



UNIVERSITI PUTRA MALAYSIA

***CONTEXTUAL SOUND PRESERVATION OF
SELECTED LOCAL STRING INSTRUMENTS***

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SELECTED LOCAL STRING INSTRUMENTS**

By

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**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

June 2015

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

CONTEXTUAL SOUND PRESERVATION OF SELECTED LOCAL STRING INSTRUMENTS

By

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June 2015

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This thesis aims at approaches to audio field recording that forms contextual sound preservation under present-day conditions of wide-spread electro-acoustic enforcement applied on musical instruments, which were traditionally played in rural and/or communal settings in their special sound environments. Through the development of methods and technical possibilities, the study can contribute to high quality audio archiving that encompasses multiple sound perspectives.

Thus it will help to preserve instrumental music in its sound context and document the unique relationship of the communities to it. The study is limited to a strict choice of instruments, which will play the role of a model for further applications. The study applies qualitative research methods, especially recording experiments leading to a descriptive analysis. From the fieldwork conducted, two selected local string instruments have been selected and recorded embedded in their actual sound context, namely the Bidayuh tube zither *pratuokng* and the *sape* native to various groups of the Kenyah and Kayan. Recordings were made from different positions utilizing appropriate audio recording equipment that is also examined in this study. The audio analysis focuses descriptively on the aspect of contextual sound preservation realized through recording instrumental sound from various highlighted positions. The sound captured represents four different perspectives, namely the sound of the immediate instrument, the ensemble in which it is played, the ensemble in its closer sound environment, and the entire sound setting in a place.

The audio materials collected reveal that the sound context given in the rural and communal setting plays an important role for the community. For preservation purposes, the sound context cannot be eliminated or replaced even though it is a common practice in sound productions made in a conventional recording studio as this will affect the identification of instrumental sound and its perception. The importance of sound preservation with a possible choice of perception is not only limited to the chosen musical instruments. Contextual sound contributes to the overall information from the aspect of audio documentations and from the aspect of knowledge on music perception and communication.

Based on the findings of the analysis, a few issues are discussed which include reviewing commercial recordings of local string instruments from the aspect of preservation and genre identity, instrumental sound modifications achieved acoustically through types and numbers of strings used, sizes and shapes; or electronically through installation of an electromagnetic pick-up, microphone techniques in live sound reinforcement, and cultural lexis. Through this, the importance of contextual sound

preservation of the selected string instruments in their rural sound environment is informed. Further studies may focus on the application of the proposed recording concept with other musical instruments in Malaysia, namely in Sarawak, which may verify the applicability of the preservation method developed in this study.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PEMELIHARAAN BUNYI KONTEKSUAL UNTUK ALATAN MUZIK BERTALI TEMPATAN YANG TERPILIH

Oleh

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Memandangkan penggunaan alatan elektro-akustik terhadap alat-alat muzik kini semakin tersebar luas, tesis ini telah ditulis untuk memberi pendekatan yang lebih halus terhadap rakaman audio luar. Rakaman audio luar yang dibuat untuk memelihara bunyi kontekstual ke atas alat-alat muzik yang secara tradisinya dimainkan oleh sesuatu kaum dalam persekitarannya yang tersendiri seperti di pendalaman. Melalui pembangunan kaedah dan kemampuan teknikal, kajian ini boleh menyumbang terhadap hasil bahan arkib berbentuk audio yang berkualiti tinggi dan merangkumi bunyi daripada pelbagai perspektif. Justeru, hal ini akan memelihara muzik yang dimainkan dalam konteksnya tersendiri dan menyimpan rekod dari segi dokumen mengenai hubungan unik sesebuah masyarakat dan muzik itu sendiri. Kajian ini adalah terhad kepada pilihan instrumen yang dipercayai akan memainkan peranan sebagai model untuk penggunaan masa akan datang. Kajian ini menggunakan kaedah penyelidikan kualitatif, terutamanya melalui rakaman eksperimen yang menjurus kepada analisis deskriptif. Berdasarkan kerja lapangan yang dijalankan, dua instrumen bertali tempatan telah dipilih dan di rakam didalam konteks bunyinya yang sebenar, iaitu “tube zither” *pratuokng* kaum Bidayuh dan *sape* untuk pelbagai kumpulan etnik, misalnya, Kenyah dan Kayan.

Bunyi dari pelbagai kedudukan di tempat kajian yang telah dirakam juga menjadi salah satu elemen kajian tesis ini. Analisis deskriptif audio yang memberi tumpuan kepada aspek pemeliharaan bunyi konteks di realisasikan melalui rakaman bunyi instrumental dari pelbagai posisi bunyi yang di perolehi daripada empat perspektif yang berbeza, iaitu pertama, bunyi instrumen, kedua, ensemble di mana instrumen dimainkan, ketiga ensemble dalam persekitaran bunyi lebih dekat, dan akhir sekali tetapan bunyi keseluruhan di tempat tersebut.

Bahan-bahan audio yang terkumpul ini membuktikan bahawa konteks bunyi sesuatu kaum di persekitaran luar bandar juga memainkan peranan yang mustahak bagi masyarakat tersebut. Untuk tujuan pemeliharaan, konteks bunyi ini tidak boleh di hapuskan atau di ganti walaupun menjadi amalan kebiasaan penghasilan produk yang dihasilkan di studio rakaman konvensional kerana akan menjejaskan identiti bunyi instrumental serta persepsinya.

Kepentingan pemeliharaan bunyi dengan pelbagai perspektif tidak hanya terhad untuk rakaman alat-alat muzik semata-mata tetapi juga menyumbang maklumat secara menyeluruh, yakni dari segi dokumentasi audio serta aspek pengetahuan perihal persepsi muzik dan komunikasi. Berdasarkan hasil analisis, beberapa isu di bincangkan termasuk mengkaji kesan rakaman komersial instrumen bertali tempatan dari aspek pemeliharaan dan identiti genre, pengubahsuaian bunyi melalui instrumental akustik, struktur fizikal alat tersebut, aspek teknikal seperti pemasangan “electro-magnetic pick-

up”, serta teknik mikrofon dalam siar raya audio, dan akhir sekali peranan kebudayaannya. Melalui kaedah ini, kepentingan pemeliharaan bunyi konteks instrumen bertali yang dipilih didalam persekitaran bunyi luar bandar dapat dinyatakan. Oleh yang demikian, lanjutan kajian lain terhadap aplikasi konsep rakaman yang dicadangkan mungkin memberi tumpuan kepada alatan muzik lain di Malaysia, iaitu di Sarawak, yang pasti mengiktiraf keberkesanan kaedah pemeliharaan yang di ketengahkan dalam kajian ini.



I certify that a Thesis Examination Committee has met on 23 June 2015 to conduct the final examination of Ahmad Faudzi Musib on his thesis titled “Contextual Sound Preservation of Selected Local String Instruments” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

From the viewpoint of **preservation through collecting**, the environment of existing sound production can be seen as of the same importance as the tools for their production. In an earlier publication, the author (Musib, 2012a) discusses sound preservation of a sound generating tool as following:

“One such example might be a special music instrument played in a special context, which depends on place, time and the sound producer, in this case the musician with partners and addressees set into an environment that sounds itself in various ways. The role of the environment as a sounding complex was in long-held opinions of collectors and media distributors a disturbing fact that had to be eliminated or suppressed. In best / worst case, side sounds were left unchanged to create a lively atmosphere for anthropological sound recordings or sound recordings made for a special audience to which the place is of particular interest. The coughing in a live concert or the dog barking in the background of a village ensemble became then part of the item when being marketed detached from the time and space of recording. In an audio archive, a sound reduction hopefully does not take place”. (Musib, 2012a: 42). Another aspect of sound preservation is that of the unique sound identity. Musician of electronic instruments such as electric guitar, bass and synthesizer portray themselves through their sound identification. “Having our own sound print that is unique, would stand a chance of being “noticed” by the sound designer manufacturers to perhaps commemorate their individual preferences in a form of sound patch of a device”(Musib 2011:13). Musicians who play acoustic instruments also maintain a strong identity of their instrument type and the individuality of the instrument.

There, sound preservation includes side sound as contextual sound, independent from the intention of the collector. Since the intentional sound is in many cases the main concern of the collector, the occurrence of contextual sound was most of the time neglected. The contextual sound is of an equal importance to the intentional sound. The occurrence of contextual sound around the intended sound usually is very soft in amplitude. But that does not mean that contextual sounds do not exist. This is because the ear in reality hears sound spatially through depth and distance. The contextual sound is also serving as interface of communication and interaction through information. Attributions of intended sound and contextual sound both encompass information about a context in reality as a whole. Naturally, intended sound and contextual sound is bound to an interaction chronologically or together and should not be separated. Therefore the collection of sound as information for preservation should not route to or from one source. With sound in a wider sounding context, one is able to distinguish one sound from its surroundings; consequently the awareness of sound intensity is of an equal importance to the source and the environment, in which its assessment, outcome and connotation derives. The contextual sound is deciding for the ability to remembering a sound setting in time and space. Details can be of high importance (Musib, 2012b).

Therefore, compound sound awareness would give a bigger perspective and perceptive choice in a sound production assessment. In order to lively illustrate the facts mentioned, an in-depth study on contextual sound preservation may help to reveal the potential of multi-perspectivity regarding sound sources. Living in a *kupuo* of the *Bidayuh* or long house of the *Orang Ulu* (Kayan and Kenyah) may provide communicational approaches that allow best explorations of a desired sound in its environmental sound context. Despite the vast growth of communication devices such as cellular and smart phones, communicating from veranda or windows by the villagers who live in the *kupuo* of the *Bidayuh* or long house of the the *Kenyah* and *Kayan* is common. The sound of the tube zither *pratuokng* of the *Bidayuh* or the *sape* of the *Kayan* and *Kenyah* heard even from a distance is an inseparable portion of the sound mosaic which cannot be detached from the acoustic memory of people living for example in Annah Rais, Padawan, towards the *pratuokng* or people in Bau near Kuching, Sarawak, towards the *sape*.

The *pratuokng* is the *Bidayuh* traditional musical instrument. This musical instrument is classified as a tube zither and categorized as a chordophone. As such it is further categorizes as an idiochord chordophone, means, the strings are cut from and lifted out of the body of the instrument itself. It is made from a type of bamboo called 'petung'. The parts contained within the musical instrument are equal to the functions within a gong set of *Bidayuh* community. The Annah Rais *pratuokng* sound radiator consists of 'tawak', 'satu' and 'canang'. For the *Bidayuh* of Bau, a similar tube zither made of bamboo named *pretong* or *sretong*. The three-string-*pretong* sound radiators are the 'kromong', 'canang', 'gong', 'tawak' and 'gedabak'.

The *sape* is an instrument which belongs to the *Kayan* and *Kenyah* and is widely described as following: "It is also known as "the *sambi*' is a type of *kecapi*' (lute) with at least three strings, but it may have up to four or five strings depending on its origins. In other *Kenyah* languages, it is known as *sampe*' and in *Kayan* it is called *sape*' Before plastic and metal strings appeared, fibres from *iman*' (*Arenga pinnata*) tree or sugar palm were used as strings for the *sambi*' Today, steel wire is much used, it is obtained from wire of the bicycle brakes or from guitar strings". (La Wing, 2003:269). Even in recent times, quite archaic statements on *sape* playing can be found as this: "The *Orang Ulu* tribe can also be identified by their unique music distinctive sound from their *sape*, a stringed instrument not unlike the mandolin". (Welman, 2011:138). The *sape* is further played by a number of individual musicians in Sarawak which can be Iban or even Chinese who are simply attracted by its sound or take the sound of the *sape* up as a marketing sound for tourists and Sarawakian products.

The changes over the times in the instrumental sound can be partly traced from various sources of information of which audiovisual documents such as the audio archives of the Ethnology Section in the Sarawak Museum, written reports of the Sarawak Museum Journal and the Tun Jugah Foundation library are the most reliable. For example, the sound of the *Bidayuh* tube zither *pratuokng* might have been quite different compared to the first decade of the 21st century. Perhaps, it is due to the tools used before, that did not allow for sophisticated details, thus affecting the sound production; or the size of the bamboo could have been smaller or bigger. With smaller bamboo, the distance between the nodes is mostly shorter thus the strings are shorter as well and the sound higher in pitch. These features, in return, affect the string arrangement. The amount of strings could have been less, which might have affected

the Bidayuh tube zither *pratuokng* tuning in general. The recent sound preference could have been transformed as the sound vocabulary of the musician and is heavily influenced by mass media, stage concerts, observation and adaptation of similar instruments in terms of producing 'fusion' sound that could be a factor of changing instrumental sound identities. Any alteration in sound, so far, affects the whole timbre, too. The question of 'modernization' in using traditional string instruments detached from their rural environment has to be answered from different perspectives such as the perspective of the cultural bearer as well as the cultural observer. Social and economic environment deserves special attention in this context that has to be scrutinized through analytic induction as well as typology of changing life styles and communication patterns. In result, the bearers' as well as the observers' cultural conditions can be understood better.

String instruments that are considered to be of low level volume, give an extraordinary insight into this phenomenon of acoustical placement within a communal sound that deserves to be preserved from various perspectives. Additionally to the recently re-discovered discussion of 'soundscape'¹ defined by Truax, "as part of that environment [that] is understood by those living within it – the people who are in fact creating it" (Truax, 2001:11) some scholars conducted studies on sound in context (Aubert & Ribeiro 2007; Barz & Cooley 1997). The approach of 'perspectivism' in sound awareness and acoustical placement of oneself is to be explored through the development of technical tools and methods. Truax names as main elements of soundscape the listener's recognition of the source materials and the listener's knowledge of the environs and psychological context (Truax, 2001:240). How string instruments of low volume level fit into that set of knowledge when appearing acoustically deserves a deeper analysis for their high potential of local identification within a community. Other instruments such as gongs and drums may be of additional interest, however, their identity potential is more regionally or ethnically determined and more abstract than that of local string instruments (Brémaud, 2012).

In most of all types of sound conservation, listeners are unable to choose from which direction he or she would prefer to hear. Music was mainly collected by field recordists without considering technical aspects of audio recordings in terms of directed sound. Collections in sound archives are sometimes interesting only to just few researchers who are specialized in only one aspect of music production. Nevertheless, sound environmental inclusions in certain recordings are considered to be side effects of main recording projects undertaken by collectors of different disciplines who did not purposely intend to record those 'noises'. Unlike conventional methods used currently for sound production and subsequent preservation aiming at capturing sound of the core source and eliminating the context in which the instruments are played, the preservation tools to be designed through this study try to provide a wide choice of receptive perspectives. "This includes all eventually possible sound components in environment such as the primary sound production taken from various distances or directions - are heard as realistic as possible from the viewpoint of the producer as well as from the viewpoint of the participating addressees" (Jähnichen, 2011b; Musib, 2012a). Other views and instances were considered in relation to this research

¹ Sound scape: A term coined by R. Murray Schaffer in the 1970s (Schaffer, 1977) about the study of sound in daily environment.

particularly the understanding of how recorded sound becomes more present in our everyday environment. Vincent Andrisani, another researcher interviewed by Wood, uses sound as means of exploring culture. He conducted and experimented both in his homeland Canada and in Cuba. Hildegard Westerkamp of Osnabruck, Germany, is a German and Canadian composer of electro acoustic music has a social and political view about listening to sound. Andisani and Westerkamp are quoted in interviews² (see appendix K: transcriptions).

Sound archives enable user to be in an acoustic space through listening without being physically present in that very space. Further, recordings in sound archives enable one to hear sound in a space with its multi-layered dimension. The research in contextual sound is about options made available to the user accessing sounds beyond the capability of one existence in an acoustic space, exemplarily of selected local string instrument.

Anthropological explorations support the axiom that identity formation of any group of people is of a dynamic nature. It therefore may not be altogether untrue to say that the appreciation of these sounds would be more effectively addressed if the *sape* and *pratuokng* were located or contextualized in a historical social environment with realistic cultural forces surrounding them giving meaning to their existence as a musical feature of Sarawak. Positioning these sounds as close as possible in their 'cultural habitat' would help in the measurement of how much they have departed later from their earlier state and form.

1.2 Statement of the Problem

The background of this study as defined above suggests a number of aspects that have to be considered. First, the cultural context of the local string instruments chosen for this research, exemplarily the *pratuokng* of the Bidayuh and the *sape* of the Kayan and Kenyah, their social meaning within the community as well as from diverse external viewpoints, especially as the instruments are becoming tourist attractions in formal performances, have to be examined. This might lead to the observation of fabrication of information and neglecting of varying sound contexts as the current performances motivate economic improvements in the cultural space of the two chosen string instruments.

Studies regarding contextual sound preservation of local string instruments are yet to be developed. As explained in the background of the study, academic researchers are more focused on historical and anthropological aspects. Detailed studies referring specifically to technical aspects of contextual sound regarding local string instruments do not exist in Malaysia.

Truax (2001: xviii) points out that listening is the key issue in communication via sound because it is the primary interface between the individual and the environment. Jähnichen, on the other hand, suggested that considering the persistence theory caused

² Chris Wood who conducted an audio documentary titled 'A Short History of Acoustic Ecology' was commissioned by Pixel Palace for Basic FM along with Camara Miller and Nathan Clarkson (see Appendix I: Transcription 1).

through early writings and looking critically at the aspect of “naturalness” proposed for people living on Borneo (Denison, 1879, Forbes, 1885, Furness 1888) sound positioning and soundscape are sensitive issues in preserving the environment and in constructing listening cultures (Jähnichen, 2012). Sound preservation and collection should care about the sound in which one is primarily interested in plus the sound context in which this sound is embedded. Only then, knowledge deriving from acoustic communication and the entire sound coming with it may be captured for a sustaining use. Furthermore, the unique relationship between instrumental music in the communities of the Bidayuh and the Kayan and Kenyah and the environment in which they live should be kept in a way that allows for perceptive choices as it also appears in daily practice. Only then, knowledge deriving from acoustic communication and general soundscaping may be captured for a sustaining society. Therefore applying a theory of specification in communication patterns within the community is one of the methods in conducting this research. Thus, in this study the theoretical framework for embedding contextual sound preservation of local string instruments can be developed combining acoustic communication theory with the critical approach to sound naturalness of local instrumental music and to the unique relationship of communities to their string instruments. In present scenarios the vast technology of sound generators has taken the place of an actual sound setting.

Mock-up context through libraries of ‘sound in context’ such as waterfalls of the Borneo rainforest, the Pacific Ocean waves, insects and reptiles of the Amazon are standard applications for sound symbolism of Sarawakian culture. None of these sounds were connected contextually. These layerings of sound effects along with some ethnic musical instrument have been widely used and abused. With state of the art studios, a producer is able to simulate his or her own context in whatever conceptual idea one has in mind or is in demand. Layering few tracks of sound effects such as the sound of the rainforest, waterfalls, or distance thunderstorm with brisk of raindrops side by side with the local string instruments is enough to transport to the listener’s imagination the feeling of calm, tranquility, and serenity. Isolation as well as individualizing recorded tracks seems to be a common procedure in any conventional studio recording. In every recording studio, the room is well treated from the aspect of room acoustics. The room is normally equipped with isolation, booth sound proofing, bass trap to diffuse low frequency rumble, acoustic paneling for absorbing any potential presence of standing wave, which in turn, alter the sound characteristic of the selected string instruments as a whole. Production as such is even more critical when recording producer’s mockup his or her own environmental sound context intentionally. Created contexts contain samples or effects that do not have any relation to the real situation of playing and the sound environment in which the instruments ‘live’. As the main two examples the *pratuokng* and the *sape* are taken to be examined. Approaches as well as re-designing of technical ways in audio field recording have to be investigated and preservation principles found that follow the most recent standards of audio preservation. The contextual sound of the selected instruments along with the environment is a composite evidence of time, space and place that one should not isolate or eliminate from the instrumental sound, particularly in the field of audio archiving. Through the development of methods and technical possibilities, the study can contribute to propose applicable tools such as engineering of technical devices, work flow, modifications of principles and the classification of musical practice as shown in the development of classification at National Library of Laos while keeping

to standards of documentation as primary archiving outcomes that allow for reconstructive choices in the future.

1.3 Objectives of the Study

The main objective of this research is to contribute to high standard audio archiving of the entire sound culture of string instruments selected for their high potential of providing an individual community identity, namely the *pratuokng* of the Bidayuh and the *sape* of the Kayan and Kenyah in their environment seen from the perspective of field recordings. This contribution helps to further explicate the role of audio archivists and his/her relation to sound preservation in general. Sound preservation that includes a variety of receptive perspectives will be of increasing interest in research projects among social scientists, technicians, and decision makers in Malaysian communities through growing awareness of intangible attributes of cultures. Focusing on selected string instruments namely *pratuokng* of the Bidayuh and the *sape* of the Kayan and Kenyah as the main objects, this study aims at proving the importance of audio archiving in a field recording setting as well as the diversity of sonic observations and perceptions in the context presented by these instruments' actual meaning. The outcome has to be set into relation of the cultural needs detected within the practicing communities thus finally contributing to the way of cultural decision making. As the study applies qualitative research methods, namely various open experiments, domain and descriptive analysis, this study will model a way of contextual sound preservation. Further studies may focus on recording concepts proposed in other local areas or with other objects thus testing the applicability of developed methods, tools and derived theoretical views used in the study.

The specific objectives are:

1. To describe and conduct a critical sound analysis of contextual sound in which the *pratuokng* and *sape* is played. To examine how musical sound samples are embedded in social functions accordingly
2. To derive sound ecological views that support a multi-perspective preservation in an effective and high quality way. This will be based on the combination of acoustic communication theory with the critical approach to sound naturalness of local instrumental music with the unique relationship of communities to their string instruments.
3. To assemble recorded sound samples into an archive of multi-perspective sound banks characterized by technical highlights according to their local context of use including the faculties of sound of the instrument, location of use, and sound perception. This includes the construction of tools such as the engineering of technical devices, work flow, modifications of recording principles and the classification of musical practice for the actual examples.
4. To analyze the multiple perspective sound banks created and to conduct evaluation on these sound banks based on feedback from user of different perspective, include archivist, environmentalist, community member, sound engineer, and the musicians.

1.4 Significance of the Study

The magnitude of this research is to nurture and extend an approach to working with a combination of audio tools and applications, socially and culturally understood music practices and contextual sound preservation. This study bases on a deep interest in overcoming the conventional way of sound recording by using different technical and qualitative methods. That may lead finally to a comprehensive approach to sound preservation under present-day conditions of wide-spread audio recording equipment applied to capture sound of musical instruments (Kolovos, 2007), which were traditionally played in a rural and/or communal setting representing a local identity with its special sound environment. The research on contextual sound preservation of local string instruments can serve as a pioneering approach to recognition, perception and construction of contextual sound preservation that takes into account the nature of local string instruments through different receptive perspectives in their rural environment. This will enhance information on factors that might have an impact towards the detachment of local string instruments as well as granting useful data on factors that might have contributed to the changes in the rural environment over the last decades. The string instruments are very important to the local sound memory in its rural environment. Their cultural positioning is, therefore, to be put into the centre of further observations. Data collected leading to knowledge on factors of transformation processes within the object itself (the instruments), the way of functioning (process of sound production from diverse perspectives) and as sound culture within a community allows for enrichment of a theory based on facts. The outcomes are important to the correlation between social meanings and the development of sound cultures in public domains that are similar in their nature of service in sound production and contextual audio archiving. Hence, the study will stimulate discussion and generate greater awareness among practitioners and public organizations on the importance of having a working method of contextual sound preservation, a framework consisting of effective tools, and an enhanced theory of preserving local string instruments. The proposed outcome consisting of an electro-acoustic design tool based on comprehensive work flow such as describing sound in context, suggesting the concept of capturing contextual sound sampling of contextual sound, assembly of the samples taken, and a set of sociological approaches to sound cultures of string instruments within predominantly mono-ethnic communities is applicable on similar examples. Therefore, this study can also be seen as a model study that compensates for limitations in more abstract findings. This may benefit especially the cultural bearers, internal and external musicians, anthropologists and social scientists in a broader sense and of different background through evaluation of the outcome of the study into its community context.

1.5 Limitations of the Study

The study and fieldwork will be limited to selected instrumental music practiced on the *pratuokng* of the Bidayuh and the *sape* of the Kayan and Kenyah and their contextual sound preservation within a time frame of 2010 to 2014. The study cannot consider all contextual sound preservation of local string instruments found in Malaysia as a whole. The choice of the string instruments was done according to their high potential of culturally identifying meanings and their specific sound quality. Both instruments belong to the family of zithers thus representing simple chordophones. Further, both originate in cultures of Sarawak, yet are of different historical background and function in the future development of local music practices within Bidayuh and Kayan and

Kenyah communities. Through expected in depth outcomes of the study, their application on other examples is limited as well.

1.6 Methodology

The study is based on an interdisciplinary approach involving ethnomusicology as it deals with the practice of playing *pratuokng* of the Bidayuh and the *sape* of the Kayan and Kenyah as well as sound engineering in the area of field recordings. Methods applied in this study are of qualitative nature. Measurements and technical parameter to be considered will, therefore, follow strictly qualitative research requirements and not taken as means of constructing quantitatively employed sample organization.

The research will include describing sound of selected string instruments in their immediate and actual context and their conditions in different cultures. Through domain analysis in the given place and time frame, the validity as well as the importance of sound identities of selected string instruments can be described. As a basis, critical analysis of as well as reviewing audio recording qualities detected for samples of recordings such as the products of commercial recordings sold in music stores and cultural centres, amateur audio field recordings, audio recordings collected in the Sarawak National Museum, as well as archive materials of Universiti Putra Malaysia. Regarding sound production, typology, especially of sound structures, and constant comparison of data resulting from it have to be conducted. These methods overlap with domain analysis, partly analytical induction and quasi statistics in dealing with the approaches performed by the cultural bearers. This multi-methods help to define clearer which transformations regarding sound production with traditional string instruments took place in the last decade, how they were accepted by the sound producers and finally understood in the wider context. In dealing with issues regarding sound structures in sound production, typology and constant comparison have to be conducted on the resulting data.

Further, information gained through intense exchange in unstructured interviews and in interaction with the musicians has to be analysed. Changes within this complex sound environment in the last decade alienated the sound of the selected string instruments from their traditional significance and eventually lead to new sound meanings in the communities of cultural bearers. These new sound meanings have to be clarified through discourse analysis in the Foucauldian³ way taking various individual opinions of musicians, their audiences and cultural observers into consideration. In this context, differences in cultural experiences and the ability of abstraction might be of importance and deserve special attention. Focusing on preservation of the selected local string instruments and their contextual sound as a 'sound memory' in rural environment and local sound culture, content analysis in combination with micro-analysis of musical features and interviews among musicians as well as community members might be appropriate research methods that will round up conclusions deriving from technical details.

³ Foucault, discourse and subject positions on analyses of statement are described in details in Cultural Studies and Discourse Analysis: A Dialogue on Language and Identity by Chris Barker and Dariusz Galansinski (2001, SAGE Publication, London, pp.12-13).

Conventional sound preservation methods and practice around the world follow the requirements implemented by the Technical Committee ‘Standard Recommended, Practices and Strategies’ (TC-04, 2001:31) of the International Association of Sound and Audiovisual Archives (IASA). This is the key reference of all sound preservation institutions such as the National Library, but also of any archive and museum worldwide. The content of the said documentation, mentioned in the chapter on ‘Signal Extraction from Original Carriers’ focuses on technical issues such as the standard guidelines of output formats, sampling rate resolutions, dynamic range in which the high and the lowest signal can be recorded. Other considerations were made in relation to signal extraction standard such as the avoidance of data reduction such as MPEG2, 3, 4 which are implementing data reduction codecs and are not suitable for signal analysis. Other recommendations are given about recording approach, stereo microphone techniques such as the NOS, BLUMLIEN PAIR, ORFT, XY-cross pair, AB or 3:1 ratio, MS technique or the Mid-Side and recording equipment’s requirement in which .wav- or .bwf-files (broadcast waveform format) are an important requirement particularly in encoding signals for speech, music and other sounds in general.

Through microanalysis, a research scheme is constructed in order to evaluate the sound quality of recording materials obtained from various outlets. The constructed research scheme enables the research to outline the consideration of contextual sound of the two string instruments. A model of contextual sound preservation to be developed applies various highlights particularly important to sound collecting methods, as well as tools such as engineering of technical devices, work flow, modifications of recording principles and the classification of musical practice with regard to contextual sound preservation of local string instruments.

Based on the literature review of the methodology discussed, contextual consideration is formulated according to the objectives of the research. Contextual consideration involve cultural context, the place in which the musical instrument is played, organology of the instruments, local modifications and current issues in the developing the musical instruments. As a basis, the selected string instruments are examined through critical sound analysis. Prior to the methods applied, the concept of capturing the contextual sound for audio production techniques that support a multi-perspective preservation of audiovisual documents in an effective and high quality way is introduced.

The string instruments chosen are differently documented since the given conditions in which they exist differ remarkably. While the *pratuokng* of the Bidayuh is comprehensively studied through this research, the *sape* of the Kayan and Kenyah is taken as an example supporting comparative approaches and as an instrument symbolising the continuation of sound in a continuously transforming space. Therefore, methodological synthesis and overlapping types of approaches cannot be fully avoided.

The mixture of discourse and technical details in this research has to be well balanced in order to achieve a clear understanding of contextual sound preservation.

1.6.1 Literature on Methodology

Bernie Krause (2008:73), a researcher who conducted the work of the sound archive of beings and the environment, as well as a description of his exploration of the acoustic

scene. He highlighted "to more accurately describe and investigate the roots of the phenomenon of technological developments in the field recording and data analysis, it has become necessary to focus more specifically on the complex acoustic soundscape resources".

Referring to his book, "Anatomy of the Soundscape: Evolving Perspectives", there are three basic sources of active acoustics, which are biophony, geophony, and anthrophony. He elucidates that "These resources are sometimes independent of one another whilst intrinsically linked in various combinations. Besides, the active soundscape can only be understood on the basis of passive about the environment in which resources are delivered". (Krause, 2008:73)

Bernie Krause has been dubbed a "bioacoustician" and an "aural environmentalist" interchangeably and not without good reason for his prowess in acoustic ecology, which lends strength to the conceptual term, soundscape was achieved through analytical induction methods. A change of sound occurs most of the time due to the changes occurring in the environment. Though his focus was on 'biophony' the methods of collection of sound employed by Bernie Krause consisted of studies on the organizational sounds created by nature in the given place, amidst factors of the surrounding being environment and time.

The research that is conducted here bears parallelism to Bernie Krause's approaches differing in some aspects, since this research is focusing on the control sound or what he classified as the anthrophony or human made sounds instead of biophony. However, in both cases, collection of sounds were conducted through the comprehensive mode, such as ways of recording or capturing of sounds in the context, instruments used, positions, on a given time frame and place. The collection can be more meaningful and not only cater to the collection of any library but also to individual social scientists at large. Just as Krause places emphasis on preserving the natural sounds of habitats that have long been extinct, the object of this study points towards the preservation of these man-made sound productions in its real sound context.

Sounds obtained from the surroundings are almost never captured in its pure, raw state for the simple reason that these are inherited together with a mixture of other environmental sounds and an assortment of noise, which provides contextual depth to their wholesomeness, whether purposely or not. Murray Schafer makes reference to these sounds, which can only achieve its maximum potential of cause and effect if taken in together with the ambience in which they were naturally produced when he argues in his writing 'The Music of the Environment...' (Schafer, 1973:30) "We must seek a way to make environmental acoustics a positive study program. Which sounds do we want to preserve, encourage, multiply? When we know this, the boring or destructive sounds will be conspicuous enough and we will know why we must eliminate them. Only a total appreciation of the acoustic environment can give us the resources for improving the orchestration of the world".

The logical nexus would be henceforth to deduce that one is not headed in the right direction of appreciating the acoustic environment if one eliminates noise for instance, which is a given component of the soundscape. Noise is sound and yet sound is not necessarily music. We know music to be a blend of sounds reproduced by humans and bring different meanings to different peoples and cultures. Yet human or otherwise,

sounds are the inevitable characteristic of the soundscape in which music has a place to share.

In 'Worlds of Music: An Introduction to the Music of the World's Peoples', Jeff Todd Titon in his chapter The Music-Culture as a World of Music, relates the 150-year-old tale of the Asian musician who had his first taste of the European American music-culture by attending a Western music concert. When asked at the end of the performance which part of the concert did he most like, his host did not anticipate him to reply that he best enjoyed the tuning-up session. Though they did not agree given largely because of their differences in music-culture backgrounds, neither is wrong in the sense that everybody understands music differently. This intellectual position taken perpetuates that both guest and host are right in that it is founded based on their way of life, learned and passed over from their ancestors to them as the succeeding generations. Audiences all over the world therefore are prejudiced based on the music they know and like – and so, too, are they with sound. That being established, the likelihood is that for unfamiliar sounds perceived to be non-musical (based on one's music-culture) may be acknowledged as but another feature of the soundscape or dismissed altogether as noise. My study will attempt to corroborate the relationship of the anthrophony and the acoustic elements of the multi-layered environment in question thus expanding upon a new horizon of appreciation.

Glenn Gould who started off as a child prodigy and rose to stardom as a renowned classical pianist ended his six-year international reign when he felt strongly that the emphasis and importance placed on himself as a performer had been significantly reduced and outshined by skills exhibited by musicologists then to produce recording pieces that were perfect in every sense. In the book *Audio Culture: Readings in Modern Music*, Gould submits in Chapter 21 of his writing 'The Prospects of Recording' (Cox and Warner, 2006:115):

“But most important, this archival responsibility enables the performer to establish a contact with a work which is very much like that of the composer's own relation to it. It permits him to encounter a particular piece of music and to analyze and dissect it in a most thorough way, to make it a vital part of his life for a relatively brief period, and then to pass on to some other challenge and to the satisfaction of some other curiosity.”

The performer was now both impacted by this seemingly full proof innovation yet simultaneously offered the facilitation of studio techniques to interpret his creative juices into edited pieces that were both perfect and final. There was no necessity to reinvent the wheel and the value placed on their otherwise outstanding abilities came to a grinding halt.

In the preface of “Music in and as environment”: (Jähnichen and Meddegoda, 2013: iii) the formation of a musical experience from a variety of ethnic backgrounds and history were driven by rapid changes of environment. This factor has influenced an individual cultural identity that positions oneself in a space and time. Mobility dimension makes the self-positioning more important than the actual local placement of that individual. It's distinctiveness is expressed through a soundscape existing between different groups of age, gender, social and ethnic backgrounds. The ethnic background as the backdrop

and the sound experience in daily life the identity of sound is focused on the environment that does not necessarily support the formation of ethnic consciousness. The concern is which cultural knowledge is endangered and which knowledge of music in a traditional soundscape might be preserved without disturbing the technical development.

“Further questions concern the enhancement of flexible research methods for sound environmental categories and corresponding music and dance experiences” (Jähnichen and Meddegoda, 2013: iii), which can help to create adaptable strategies for more freedom of auditive choice.

1.6.2 Research Design

The way this research is conducted is through describing sound in context and its condition in different cultural settings, suggesting the concept through a model in capturing the contextual sound, collecting samples of recordings from various positions in the context of rural environment, assembling and characterizing the samples according to the technical highlights and to evaluate the outcome of the study into its community context. Further details can be viewed in Table 1.6.2: Research workflow for contextual sound preservation of the selected local string instruments. The consideration of contextual sound in preserving the sound of *pratuokng* and *sape* is based on the four highlighted components. This will be further explained in Chapter 3, ‘String Instruments Selected for Contextual Sound Preservation’. An overview of the process of capturing contextual sound and preservation of the selected local string instruments in the rural environment through electro-acoustic design tools presented in micro level is shown in Chapter 4, ‘The Construction of Contextual Sound’.

Process of Capturing Contextual Sound and Preservation of the Selected Local String Instruments

1	Describing sound in context and its condition in different cultures through collecting of sound samples, and conduct a critical analysis as well as reviewing audio recording quality of commercial products, live sound and archive materials
2	Suggesting the concept of capturing the contextual sound for audio production techniques, that support a multi-perspective preservation of audiovisual documents in an effective and high quality way.
3	Sampling of contextual sound and preservation of the selected local string instrument and assemble as well as characterize these samples through technical highlights, in their local context of use through electro-acoustic workflow.
4	Assemble as well as characterize these samples through technical highlights in their local context of use , to verify how these samples are embedded in social functions accordingly and to derive sound ecological views that support a multi-perspective preservation in an effective and high quality way.
5	Evaluate the outcome of the study into its community context , the sound culture developed so far and the prospective of applying contextual sound preservation on further sound objects.

Table 1.6.2: Contextual sound research workflow, for multi-perspective sound preservation focuses on the selected local string instruments.

1.6.3 Technical Pre-Condition

The field research of the thesis consists of participant observation and of structured and unstructured interviews directly and verbally as well as via emails with the informants. Additionally are used informal conversations with the local musicians of *pratuokng* and *sape*, interactions between the Bidayuh and Kayan and Kenyah group of people. Most importantly audiovisual recordings of music practices of the *pratuokng* of the Bidayuh and *sape* of the Kayan and Kenyah in their respective context are conducted. The choices of microphone polar patterns are based on task performed on various technical highlights. The audio recordings of the selected local string instruments namely the *pratuokng* of the Bidayuh and the *sape* of the Kayan and Kenyah were made using AKG C414 large diaphragm condenser microphone, AKG C 1000 small capsule with variable polar patterns of *cardioid* and *hyper cardioid* via detachable adaptors. This choice is justified through the recommendations of the technical committee of IASA stated in their publication. "Condenser microphones are the most sensitive, and generally preferred for best recording results." IASA TC-04 (2001: 85).

For example, using a large diaphragm of a condenser microphone with omnidirectional polar pattern such as the AKG C414 positioned above two musicians playing the *pratuokng* of the Bidayuh would capture more of the sound environment, rather than the musical instruments. On the other hand, hand-held or holding the same AKG C414 microphone in its cradle produces a different result. The hand-held technique can give a more focused sound of the instruments itself. Hence, defining an acceptable sound quality means a comprehensive sound structure such as proper gain structure, omitting any influence of high pass filters which are normally found in condenser microphones and -20dB attenuation that is usually applied upon using a large diaphragm condenser microphone.

The depth of the sound captured can be manipulated and reposition the sound pickup angle through defining the "on" or "off" axis rejection of selectable microphone polar patterns. This process requires constantly comparison of the signal recorded and the signal reproduced in order to provide an equal quality both signal acquisition and signal for preservation. The sound quality produced by external devices such as external sound card and the external microphone gives excellent fidelity compared to the built-in laptop microphone for recording and the internal sound card for audio streaming and monitoring. IASA suggested through the Technical Committee publication TC-04 regarding the usage of external audio peripherals: "The use of external microphones, separate from the recorder, is recommended in the majority of recording situations" IASA TC-04 (2001: 85). All sample signals are encoded and decoded through a Tascam US122, an external audio interface capable of recording a pair of balanced signals with the aid of phantom powering, suitable when using condenser microphones with a sampling rate of 48 kHz/ 24 bit resolution audio quality in stereo.

Devices used were a pair of the AKG C414 large diaphragm condenser microphones powered by the Tascam US122 phantom powering of +48 voltage direct current, and the Fishman SBT-C adhesive mounting transducer placed near the strings and the *tawak*, specifically for 'Technical Highlight 1, the immediate instrument'. For the Technical Highlight 2 which is the ensemble in which the instrument is played and Technical Highlight 3, the ensemble in its sound environmental context, the ZOOM H1 portable digital stereo recorder is used. The device is able to produce signal in multiple

formats. All audio formats used in the collecting of contextual sound for the selected local string instruments are wave or wave format. The recorder ZOOM H1 handy recorder is equipped with a coincident pair or the x and y stereo microphone position. The microphone placement is spaced at 90 degrees pick-up angle. The microphone is preset to super-cardioid polar pattern thus giving a more precise sounding of each instrument, hence captures the depth and distance of the musical ensemble as well as sound of activity which took place at the longhouse. The R-05 Roland stereo recorder was used that is able to produce signal in multiple format.

All audio format used in the collecting of contextual sound for the selected local string instruments are in wave format. The recorder is designed with 108 degrees pick-up angle on both sides equally. This is a simulation of a binaural position. With the binaural space microphone placed equally on both sides, the recorder can pick-up a more spacious audio signal equally and accurately hence captures the depth and distance of the musical ensemble as well as sound of activity. This will translate the activity of acoustic communication around each microphone position. All handy recorders used in this research particularly of the Technical Highlights 2, 3, and 4 are installed on a boom stand and their telescopic positioning. This enables that the audio recorder records through simulating ear height of an average adult person sitting or standing at any of the highlights mentioned earlier.

All recorders were set to bypass any enhancement such as 'automated level control' or automated level compression. This function alters the overall sonic spectrum of collected samples particularly the attenuation of a high level input signal received by the recorders. Before all work, the reading and recording of the sound level meter measurement took place. The sound level meters are set to a 'C weighting'. Since C weighting as reference is quite flat, the measurement reading of the instrument will translate as frequency sensitivity of the human ear. Therefore, with this reference, the instrument includes much more of the low frequency range of sound compared to A or B weighting. With A weighting the reading may display a measurement with the low frequency filter out. The photographs taken were captured with a Nikon D3100 DSLR camera. Data collections and interviews from scholars, association members of archivist at IASA, SEAPAAYA and other performers and audiences were conducted at different times and places as documented.

1.6.4 Data and Materials

This study is carried out with qualitative approach. Fieldwork includes a plan and preparation for fieldtrip, identifying the location of designated local string instruments, on site measurement of sound level, positioning, time recording, sound mapping, installation of recording devices and data management as this is regarded the main component of the study. Data collected from field work, include audio recordings of local string instruments from a single player perspective to an ensemble in various positions, context, observation of culture, and interaction with people as well as issuing questionnaires and obtaining comments with regard to the collected sound banks, are analyzed with the hope to construct the proposed model for contextual sound preservation of local string instruments through multi-perspective approaches.

1.7 Definitions and Terms Used

Here, the definitions of terms are put in order of frequency. Many terms are already sufficiently defined in studied literature, some others are special terms used in the Bidayuh-Biatah-Bianah dialect.

Kupuo: “Bidayuh refer to their longhouses as *kupuo* or villages, even if there is only one longhouse.” (Nuek, 2002:2). *Kupuo* is a stretch of longhouse inhabit by the Bidayuh. On a *kupuo* there are houses occupied by ten to the twenty families. There are several *kupuo* in a village. *Kupuo* are made of bamboo stilts, mostly separated by nature, such as rivers, rocks and bushes.

Bidayuh: “The term Bidayuh was not in common use at this time and when referring to themselves as a larger group, the term Daya’ was used” (Nuek, 2002:2). “When I refer to the Bidayuh cultures, what I mean are the various aspects and ways of the Bidayuh life, which necessarily include their customs and traditions, ethics and codes of conduct and their attitudes and values. Cultures also include the physical manifestations of the Bidayuh racial identity such as their traditional costumes, music and dance, which some people would like to describe as their material cultures.” (Minos, 2000:128).

Orang Ulu: “The phrase ‘Orang Ulu’, ‘Dayak Orang Ulu’ means upriver people and is a term used to collectively describe the numerous tribes that live upriver in Sarawaks’ vast interior. Such groups include the major Kayan and the Kenyah tribes, and the smaller neighboring groups of the Kajang, Punan, Ukit, and Penan.” (Welman, 2011:138; Lindell, 2010).

Panggah: Refers to the headhouse. “One unique characteristic of the various Bidayuh groups in the early days was their traditional icon, the round community house (called the baruk, baluor panggah, depending on the dialect) where visitors and village bachelors slept, big ritualistic ceremonies were held, and important matters were settled.” (Rensch (et al), 2012: 4).

Bru’ or buru’: The *buru’* is a large green bamboo tube which is normally used for cooking.

Gaduok: Baby drum, small cylindrical drum made of camphor wood.

Garakng tangan: Refers to all kinds of bangles.

Kokokng brawuatn: Refer to the necklace for adult.

Patukng: Refers to bamboo of the *pratuokng*.

Pratuokng: Tube zither, representing a gong set with *canang*, *satu’*, *tawak* and drum tongue.

Sabakng: Refers to the mother drum (also sebbang).

Satung: Another name used for the *pratuokng*.

Sritakng: Refers to the xylophone.

Tarikng brunei: Refers to a strong type of bamboo, which is normally used for building houses and their foundation.

Dayak: “In Sarawak, the collective name Dayak is given to all the indigenous tribes and is also sometimes used to refer to all indigenous people Borneo” (Thiessen, 2012: 16).

“In the early 1970s the use of the terms of Dayak, Malay-Melanau, and Chinese was probably related to the emerging political cleavage between the Dayak, who rallied around the Sarawak National Party (SNAP), the Malay-Melanau, who were behind the Parti Pesaka Bumiputera Bersatu (PBB), and the Chinese who supported the Sarawak United People's Party (SUPP). This ethno-political trichotomy gained momentum when the Parti Bansa Dayak Sarawak (PBDS) in 1983 emerged to promote the Dayak political cause” (Salleh, 2006: 78).

Bumiputera: “The term Bumiputera has gained a special legal meaning, especially since the formation of Malaysia in 1963. Previously the term was generally used in reference to the Malays, to distinguish them from the Chinese and Indian immigrants who are not the sons of the soil. Now, the term legally includes the Malays, as defined by the constitution, the indigeneous or Bumiputera groups in Sabah and Sarawak, and the aborigines of the Peninsula” (Husin Ali, 2008: 6).

“The term 'Dayak' and 'Bumiputra', is often used to associate with natives of Sarawak. “The 1988 data of reclassification of the various indigenous groups sometimes into 'Dayak' and 'Malay/Melanau', and at other time into 'Bumiputra' which included all the indigenous populations” (Jawan, 1994: 207).

Adat: Refers to the traditional way of life, as the basis of indigenous religious beliefs, as well as the system that complements the description of rituals (Whitter, 1978).

The following are often used technical terms.

MPEG: MPEG- refers to Moving Pictures Expert Group, and means an algorithm that enables data compression both audio and visual to the value of small bits for the purpose of transmission, streaming as well as providing more space for data to be stored. MPEG files can be later decompressed for if decoding is the purpose.

NOS: Refers to “Nederlandse Omroep Stichting” founded by Holland Radio, a stereo microphone techniques in places with 30cm distance between two microphones of a same model position with an axle angle of $\alpha = \pm 45^\circ = 90^\circ$ space.

BLUMLIEN PAIR: Introduced by Alan Blumlein for the creation of stereo recordings based on stereo microphone techniques. The pair consists of two matched microphones pickup angle of bi-directional (figure 8) pickup pattern, with both positioned and forming 90° angle.

ORTF: Refers to “Office de Radio diffusion Télévision Française”, techniques which require a large diaphragm microphone with bidirectional or figure of 8 polar pick-up patterns.

XY cross pair: The pair consists of two matched microphones pickup angle, with both positioned and forming a 90° angle.

AB parallel pair: The pair consists of two matched microphones pickup angle and are space 3 feet between each other and 1 feet above the sound source.

MS ro Mid-Side: With single side in phase reverse that enables separation of polar patterns (Side), along with the middle (Mid) microphone set in the centre correctly.

Nagra: An open-reel tape recorder invented by Stefan Kudelski. Nagra were used since 1950 as audio recorders that were used by the radio journalist. The device first product launch in 1951 as Nagra 1 to present Nagra PICO in 2012, digital handy recorder that use by field recordsist.

Brickwall filter: Is a component in a digital audio encoding section that avoids aliasing. Aliasing usually occur when the actual signal captured accompanied by the false signal due to acceding throughput frequency suggested by Nyquist in a digital audio system

The Nyquist: “The Nyquist-Shannon sampling theorem is a fundamental result in the field of in formation theory, in particular telecommunication and signal processing. Sampling is the process of converting a signal (for example, a function of continuos time or space) into a numeric sequence (a function of discrete time or space) Shannon version of the theorem states: If a function $x(t)$ contains no frequencies higher than B hertz, it is completely determined by giving its ordinates at a series of point spaced $1/(2B)$ seconds gives the lower bound on the sampling frequency for which perfect reconstruction can be assured. This lower bound to the sampling frequency, $2B$ is called the Nyquist rate. In summary, the Shannon theorem staes: If the original signal has the highest frequency B , the sample rae should be $2B$ in order to reconstruct the original signal losslessly” (Wang and Ledly, 2013:244).

Nyquist theorem in digital audio system: “In digital audio system, we must limit the highest frequency in the incoming signal to a frequency of one-half the sampling frequency (the half of sampling frequency is also known as the Nyquist frequency). Specifically, the signal is low-pass filtered at 20 kHz or so. When this filtering is accomplished, we can successfully sample the signal such that there is no loss of information due to sampling between the sampled signal at the output and the filtered signal at the input. When the input is filtered, we can restore all intervening values, without error due to sampling, and thus re-create the original waveform filtered at the upper limit of audibility” (Pohlman, 2001: 21).

Sampling theorem: “Nyquist’s theorem states that the maximum frequency that can be represented when digitizing an analog signal is exactly half the sampling rate. Frequencies above this limit will give rise to unwanted frequencies below the Nyquist frequency of half the sampling rate. What happens to signals at exactly Nyquist frequency depends on the phase. If the entire frequency spectrum of the signal lies

below the Nyquist frequency, then the sampling theorem states that the signal can be reconstructed exactly from its digitization” (Benson , 2006: 254).

Aliasing or fold-over frequency: “Specifically if S is the sampling frequency and F is the frequency higher than half the sampling rate, then a new frequency A is also created at $A = \pm NS \pm F$ where N is any interger. In practice, the S-F component is the most troublesome. For example, if S = 44 kHz, a 23kHz input signal will alias to produce another frequency at 21 kHz. If we attempt to sample a 24 kHz signal, 20 kHz appears. In other words, a new frequency appears back in the audio band, folded over from the sampling frequency, as the placement of the sideband predicts. In fact, aliasing is sometimes called fold-over” (Pohlman, 2001:24).

Standing wave: “Standing waves are produced by interference as a result of the superposition of two waves when a travelling wave is reflected back along incident path. Standing waves occur by resonance only at the natural frequencies of vibration of a medium” (Avison, 1989:460).

Reverb unit: “Reverb is an electrical unit, used to replicate the acoustical environment” “Reverb time is the name for the number of reflections and the length of time it takes for them to die out. Large halls with high ceilings have larger reverb time than dance clubs with low ceilings” (Marvuglio, 2001:25).

Expanders and gates: Expanders and gates are electrical unit, used in recording studios. “Expanders and gates are usually set up by ear and are simple to use if operated in a logical manner. If the programme level is high, low-level background noise will not be audible, because high-level signals conceal the low-level noise. This effect is known as ‘noise masking’. If noise masking can conceal noise or spill when the programme level is high, an expander or gates can be used to reduce the noise during gaps and natural pauses in the programme” (Walker & Smith, 1999: 2-163).

Audio compressor: Audio compressor is an electrical unit, used in a recording studio. It is used to control audio dynamic range. “A compressor is used to reduce the dynamic range on an audio-recording. It does so by bringing the high peaks closer to the low peaks. That means that when a signal gets ‘too loud’ the compressor will automatically reduce the volume of the peaks of that sound according to the set parameter” (van den Belt, 2013:23)

Finally, some sound ecological terms have to be mentioned:

Biophony: Term coined by Krause (2002) with regards to animals’ species uses vast range of frequencies acoustic communications as interface or medium.

Geophony: Term coined by Krause (2002) with regards to earth-related sound naturally occurring non-biological audio signal sources coming from different types of habitats such wildlife or whether such as rain, wind as well as marine life sound in an environment or sound scape.

Anthrophony: Term coined by Krause (2002) with regards to general human made sounds within sound in an environment or sound scape.

1.8 Organization of Thesis

This thesis consists of six chapters. Chapter 1, **Introduction**, introduces the main ideas of the study, reviews and the related literature. It explains methods by laying out the theoretical dimensions of the research, and looks at how literature on methodology, research design, technical pre-condition, theoretical framework and material is adopted in the study.

Chapter 2, **Present State of Sound Preservation**, is dismantling aspects related to “Studies on Sound Archiving and Sound Preservation” in which the evolution of sound archiving, related worldviews, international standard practice, conventional methods of sound preservation, “Studies on Acoustic Ecology” are described. Further, early literature about sound environment in travel logs, which are describing sounds and giving specific scientific names to the Borneo’s habitats, is examined. Subsequently, more recent worldviews from the perspective of researchers, composers, contemporary scholars on soundscape and its importance are summarized, as well as in the section “Studies on Selected Local Strings Instrument namely *pratuokng* and *sape*” are described. The “Re-Examination of Sound Recording Qualities” is investigating various qualities of audio recordings of the selected local string instruments as well as reviews. Developed from this, evidences through measurement and an evaluation scheme design for product categories as found in the market that suit album production, field recording, and ethnography recording are collected and assembled in a consistent approach. ,

Chapter 3, **String Instruments Selected for Contextual Sound Preservation**, focuses on the three main topics of the selected string instruments and analyses the *pratuokng*” and the *sape* in their cultural context, the organology of the instruments, local modifications, as well as issues in the current development that were observed. Prior to the description discussed, four different geographical locations namely Annah Rais, Santubong, Bau and Kuching Waterfront are selected where contextual sound recordings were conducted. In addition, matters with regard to contextual consideration to preserve the sound of the two string instruments *pratuokng* and *sape* are emphasized and discussed in this chapter.

Chapter 4, **The Construction of Contextual Sound**, refers to the construction and nature of contextual sound. The chapter is elaborating in depth on the model of contextual sound preservation, to which application aspects of devices and workflow, the recording process as well as the assembling of the contextual sound as the supporting component in the development of contextual sound preservation belongs.

Chapter 5, **Multi-Persepective Sound Banks of *Pratuokng* and *Sape* and Their Meaning in the Community Context** describes the design, synthesis, characterization and evaluation of multi-perspective sound banks of *pratuokng* and *sape*. The second part describes in detail the evaluation of research output based on the two different instruments in the context of the respective community seen from informants with different professional functions and cultural background.

Chapter 6, **Summary and Conclusion**, returns to the five basic elements of the objectives and explains from the aspect of contextual sound preservation the development of a concept in capturing contextual sound. From sampling contextual

sound to preservation of selected local string instruments the concept of capturing the contextual sound is suggesting to assemble and to characterize in detail the samples through technical highlights in their local context of use. In addition, this chapter is taking into account the meaning of contextual sound preservation within the community, ideas of contextual sound preservation within the society through field recording approaches and the position of archive recordings as an economic and intellectual asset.



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