)</div>

පතල් කවියක්

වර්ගීකරණ අංකය: F/1/05/c

කරවනැල්ලේ ඉස්ටේසම ටිකට්	දෙන
රුවන්වැල්ලේ කන්තෝරුව ලියුම්	දෙන
කොටියාකුඹුර ඉස්ටෝරුව බඩු	කිරණ
මාබෝගලේ පතලෙයි අපි වැඩ	කරන

<div align="right">(නානායක්කාර, 1998, පිටුව 18)</div>

පාරු කවියක්

වර්ගීකරණ අංකය: F/1/05/a

ගමන් යන්න නැකතින් පාරු	පදගෙන

සමන් දෙවියන්ට පුද පඬුරු	බලාගෙන
මෙවන් කළ ගඟේ ගල් මුල්	බලාගෙන
අපිත් යමුව සෑම දෙවියන්ට	වැදගෙන

(නානායක්කාර, 1998, පිටුව 19)

කුරක්කන් කවියක්

වර්ගීකරණ අංකය: F/1/04/c

ගල් වානේ මහ යායේ	කුරක්කන්
අත දිගහැර මීට මොළවන	සුරක්කන්
ඇඟිලි ඉහිරිලා එකරුව	කුරක්කන්
ගෑණු මරණ පලදාවකි	කුරක්කන්

(නානායක්කාර, 1998, පිටුව 21)

දරු නැලවිලි කවියක්

වර්ගීකරණ අංකය : F/1/02

දෝයි දෝයි දෝයි දෝයිය	බබෝ
බයි බයි බයි බයිය	බබෝ
නාඬා නැල වෙන්න	බබෝ
තුන් සරණයි නුඹට	බබෝ

(නානායක්කාර, 1998, පිටුව 24)

රති කවියක්

වර්ගීකරණ අංකය: F/1/12/c

අල්ලාගෙන නෙරිය අතකින් කිමද	නගෝ
වසාගෙන දෙතන අතකින් කිමද	නගෝ
හිමියකු නැති ගමන් කිමද	නගෝ

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අම්බලමේ නැවතී යමුද   නගෝ

<div align="right">(නානායක්කාර, 1998, පිටුව 30)</div>

කමත් කවියක්

වර්ගීකරණ අංකය: F/1/04/f

නැකැත් බලා ගොයම්   ලියා

කමතට නිසි බිමක්   සොයා

නැකත බලා කමත   ලියා

කමත වටට වල්   ඇදයා

<div align="right">(බන්දුසේන, 2007, පිටුව 120)</div>

ගොයම් කවියක්

වර්ගීකරණ අංකය: F/1/04/g

බුදුන් වඩින   වෙලාවයි

කිරි උතුරන   වෙලාවයි

කොළ මඩවන   වෙලාවයි

කමත පිරෙන   වෙලාවයි

<div align="right">(බන්දුසේන, 2007, පිටුව 127)</div>

පැදුරු මාලයේ කවියක්

වර්ගීකරණ අංකය: F/1/04/i

හරස් රටාවෙන් පැදුරක් මම විය   නා

ගිරා කොබෙයියෝ පැදුරේ මැද විය   නා

පන්නන් කතුර ඇහ පියවරකින් පුර   නා

ලේලිට බලන්නට පැදුරක් මම විය   නා

<div align="right">(රත්නපාල, 1995, පිටුව 108)</div>

<div align="center">189</div>

තෙතඟු කවියක්

වර්ගීකරණ අංකය: F/1/11/a

සෝඬි ටිකිරි පොඩි පියවුරු පතුල් ටිකිරි වැන්නෙ	තෙතඟු
ළමැද පුරා එන ගණරන් මුණ බබල වන්නෙ	තෙතඟු
ඈත සොර බැල්ම බලා කොන්ඩෙන් සඟවන්නේ	තෙතඟු
සෝඬි ටිකිරි පතුල්ලියේ ඇය පිටිමඟ යන්නේ	තෙතඟු

<div align="right">(රත්නපාල, 1995, පිටුව 108)</div>

බලි යාග කවියක්

වර්ගීකරණ අංකය: F/1/03/d

බලි මුණ දෙකන් රන් පාට ග	නූ
ළමැද ලේ විලයි ගවයකු නැඟිය ග	නූ
අතකින් උලයි අතකින් කුකුලෙක්ද ග	නූ
රීරියක් බලිය මේ ලෙස දන අබ	නූ

<div align="right">(සරත්චන්ද්‍ර, 2009, පිටුව 44)</div>

කෝලම් නාටක කවියක්

වර්ගීකරණ අංකය: F/1/15/a

අණ බෙර කාරයෙ	ක්
සමඟ එන හෙවයෙ	ක්
යුග සෙබළ දෙදෙනෙ	ක්
සමඟ ලන්දේසි නෝනා යුගල	ක්

<div align="right">(සරත්චන්ද්‍ර, 2009, පිටුව 95)</div>

කවි නාඩගමක කවියක්

වර්ගීකරණ අංකය: **F/1/15/c**

සඳකිඳුරුව ඉපි   දෑ

අප මහ බෝසත් ස   දෑ

සමඟින් කිඳුරු ළ   දෑ

කියමි පෙර කළ උපත මනන   දෑ

<div align="right">(සරත්වන්ද්‍ර, 2009, පිටුව 112)</div>

සොකරි කවියක්

වර්ගීකරණ අංකය: **F/1/15/b**

සොකරි එන්නී සබයෙන් අවසර ගන්   නී

නැටුම් නටන්නී තාලෙට රාග කියන්   නී

පද අල්ලන්නී පියයුරු ළම සොලවන්   නී

කැඩපත ගන්නී සුරතින් මුණ බලන්   නී

<div align="right">(සරත්වන්ද්‍ර, 2009, පිටුව 131)</div>

තේරවිලි කවියක්

වර්ගීකරණ අංකය: **F/1/08/c**

වැඩකට නැති ලීය හැඩකට කපාගෙ   න

ගොනු නැති ලීය කනු වලින් ගොනු නැඟිට්ටුවා ගෙ   න

නහය නැති ගොනුව නහලනු දමාගෙ   න

සක් රජ හඬති ගොනු පිට අත තබා ගෙ   න

(මහනුවර නත්තරම්පොත පදිංචි කුමාරි දිසානායක මහත්මිය සමග 2011/10/13 දින කරන ලද සම්මුඛ සාකච්ඡා වේදී ඇය විසින් ගායනා කරන ලද කවියක්)