

THE PRODUCTION PROCESS OF AN AUDIO CD

An amateur demo from scratch to record

Petrus Syvänperä

Bachelor's Thesis
May 2011

Degree Programme in Music Management
School of Business and Service Management





Author(s) Syvänpää Petrus	Type of publication Bachelor's Thesis	Date 23.05.2011
	Pages 44	Language English
	Confidential () Until	Permission for web publication (X)
Title THE PRODUCTION PROCESS OF AN AUDIO CD Amateur demo from scratch to record		
Degree Programme Degree Programme in Music management		
Tutor(s) Kreus Pia		
Assigned by		
Abstract <p>Every actor in the music business comes cross with an audio CD production in one way or another. Those who have not been part of such production might not have a thorough picture of the total process and what it entails. This thesis was started as a personal project but it became a scan through the process in a way that it could be reported as a project paper. The goal was to give guidelines to music business novices who need to know what phases a CD production consists of.</p> <p>The author of this thesis wanted to be personally part of as many phases as possible. The idea of this record was conceived a long time ago, but the implementation itself started a few years ago with compositions of some of the parts that ended up on the CD. After this started a process of artistic decisions, compositions, cover design planning, pre-recordings, cooperation plans, programming, learning to use the instruments and recording programs etc. Unfortunately, failure was one of the methods, but it gave the possibility to improve every phase. The whole project was long but very rewarding.</p> <p>As a result, a CD of four songs with a total of 26 minutes of playing time was produced. It has parts of the author in it, who also learned a lesson of what that kind of project entails at its easiest. In this project report one can see what the phases are, not what it takes to implement the project. The best way to learn is to go through the whole process.</p>		
Keywords Audio-CD, recording process, mixing, mastering, studio,		
Miscellaneous		



Tekijä(t) Syvänpää Petrus	Julkaisun laji Opinnäytetyö	Päivämäärä 23.05.2011
	Sivumäärä 44	Julkaisun kieli Englanti
	Luottamuksellisuus () saakka	Verkojulkaisulupa myönnetty (X)
Työn nimi Äänilevyn tuotantoprosessi Harrastelija-demo ajatuksesta levyksi		
Koulutusohjelma Music management		
Työn ohjaaja(t) Kreus Pia		
Toimeksiantaja(t)		
Tiivistelmä <p>Jokainen musiikin alalla työskentelevä törmää ennen pitkää levyn tuotantoprosessiin. Tämä prosessi ei välttämättä ole kaikille niin yksinkertainen kun nopeasti ajateltuna luulisi. Tämä työ alkoi tekijän henkilökohtaisena harrastusprojektina, mutta kehittyi lopulta käymään prosessin läpi niin, että se voitiin analysoida pala palalta tähän opinnäytetyöhön. Tavoite oli käydä kokonaisuudessaan äänilevyn tuotantoprosessi läpi yksinkertaisella, mutta opastavalla tavalla niin, että musiikin alan aloittelijat saavat tutustua mitä kaikkea se pitää sisällään.</p> <p>Työn tekijä halusi olla mukana henkilökohtaisesti niin monessa tuotantovaiheessa kuin mahdollista. Levyn idea juontaa juurensa muutaman vuoden taakse, mutta itse toteutus alkoi pari vuotta sitten osien tapailuilla, joista osa päätyikin lopulliselle tuotteelle. Tämän jälkeen alkoi pitkä prosessi, joka sisälsi taiteellisia linjauksia, säveltämistä, visuaalista suunnittelua, esinauhoituksia, soittajien ja yhteistyökumppaneiden etsimistä, ohjelmien opiskelua ja harjoittelua ym. Valitettavasti yhdeksi toimintatavaksi muodostui virheistä oppiminen. Projektista muodostui pitkä, mutta erittäin antoisa.</p> <p>Tuloksena syntynsä sai neljän kappaleen ja 26 minuutin CD. Se sisältää osan tekijästä itsestään, mutta myös oppitunnin siitä mistä koko prosessi koostuu. Tämä raportti kuvaa työn vaiheet, muttei valitettavasti sitä mitä kaikkea se vaatii. Paras tapa oppia on käydä koko prosessi itse läpi.</p>		
Avainsanat (asiasanat) Äänilevytuotanto, äänitys, miksaus, masterointi, studio		
Muut tiedot		

TABLE OF CONTENTS

1 INTRODUCTION.....	3
2 THEORETICAL BACKGROUND	5
2.1. Introduction - from analogue to digital age	5
2.2. Statistics.....	7
2.3. Artist and content production	8
2.4. Composing and arranging	9
2.5. Recording	11
2.6. Editing.....	14
2.7. Mixing	15
2.8. Mastering.....	18
2.9. Product planning	20
3 PROJECT IMPLEMENTATION	21
3.1. Resources and schedule	21
3.2. Artistic and creative process.....	22
3.3. Technical implementation	24
3.4. Recording	26
3.4.1. Drums.....	26
3.4.2. Guitars & basses	28
3.4.3. Keyboards & orchestration	30
3.4.4. Vocals	31
3.5. Editing.....	32
3.6. Mixing	33
3.6.1. Drums.....	33
3.6.2. Other instruments	35
3.6.3. Vocals	36
3.6.4. Entity	36
3.7. Mastering.....	37
3.8. End product	38
4 CONSIDERATIONS AND SUMMARY	41
5 REFERENCES	43
6 APPENDICES	44

1 INTRODUCTION

The production of an audio CD was seen as a tempting challenge for a study. Finding the goals and the procedures in a creative CD production was the driving force in this project.

A methodical and goal-directed study is in its phases a creative process. It includes orienting to the subject and creating a plan, the implementation of the study and writing the research report (Hirsjärvi, Remes and Sajavaara 2000, 53). The production was started with a thought of a CD, how it should sound and what the means are to achieve that. The songs and the whole process were very much alive throughout the process, and even failures were not avoided. As a result a demo CD was produced that was quite a source pride for an amateur, not only for its music, but as a finished product after many hours of strenuous work.

The aim of this study was to see what CD-production means and how the related processes are conducted. As Hirsjärvi, Remes and Sajavaara (2000, 71) mentions, the subject needs to be limited. The idea of what one wants to know or what has to be indicated needs to be specified. This study was limited to be partly an experiment of the technical implementation and a test of procedures and variations. In addition to this the study discusses the licences that normally come with this kind of release. Most of the functions outside the technical implementation such as distribution, recording contracts, marketing and sales were left out.

In general and from the artistic points of view the goal of this project was to record and edit the music so long that it would sound as good as possible by using the available means. This meant many setbacks and re-recordings, several rounds of editing and almost endless mixing. Eventually the mastering was decided to be left to an outsider, so as to have a more professional touch to the sound as well as an outsider's opinion of the total sound. Another artistic and creative goal was to create an entity that also would be seen as an entity. One of

the first decisions when this project was started was that the compositions, lyrics and visual design had to follow a story made in advance.

In addition to the creative value the goal of the study itself was to see every phase of the process and list all the aspects that needed to be considered. At the same time this was a normal project with normal project management issues as well as planning issues. Even though this project had quite a rough plan and schedule, they were kept in mind and for the success and results they were necessary.

The driving force of the whole idea was to create a progressive metal album in the footsteps of artists such as Arjen Lucassen, Neal Morse, Pain of Salvation and - why not - the Queen. In Finland this genre is quite small and there are hardly any Finnish progressive metal bands that are in the headlines. The best known act in this genre is Silent Voices. With lighter expression there are still some acknowledged bands such as Von Hertzen Bros, Wigwam and Absoluuttinen Nollapiste. Javestone is one of the promising new newcomers.

This album was planned to be progressive especially as an entity, with its song structure and with regard to sound policy. The technical playing on the other hand was left in a secondary role, but still as a clear nuance.

Most of the technical work done for this album was accomplished with home equipment. The only costs came from mastering, design artists and CD-duplication and printing. Nevertheless the desired and aimed sound was to be convincing without the character of a garage sound.

The dream was to make a credible progressive album that would not be recognised to be home made in the ears of a normal listener. At the same time it was an experiment of the process, test of techniques and technology, an act of taking risks and seeing what artistic and creative potential this demands.

This was clearly a project study more than research and the structure of this report is a consequence of this. After this introduction the report discusses the

theoretical background of the project and then it describes the technical implementation of recording the compositions on a CD. The last chapters are reserved for a discussion and summary.

2 THEORETICAL BACKGROUND

The sound recording history takes us back as far as the 9th century as the first sounds were recorded with a mechanical music instrument. The instrument was a hydro powered organ. This can be seen as a very primitive system and it could not record normal sounds such as the human voice (Charles B. Fowler 1967), but was a crucial step towards the present-day enormous music production business. First we shortly describe the history of acoustic recording, followed by the major step to digital recording and finally discuss statistics on how much the music world has produced and produces daily.

2.1 Introduction – from analogue to digital age

The first device that recorded arbitrary sound was a phonautograph, invented by Édouard-Léon Scott de Martinville in 1857. This machine recorded the sound visually on paper, and thus it could not play it back. These were later on turned into sounds with metal plates (Jody Rosen, 2008). This was done before Thomas Edison invented the phonograph in 1878. Edison is considered as the father of the recorded sound, as his device could playback the recordings. His phonograph recorded the sounds onto a tin foil cylinder with a stylus making up-down motion (Gronow & Saunio, 1990). This was developed into gramophone in 1887 by Emile Berliner. His device imprinted the sound on a disc with horizontal motion and that was read by a needle, which vibrated and the vibration was amplified. This was still a mechanical music recorder that then led to the first electrical recordings.

The situation changed drastically in 1920's when the first electric recording devices were born. The idea had been alive for years (even in the mind of Mr. Edison), but only the development of microphones and electric amplifiers opened

the curtains. In these systems an electric amplifier drove the cutting head stylus. This made the sound louder and the quality of the sound was better. The electrical systems did not become general among the public before World War 2, but the recording studios, radios and movie industry used them widely already. The next step was the expansion of tape recording in the 1940's which was already started in the early 1930's. It helped the artist and producer to a great deal, as the tapes could be used several times, as well as copied and altered. Since then the development of the recording technology has been very fast (www.recording-history.org).

Multitrack recorders were developed in the 1960's and they belonged to the basic equipment of every recording studio in the 1970's. The pioneer of multitrack recording was the guitarist Les Paul who made the first multitrack recordings already in the beginning of the 1950's. In the 60's and 70's some even nowadays remarkable albums were already recorded with 4-track recorders, such as the Revolver and Sgt. Pepper's Lonely Hearts Club Band by the Beatles and Dark side of the moon by Pink Floyd. With this development the first analogue synthesisers arrived at the markets.

The next major step was the C-cassette in the 80's. It was the first time that the earlier vinyl record was threatened. The advantages of the c-cassette were the size, easy duplication and the possibility to make cheap demo recordings. This also started the demo trading between bands. Metallica is a good example of the bands that started their success with the tape trading.

Magnetic tapes remained as the main system in the recording studios. Digital recorders replaced the analogue recorders during the 80's as the DAT (digital audio tapes) were taken into use. The c-cassette was replaced relatively fast by the compact disc a.k.a. CD. The use of vinyl also reduced remarkably. Besides the CD, the digitalisation of music recording brought the minidisc to the markets. It challenged the CD as the primary system, but became popular only in Asia.

Along with the digitalisation the MIDI protocol (musical instrument digital interface) was created in the 80's and it became an important feature especially in synthesiser music. The MIDI-system meant that the instrument, computer and software could communicate together and be synchronised. In addition MIDI recordings were and are easy to modify afterwards. Many of the synthesisers and software use the MIDI system even today (J. Pisano, 2006).

With the fast digitalisation and the development of computers the music recording systems started to move towards hard drive computer based recording systems in the late 90's. However analogue systems along with the modern systems are still widely used. The battle between the analogue and digital equipment is one of the never ending discussions among producers and audio technicians.

The new millennium made it possible to build fully equipped home studios with a fairly cheap price. The development of home computers enables the transformation of much of the hardware into software based systems, which makes audio production easier even in amateur circumstances (Ahokas etc., 2004).

2.2 Statistics

As stated earlier, this project was started in 2008 even though the world was already full of music and albums. It would have been optimistic even to say that it is almost impossible to break through in global markets, at least with self made and released album.

The PPL (Phonographic Performance Limited) reported that they received electronic details of approximately 6500 new recordings weekly in 2008 (www.ppluk.com). In the same year there were approximately 115000 albums released worldwide, of which less than 6000 sold more than 1000 copies (Greg Kot, 2009).

The record sales in 2008 were approximately 13,5 billion Euros. The share of Finland was 65 million, which takes Finland to position 23 in the world sales ranking. The global record sales decreased by 8,3 %, but in Finland only by 0,2%. The global share of digital sales has increased to 2,8 billion Euros (24% more than in 2007). (IFPI, 2009, 5, 38-39)

2.3 Artist and content production

An artist starts with an image because every artist has a story, even if it is real, invented or just a rumour. It creates the picture of the artist that people have. It affects the attitudes and biases, and they can be hard to erase afterwards. There are several different features that affect the image, and most of them are based on basic features such as the appearance, behaviour, the lifestyle etc. Music could also tell the story, but to obtain the opportunity to share it with many people can be hard. Usually successful artists have a strong and interesting story.

Every artist has his/her own personal relationship to music. For others it is simply work and for others it is a pure hobby. At the same time they are usually listeners and customers of the music business. Usually this kind of customer differs from a normal music listener. Production techniques, expertise and song structures are in a bigger role in the ears of an artist. This is one issue that an artist needs to know: the demands and listening styles differ on the customer side. Listening is not so much calculating and usually not so pedantic. The atmosphere, style and the drive are at least as important. Different kinds of accents can be interpreted in different ways.(P. Ahokas, 2004)

A clear formula to success is still a mystery. Ingeniousness, originality and catchiness are features that music should have. However, they are fairly universal terms as they can be perceived in several different ways. Different music genres demand different kinds of features and regularities. Natural appearance in music (composing) creates credibility and finds the listeners more easily than forced styles.

Unconscious loans and citations from other artists and bands are inevitable and the perception of different nuances in music is important. Reusing those ideas and nuances in a personal and original way is delicate work. However, this is the way in which most composers work. Influences start to fade along the way as the personal expression develops.

In general the comprehension of the big picture, understanding of the information such as nuances and the personal expression and style need to be kept in mind when composing and planning a product. The music and lyrics reveal out the personality of the artist, and the cover and designs immediately create the image of the music inside.

2.4 Composing and arranging

A song is much more than simply lyrics and a tune. There is no one formula for creating a hit song or any kind of song. Composing is a process where creativity and talent are tested. There are no strict rules, but some basics should be kept in mind.

A piece needs to have a story, the driving force and the basic idea. It has to be defined where the song aims at, what kind of feelings it tries to create and affect on and what the picture is that it wants to leave to the listener. Every story has the beginning, the middle and the end.

The structure is one that creates the total picture. The structure needs to be planned, otherwise the entity might sound irrational and bouncy. When writing a pop song, the structure can be as simple as intro-verse-chorus-verse-instrumental-chorus. It does not need any more tricks if the basic idea is somewhere else than in the structure. The structure a songwriter chooses depends on his or her style, how much he/she has to say in the song and how the melody fits in the context of the song.

The length of the song depends highly on the genre in question. If the goal is to make pure hit songs and seek radio play the length must be kept in 3-4,5 minutes. According to professionals, the ideal radio song has a 13-second intro and is approximately 4 minutes in total length.

The tempo needs to be fitted into the spirit of the song. Pop music uses mostly the mid tempo songs. The best pop and rock music tempo that attracts the interest of the audience is the mid tempo that makes people “groove” or a slightly up-beat tempo that makes people want to dance. Most of the chart music has the beat 4/4. This is the easiest beat for people to follow along. However, this does not mean a boring straight beat, but only the basic idea.

In pop and rock music played on the radio the most important feature is the so called hook of the song. This simply means the melody or some single feature that makes the listener stop and listen to the whole song. When the hook is working, it stays in the mind of the listener and thus forces the listener to buy the song, or at least to hear it again. (Yogesh Bakshi, 2007)

With progressive music these rules do not work mostly. The story is the strongest connection. Progressive rock songs have complex structures, long play time and the tempo and beat varies remarkably inside the album as well as inside every song. Even the hook can be understood differently as one single feature does not carry the whole 10 minute piece. These features make the music progressive and it is the simple reason why radios do not usually play progressive music.

Arrangement is a function where a piece of music is modified to suit the needs of the singer, artist or group. The goal is to ascertain that every aspect, from tempo to instruments and styles, is well harmonised and suited. Usually this means that the arranger has a good picture of different instruments and skills to play them. The arranger also needs to be very cooperative and skilful so as to follow the guidelines given by artist features, the producer or music directors. A good

arranger can be identified when all of these demands are met and the piece itself is more effective.

2.5 Recording

The equipment is hardly half of the studio. The properties of good equipment will be wasted if the room is badly soundproofed or the acoustics are bad, the loudspeakers are placed in the corner or the cables whirr because of bad connections. Still the equipment also plays a major role. There is a vast selection of different apparatus to be chosen for the recording, mixing and mastering studios. In fact, the range of equipment and techniques is so great that this thesis could have been written only about those, but, instead, in this chapter we shortly discuss the basic terms and techniques. A great deal of information needs to be left out, but more information can be found on the internet or library.

Good recording starts with the room. Good acoustics and the sound of the space play a major role with well sounding instruments. Different room features can highlight different features of the instrument and the basic sound. Especially in drum recordings the soundproofing is important. The noise that they produce can be harmful and disturbing for outsiders. Along with the soundproofing come the acoustics. The wall, floor and roof materials, furniture, and textiles have a great influence on the sound. With walls, floor and roof the concern is in the reflections. If the surface is hard and plane, the sound bounces around causing annoying reflections. With carpets, curtains and acoustic wall panels the room sound becomes warmer and restful. Of course, the sound of the space creates personality and character, but it needs to be controlled and designed. At the same time the room should be designed for the artist. Cosiness and aesthetics affect the atmosphere and expression and it can be definitely heard from the album.

The technology in recording starts with the microphone. It is the link between the artist or instrument and the recording device. There is an almost unlimited range of microphones in different types, prices and quality. There are three types of microphones commonly used in music recording: dynamic, condenser and

ribbon microphones. A dynamic microphone consists of an induction coil and a diaphragm. A sound makes the diaphragm vibrate and the movement causes changes in the coil's magnetic field thus causing a current in the coil. This current is then lead to a recording device or through the interface and changed into a digital form on a computer. A condenser microphone consists of two plates', a diaphragm and back plate that form a capacitor. The plates are biased with DC-voltage that is handled with a battery or phantom power through the microphone cable. As the diaphragm vibrates, the distance between the plates varies and it changes the charge, which represents the sound in electrical form. Ribbon microphones have the same principles as dynamic microphones with the difference that the coil and diaphragm are replaced with an aluminium, duraluminium or nano film ribbon placed between the poles of a magnet, which then vibrates with the sound.

Dynamic microphones are good basic microphones that are usually used in this kind of production in the recording of different drums and guitars. The condenser microphones are more sensitive than dynamic and they are usually used in the recording of vocals, acoustic guitars and as overhead microphones with drums. They capture the higher frequencies better and usually they are somewhat more expensive. Ribbon microphones are the specialities of the studios. They are expensive, and it is said that their sound is warm and very rich. In addition to this, microphones have different polar patterns. The most common patterns can be seen in figure 1 and they represent the directions where the microphones capture the sound.

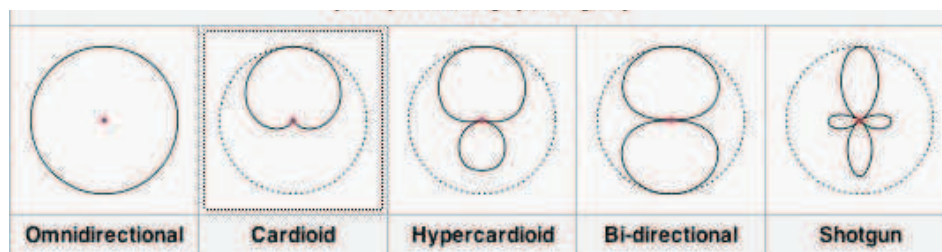


Figure 1 Most common polar patterns

After the microphone come the pre-amplifiers, compressors and equalizers. A pre-amplifier is a piece of equipment that amplifies the signal from the

microphone loud enough for the recording device or computer. If the signal is not amplified, it can be too weak and the properties of the sound vanish. At the same time it colours up the sound depending on the pre-amplifier. The compressor levels the changes in the volume when singing or playing. It damps the high volumes and amplifies the low volumes. This is used usually with e.g. the bass guitar and drums, where smoothness is wanted. The use of a compressor differs in different genres. In classic and jazz music the dynamics of the instruments are more important, and compressors are not used whereas in rock and metal music the volumes need to be more levelled and amplified. With an equalizer the sound frequencies are adjusted. This can also be made afterwards, but usually if it is clear that some frequencies need to be damped or strengthened, it can be done straight on the way to the recorder.

The placing of the microphones (micing) is a form of art. It has several different variations and has no right or wrong ways. Mistakes are still possible, but this gives a nice space to try different kinds of possibilities. Drums are usually miced with close micing where the microphone is placed close to the instrument. This gives a precise sound and it minimizes the leaks from the surroundings. In the overhead microphones the stereo micing technique is normally used, where two microphones are placed beside each other. This creates a stereo impression where the same source is recorded from the human ear view. The stereo micing technique is a good way to record almost anything from vocals to choirs or orchestrations. There are several different stereo micing techniques such as the XY-technique where the microphones are directed about 90 degrees to different directions from each other. In the AB-technique the microphones are placed some distance apart to the same direction and in mid-side technique a cardioid and bidirectional microphones are placed on top of each other to face to the same direction. As a result to the patterns the microphones capture the same sound in a different ways. In choir and orchestration recordings the close micing technique is usually not the best technique and instead of that ambient or distance micing is used where the microphones are placed a little further. This creates the ambience and the entity is captured. The ambient microphones can

be used as extra microphones to capture some space and thus make the sound somewhat more alive.

The order of the instrument recording is a fairly open concept. It depends highly on the genre and the nature of the recordings. If we limit the scale to pop, rock and metal music, the variations are narrowed down. Usually the recordings are started with the drums and basses. They form the rhythm section of the band and they create the base to the songs. If the recordings are made with a metronome, the order is more open, when the metronome tells the tempo. Still there might come some nuances to the tempo where the base rhythm of drums is needed, before other instruments are played in. The next group is usually the guitars. In these limited genres the guitars normally create the melody base. On top of rhythm guitars almost anything can be recorded. Background keyboards, pianos or lead guitars spice the entity nicely. Normally the vocals are left last, because the singer has an easier task when the instruments backup the melodies and direct the atmosphere.

Another way to record is a live recording where most of the instruments or all of them are recorded at the same time. In this way the mood can be more authentic, and the band sounds more intact. This style asks more from the microphone placing, as the leaks are harder to control. (J. Pekka Mäkelä, 84-86, 96-103, 114-121, 136-137, 2003)

2.6 Editing

Editing is normally seen as a part of the mixing process. This time we describe the editing process as a separate one, as it played a fairly important part in this study.

In the editing process recorded clips are edited to fit to the entity. The takes are faded in and out in order to avoid digital snaps in the beginning and end of the take. The empty parts before and after the take can be cut out, because those parts can contain accidental noises made by the artists or equipment.

As the recordings are made almost entirely straight into the digital form modifications are fairly easy to make. Tracks from several takes are easy to cut and glue together. This battles against the basic idea of band playing, but it is commonly used in today's music business. For a home user it gives many opportunities. This is a task where the engineer needs to be careful. The entity can easily sound as a patchwork and the sections do not fit to each other. At the same time the editing process cleans everything unnecessary out from the tracks and smoothes the entity.

2.7 Mixing

Mixing is a process where the recorded tracks are adjusted to such a form that the entity sounds like a band. The basic task is to find the balance between the volume levels of the instruments and to find the true properties of the instruments' sound. At the same time the entity can be manipulated with effects to create ambience, atmosphere and a lively general sound.

If the producer and the mixing engineer (mixer) are the same person, a small break should be kept after the recordings. It gives the ears a possibility to rest and creates a small distance to the song itself. This is needed in order to be able to hear the song with the ears of the listener.

Everything starts again with the room. The room should be organised in a way that the room itself does not add anything to the result. The loudspeakers need to be positioned ideally making an equilateral triangle with the mixer. Mixing needs to be done with a decent volume level, because it gives the best picture of the volume balances between the instruments. With high volume the differences between the instruments are hard to separate. Headphones can be used as a helping tool in mixing. Headphones give the possibility to work in a surrounding where the sound cannot disturb the environment and it gives a more precise picture on the sound details. At the same time it does not give a realistic picture of the space impression. The loudspeakers should create a fairly raw sound so as

to give a realistic total sound. The room also has a major influence on the hearing. The positioning of the loudspeakers affect the room reflections that might corrupt the sound.

The room and the loudspeakers should be familiar with the mixer. Playing some familiar good sounding CD's from the loudspeakers gives a picture of how the entity should sound.

The mixing itself is good to begin with the basic settings. The volume levels of all the tracks should be near to 0 db and little adjustments made in the stereo picture. Rhythm guitars can be put on the sides of the stereo picture, drums and keyboards a little narrower, backing vocals again a little narrower and the lead vocals in the centre. After this the song should be just listened to in order to find the basic idea and the nuances. This creates a picture of what should be emphasized, what should be damped, what the driving instrument is and what the goal should be. Even better, the listening should be made with different kinds of loudspeakers, from different directions and around the room.

The sound is mixed in three directions: width, height and depth. Width means the stereo picture, height means the pitch of the sound and the depth is the distance that the listener experiences. Width is adjusted with the panning control. With this the sound is adjusted to either the left or right loudspeaker. The bass guitar and bass drum are placed in the middle of the stereo picture. This has been more or less the standard for making the basic rhythm be heard as the base of the song. The melody functions (vocals, lead piano, lead guitar) are also placed in the middle. The melody instruments should be perceived to be in the centre of the song. The stereo instruments such as keyboards, orchestrations and guitars are placed in the sides of the stereo picture. For example the doubled rhythm guitar is placed approximately 80% to left and right. In this way the total sound is richer and more impressive. The drums can be placed in the stereo picture in the way of a normal drum set. From the audience point of view it means that the bass drum is in the middle, the snare a slightly to the right, the hi-hat perhaps 80% to the right, the small tom 25% to the right, the mid tom slightly to the left and the floor

tom 60% to the left. The overhead microphones should be divided from 75% to 100% to the left and right. The drums can also be mixed from the drummers view when the picture is reversed.

Height mixing means the use of an equalizer. Every instrument has its own range of frequencies that it plays in, but there are certain frequencies that are packed in band playing. The human ear catches the mid frequencies from 1 to 3 kHz best and usually those frequencies have the most users. In a band mix it is important to find a great deal for every instrument and compromise in the frequency areas that each of them uses. Some instruments give some frequencies and the next instrument some other. In this way every instrument has its own space and the sound becomes airy. The most important mid frequency area is also known as presence. The rough generalisations in frequency adjustments are that the vocals should have their space in higher mid frequencies, the guitars in the lower mid frequencies and some high ones, the bass should have most of the low frequencies with the bass drum. The cymbals and snare drum operate mostly in high frequencies. In equalizer settings the saying "more is less" becomes true, it is better to cut than to increase.

Depth is handled with reverbs. The human ear is very skilled in hearing the distance of the sound source by listening to the reflections on the way and then defining the distance. The sections that need to be in focus have less reverb and thus they sound to be close and in the front whereas the background instruments are given some reverb. In some cases the reverb can be used as an atmosphere effect, for example, in guitar solos. There are several different kinds of reverbs that can be used such as spring reverbs, plate reverbs, digital reverbs and - the newest - convolution reverbs. The idea in convolution, or sampling, reverbs is that they are modelling a real space. The reverb has been recorded in that very space and then modified into digital measures. This can be then attached to the desired instrument and it acts as if played in that space. The basic mistake that an amateur mixer makes is to use too much reverb. It is easy to use and the single instruments sound good with it, but when combined, the entity might be severely blurry.

Besides these techniques there are several other effects to be used in the mixing process. Delays, choruses, flangers and phasers are examples of the available effects. The best way is to try them carefully and find the right mix.

For a mixing engineer is important to rest the ears regularly. The mixing process also needs inspiration and force does not help. A good policy is to have a day off and let the song rest, tomorrow it might sound totally different and the idea might be easier to find. (J. Pekka Mäkelä, 182-184, 193-200 2003)

2.8 Mastering

Basically, mastering is balancing, equalizing, compressing, and simply trying to make the most out of a musical performance. It means smoothing out all the rough edges so as to make a polished, finished performance. The idea is to make it as musical and exciting to listen to as possible (J.J. Jenkins, 2003). Mastering also turns the collection of songs into a record by making them sound as if they belong together in tone, volume and timing. Mastering can be considered the final step in the creative process because it is the last chance to polish and finish the project. The master engineer's task is to add judicious amounts of equalizer and compression in order to make the project bigger, fatter, richer and louder. Another task is to match the levels of each song so that they all have the same apparent level and ascertain that the master is free of any glitches and noise. The master engineer normally brings some objectivity to the mix, plus a certain amount of experience (Bob Owsinski, 2007). The mastering process can be roughly divided in two parts: audio editing and the making of the pre master.

The mastering process also starts with the room. The mastering room is usually especially planned for mastering. In acoustics the principles are the same as in recording and mixing, but they are planned more precisely. The second tool is the monitoring, in other words the loudspeakers, which are the microscope of the mastering engineer. The loudspeakers need to have high fidelity and to play every detail and nuance (Bob Katz, 12, 2007). The task itself is nowadays done

with computer, which is supplied with the appropriate software. The software is the same as that used in signal processors, audio meters, level meters, frequency analyzers and phase meters.

The process consists of several different phases. It starts with equalizing, which is one of the most important tools in mastering. The equalizing in this phase differs from the mixing process so that in mastering it aims at a balance between the different frequency areas. The adjustment is in this phase fine tuning and the adjustments are rarely more than 3db. (Shepherd, 2008) Dynamics processing is the second area. In this phase the CD is made to play as loudly as possible, but still taking into account the dynamics that the songs have. The most recent trend in mastering is the "loudness war" where every album should play louder than the other. This kills all dynamics from the radio music. A good mastering engineer finds the balance between the volume and the dynamics. Besides these main tasks, there might be a need for some noise reduction, stereo picture adjustments and reverbs. In addition to this, the mastering engineer still does some editing. The beginning and the end of the song need to be faded as well as the song order and the gaps between the songs need to be modified.

Finally, the mastering engineer transfers the tracks into the right format and contains the needed ISRC-codes, CD-texts and PQ-coding. The process ends with the finished product ready to be shipped for duplication.

In general, the mastering process is not as technical a performance as might be understood from this description. The equipment, software and the room play a major role in the process, but still there is a pair of ears that decides everything. Experience, ability to perceive audio features and talent to hear the differences are the most important tools. A mastering engineer needs to have experience in every phase of the production as well as of every role in the production team from players to the composer and to the producer in order to form a picture of what the project is aiming at and why. He needs to have good social skills in order to find the goals and an almost amazing skill to make the audio bend to the wishes of the customer (Pekka Rännäli, 2010).

2.9 Product planning

There is a great amount of formats that an album can be released in. In these times of digital media, internet and the retro enthusiasts the CD is not the only choice.

For amateur releases the mp3-release can be a good choice. Social medias and internet marketing can be done with a home computer and the release is immediately world wide. This has caused, of course, that the internet is full of amateur music as well as professional music. Now the problem is to market the music in the right place and in the right way.

Along with the digital wave the vinyl is coming back. Most of its fans support the unique sound of vinyl. The trend at the moment is to release an album first in the CD format and then make a special edition of vinyl. In this way the sales are increased.

The most popular format is still the CD. CD holds the position because of its good quality and the quantity of the players. CD's and CD cases have taken several different forms and are crowing all the time. Besides the basic jewel case and double case there are nowadays slim cases, single cases, multi panel jewel cases, cardboard jackets, multi panel cardboard jackets, digi cases etc. The popularity of the CD is tried to be maintained with several types of special cases with special booklets and added material.

In the end there are not so many licences involved in music recording. The situation is somewhat different if there is copyrighted material involved.

All albums must have an NCB license for the duplication of the CD. The costs depend on the details of the music involved. If the music is completely self made and the artists and composers are not members of Teosto, and the album is not sold, there are no costs. Nevertheless the free copies that are distributed are invoiced. The license becomes more expensive if the album contains cover songs,

copyrighted material (even if the composer is applying for the license) or the album is sold.

If someone from the production group (the composer, producer, lyricist etc) is a member of Teosto and there is a purpose of profiting from the album the pieces need to be registered with Teosto (www.teosto.fi and www.ncb.dk).

3 PROJECT IMPLEMENTATION

3.1 Resources and schedule

The project was implemented with somewhat ordinary means. Despite the fact that professional studios were not used, the project still aimed at a high-quality product and elegant appearance, both in terms of production and music. Most of the technical implementation was executed with home equipment and experimentally, as a result which a CD was produced with minimal costs. Everything was attempted to be done with amateur forces, but still with high demands.

The estimate of the cost aimed at less than 300€ in total. This was, of course, a low budget. The biggest costs were brought by the duplication of the CD's.

The budget:

Duplication and pressing (Pro Soundia)	100-150€
Designers (Drawing and labels)	50€
Label printing	50€
Mastering	50€

The schedule was fairly open. The project started already during the winter of 2008-2009 with the composing and pre recordings. The drum tracks were recorded during the spring and summer of 2009. After this the rest of the tracks were recorded and modified with all the ideas of lyrics and vocal parts. The first

vocals were recorded in fall 2009. Because of the distance and schedule backlogs the vocal recordings stretched to last a year and the last parts were recorded during the end of the summer 2010. At this point a closure date had to be decided; otherwise the project would have lasted much longer. The mastering schedule nailed the schedule in the end, which a relief. Even though the process was rewarding and fun, it was also consuming and frustrating when it began to stretch.

In hindsight, the project could have been made in a year if it had been planned better. Especially the vocal parts and vocal recordings could have been handled better with a straight plan and stricter schedule. This showed the importance of schedule planning. Here we are dealing with the basics of project planning, and it was handled fairly poorly in this project.

3.2 Artistic and creative process

The artistic process was started by deciding what the goal will be and what kind of entity the end product should be. In terms of music the aim was, of course, to create a solid product, but still in a way that it would be recognised as progressive music. Even though it was not decided beforehand, it was clear that the song structures would not be traditional. The songs were composed to have clear story, and again especially from the musical point of view. The songs were part of a bigger concept that was planned to be implemented later on. This was the base for the lyrics that were sections of a bigger story. Now that the concept was not implemented in its entirety in this CD we do not address to it more in this study. The song structures were part oriented. Three of the four songs were more than 6 minutes long. They do not lean on any choruses or specific melody, but try to create impressions of images and landscapes. One major goal was that the music would appeal to feelings, and create images for identification.

The composition of the first song was the easiest, as it was clear what the idea was. The song was composed for an amateur travel document, but at the same time clearly for this CD's concept. The song ended up to have three parts, all tied

together. The aim was to start the CD with a big and simple heavy riff and make a slightly longer intro part to introduce the sound and atmosphere. The first part was more restful, heavy and somehow cruel, the second part was desired to be more cheerful and technically instrumental, and the third part sensitive, beautiful and dramatic with a big ending. The song fulfilled all expectations and the structure hopes. This song was the best in terms of structure and music.

The second song was a ballad experiment. It tried to go as far as possible without distorted guitars. The song ended up to have two parts. The first part has a more traditional structure and the second part took one riff, and the idea was to make that riff bigger and bigger with layers, modulations and catchy melodies. The song is the 'End of abyss'- vision of a ballad song.

The third song was instrumental right from the beginning. The riffs were composed during a long time span, but they are not a collection, but a continuum. Different riffs were made to keep up the idea of the last one. The song has two parts and they represent, as the title says, pride and fall. The idea was created from the idiom "pride goes before a fall". It is the sad journey the most of us head for at least once in a lifetime. This song represents the most progressive song entity in the CD.

The fourth song is the oldest one. This song is more or less the heavy metal piece of the album. This song has not as clear parts as the first three, but still it can be seen as a three part song. It was born with an idea of quite a speedy song, not that fast, but energetic. This song ended up to have the best lyrics and best rolling vocals. The CD was planned to have a big ending with a crowing riff that was started with a clean guitar sound. In the beginning the song was planned to have a female vocalist in the clean ending part, but a singer was not available and it was implemented with the lead guitar. This was mellowed down with a piano coda. Mrs. Tuomaala was given the chord frame and she improvised the rest. It greatly packed up the album.

In vocals the composition responsibility was divided. Some of the vocal compositions arrangements and lyrics were done by Mr. Mikko Lempinen.

Mr. Lempinen told afterwards that the backing tracks were not optimal for vocals. In some parts he thought that they even mixed up the entity. The vocal arrangements and compositions were hard to fit in with this kind of long pieces. The songs had many parts with a beginning and end, but the vocal line should have carried on right from the beginning of the song to the very end. Schedule problems eroded some of the interpretation and some parts could have had character and a better atmosphere if produced a little more and more carefully. Lack of rehearsing and band playing also caused impersonality. It seems that ideas are much richer when done as band in a group with more time (Mikko Lempinen, 2010)

The visual planning was made in cooperation with Ms. Iina Kolari who implemented the visual design. The idea was to have a man from the story in the front and back covers. It was clear right from the beginning that he should be drawn. The situation made it impossible to find right kind of person to be photographed. The cover shows “the loss” and the back “the victory”.

The planning was challenging, but luckily Ms. Kolari had such good experience and visual vision that it ended up to have the atmosphere that was reached for. She also found the drawer, Ms. Laura Lehtinen, who then quite remarkably found the vision that was aimed for. The fonts were desired to have personality, but not in a cliché way. We were happy with the results.

3.3 Technical implementation

As mentioned earlier, the album was implemented mostly without costs and with home equipment. Used operation system was Windows XP and the recording programme was Cubase SX3. Windows does not offer the most optimum base for music production, but in this case it was good enough. Device and software compatibility is always big question mark when dealing with Windows based

system. Cubase is on the other hand simple, versatile and reliable music production software. Even though Pro Tools is overriding almost all other programs, Cubase gives a good option, and at least in this case it was found better and easier to use.

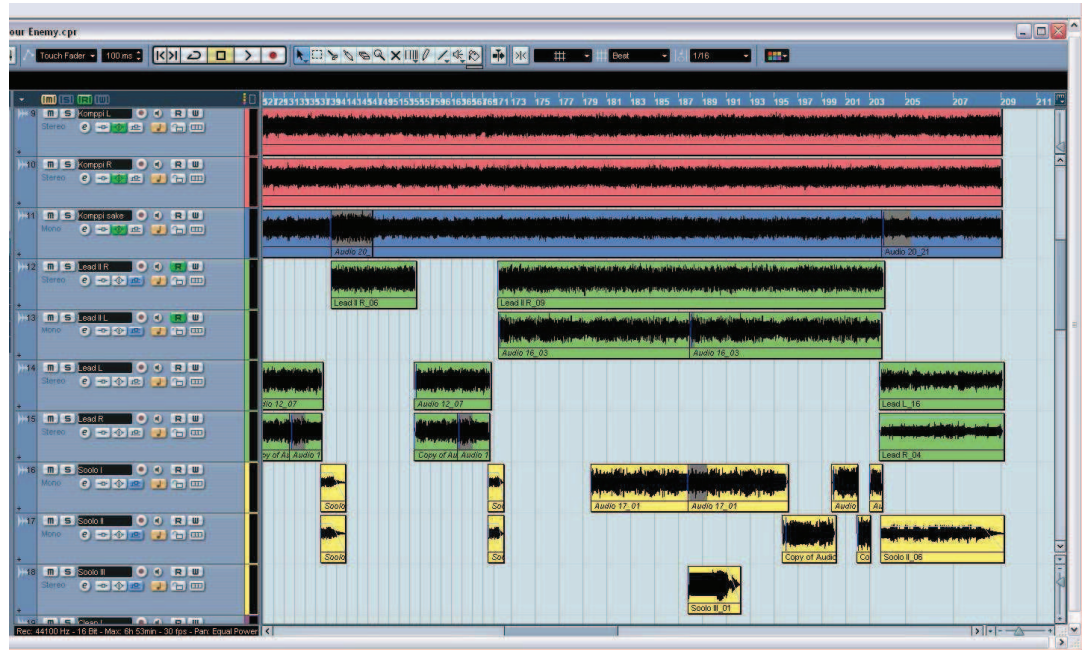


Figure 2 Screenshot of tracks in Cubase

The devices used in the recording are rarely basic equipment, but still with quite a wide range of options. All instruments were recorded with an audio interface M-Audio Firewire 1814, which has 2 pre amplified inputs. They were multiplied in drum recording with Behringer Ultragain 8 digital ADA8000 preamplifier that had 8 channels and an ADAT-connection. This entity gave 10 pre amplified channels to work with the drums.

The tracks themselves had pre recordings as a base for the rest of the instruments. They contained the tempo track with a metronome and some guiding instruments, such as few tracks of guitar etc.

3.4 Recording

As stated before the equipment entity kept the same with the instruments except with the vocals. The schedule with the recordings was quite airy. This was made possible by recording every instrument in a home studio and thus studio time was free as charge. The idea of the “one man band” forced the recordings to wait for the right inspiration and a right time spot.

The recording of the vocals was handled as remote work that brought some challenges to the recording process. Whole project suffered some interpretation difficulties, and with the vocals this was a distinct problem. Otherwise the used style of the recording gave a great deal of liberties and almost free hands to try everything at least ones. This also gave liberties to the idea changes.

3.4.1 Drums

The recording was started with the drum tracks. The pre recordings contained some tracks made with Ezdrummer that is drum programming software, which helped with the compositions. These drum tracks were, however, excluded from the guiding tracks, to avoid disturbance and to find the right mood for the recordings.

Above mentioned recording devices got 10 microphones attached to them. Base set was T-bone DC1500, which contained a bass drum microphone (BD-300), 4 dynamic instrument microphones (CD65) and 2 overhead condenser microphones (EM500). Besides these microphones, 3 Shure SM57 dynamic microphones were used in the recording of the snare drum and 3 roto-toms.

All tracks were recorded with a back track and a metronome. This gave a better chance for latter variations. Used headphones were T-Bone HD-990D that is specially designed for drum recordings. They are closed and thus they minimize the leaks of the backing tracks and the metronome to the recording microphone.

At the same time they gave good noise isolation for the drummer as well as made possible to adjust the volume of the metronome to the comfortable level.

In this case the room was a normal bedroom. Only things that were considered were the acoustical issues. The room had carpets and curtains as well as big couch. Those elements damped effectively the unnecessary delays.

The microphone placing was handled with a normal microphone stands and with a fixed tom rim attachments. The bass drum had smaller microphone stand that is made for this kind of instruments. It can also be used, for example, in contra bass or cello recordings. The bass drum microphone was placed slightly inside the bass drum through the sound hole of the hinder bass drum head. The sound hole of the head is not in the centre and the microphone was pointed towards the hit point from the mouth of the sound hole. With this setup the goal was to get the bass drum sound as rich as possible, but in the same time clear edged, in order to get the punch clear and tight.

The snare drum was recorded from the top head only with one microphone. The snare microphone placing aimed to get the sound clear. Another goal was to get it close to the head so that the cymbals and toms would leak as less as possible to the track. Same thing applied also to the tom microphones. The placing of these microphones was balancing between the sound and the leakage. If possible, the snare drum should have also been recorded from top head and reflection head that captures the sound of the snares. Snares create the most of the recognisable snare drum sound.

The overhead microphones were placed about 1,5m above the drum bench using X-Y stereo microphone technique in approximately 90 degree angle. This was found to be the best placing in order to get the stereo picture lively and wide enough, and in order to get the cymbals inclusively on track. This helped also to get the hi-hat sound to rise up from the entity. Normally a hi-hat has its own microphone, but due to the lack of proper microphone the stereo overhead pair was found to be enough.

Most of the drum tracks were done with one take through the song. This aimed to the intact atmosphere. However, every song contained of several takes. At the present day the song is possible to be recorded piece by piece and still get the entity solid. Unfortunately, that can be usually heard in the total interpretation, as a restless entity. This time only some of the most challenging spots were recorded separately.

Finally the drum recordings took several days, even though only 4 songs were recorded. This was caused by the lack of possibility to rehearse as a band and thus the songs did not have possibility to develop naturally during the rehearsing.

3.4.2 Guitars & basses

After the drum recordings rest of the instruments were recorded in high-rise flat and this brought some issues to the process. In this case compromises were used and all of the guitar and bass tracks were recorded by attaching them straight to the line-in, this meaning that guitar and bass amplifiers were not used. That kind of procedure is almost “against the rules”, but force of circumstances left no choice. In general, this meant that the sounds turned a little flat. Amplifiers usually give more colour and richness to the sound. This can be partially heard in the end product. Fortunately, at present day the software gives some leeway and the sounds are easy to enrich and grow. In the CD the sounds are as close to the goal as wanted, but there was still some character missing. Amplifier would also give some space to work in, as well as alternative in the sound.

The guitar tracks were recorded with three guitars: an electric guitar (ESP LTD EC-400AT), an electro acoustic guitar (Hohner HEA-60CE) and an acoustic guitar (Yamaha CG-170SA).

With the electric guitar was used Korg Toneworks AX-1000G effect pedal. This multi-effect pedal is versatile tool with several amplifier and cabinet modelling.

The electro acoustic guitar parts were recorded mostly with microphone. The decision allowed the guitars acoustic features come out better and thus it could be considered as an acoustic guitar with steel strings. With the electro acoustic guitar the use of amplifier would have given a plenty of character and brightness to the sound. With microphones and digital effects the aimed sound was achieved. There were used two different microphones, dynamic Shure SM-57 and condenser T-Bone (EM-500). Eventually the cheap and simpler condenser microphone gave the needed brightness and sharpness to the sound. The sound was doubled with a clean electric guitar sound that was somewhat darker and at the same time too stuffy to handle the parts solo. One solution to the brighter sound in electro acoustic guitar could have been the use of a DI-box.

The nylon string acoustic guitar was used to give more character to the peaceful parts. With the used digital reverbs the sound was really captivating and gave a great contrast to the distortion guitars and big orchestrations. These guitar parts were also recorded with the condenser microphone, in order to capture the bright sound.

The guitar recordings took most of the recording schedule. The guitar arrangements are easy to modify and they tend to grow along with the process. The best improvised ideas came during the guitar recordings. Several parts got over 10 guitar layers. This easily leads to unclear entity, but mixing of these parts came crucial. Level adjustments and panning can analyse the sound and clear up a single track. The aim with the tracks was to create big and impressive guitar walls, with even a slight theatrical affect added.

The bass guitar tracks were recorded with an electric bass (Harley Benton HBB4000). The bass was connected straight to the line-in, and analogue effects were not used. The bass tracks were played with two players simply in order to get different interpretation to different sections. This worked in this case very well.

3.4.3 Keyboards & orchestration

The keyboards were recorded with Roland XP-10 that was connected straight to pre-amplified line. The variety of the sounds that the keyboard offered made possible to combine some synthesizer sounds to the synthesized instrument sounds. Roland gave better base for piano player Katja Tuomaala to play her parts.

Rest of the keyboard sections and the orchestration parts were recorded with small USB-keyboard, ESI-KeyControl 25. This keyboard gave possibility to use pure software synthesizers with a great variety of possibilities. Cubase itself has couple synthesizers and they were used in track 3. Most of the orchestration parts and some of the piano parts were recorded with Garritan Personal Orchestra which offers amazing range of modelled orchestration instruments. At the same time the software offered guidance on the combinations of the instruments in different kind of styles. This was seen almost crucial for this project as the entity was wanted to be symphonic from its general sound. These instruments and assemblies supported outstandingly the already built guitar walls. On the other hand this software also brought the embarrassment of riches that can be heard in the end result. Some sections are full of instruments causing some sort of chaos. In these cases could have been better to cut the instrument range a little.

Garritan Personal Orchestra offered so authentic sounds that some of the parts are much better than the musical skills offer. In this kind of projects without budget these kind of software offers the possibilities to create credible symphonic music.

This software works straight as Cubase's plug-in and uses midi tracks inside the programme. In the other words this orchestration program works inside the recording software. This makes some technical demands for the computer to work properly. Midi tracks are very easy to be processed afterwards. The hits can

be corrected and changed almost anyhow. In this project the parts were mostly kept so simple that editing was kept fairly slight.

3.4.4 Vocals

Vocals were recorded by Mr. Mikko Lempinen. As stated earlier the vocal recordings were done mostly as remote work between Kuopio and Jyväskylä. General policies were settled face to face, but the implementation was handled through the internet.

The acoustics Mr. Lempinen handled with acoustic panels on the walls. The recording room had a slope roof that cuts the straight and unnecessary reflections. Natural sound of that space was included by taking the carpet away that caused the total sound to be dead. The better the microphone the better it catches the space.

Mr. Lempinen used AKG C 2000B condenser microphone with an integrated shock mount. The shock mount means that the microphone has no elastic mounting that cuts all structural noises out and keeps the sound fresh. The shock mount is recommended to the sensitive condenser microphones and it can be integrated or with external stand.

The microphone was connected to the computer with Mbox 2 that also had the needed pre amplification so separate pre amps were not used. The used software in vocal recordings was Logic Audio 5.5.1. The needed modifications, amplifications and effects were made afterwards digitally with the software. The computer performance made restrictions to use of the effects along with the recording. Normally it is better to use them at the same time because it has major affect on the interpretation to hear the ready sound during the recording.

The singer and vocals suffered the most on the nature of the project. The interpretation lacked character as the lyrics were not discussed through and the rehearsing was handled through samples that were sent back and forth through

internet. On the other hand this gave room for Mr. Lempinen to express himself more loosely. His arrangements played important role in the result. The backgrounds were made ready for vocals and Mr. Lempinen composed some vocal sections to the songs. Afterwards was realised that the vocals gave great ideas to modify the backgrounds to adapt more smoothly to vocals. This “problem” is normally not an issue as the songs are composed ready before the recording.

3.5 Editing

The editing was handled mostly along with the recording. It is more easy to cut the takes straight to right form and save time, as well as possibility to remember what was ought to be saved and what were the takes that needed to be erased. The drums were recorded mostly with one take in a way that the tracks were full length and the editing contained several takes of 10 tracks and the best takes were chosen afterwards.

In general the editing process in “one man band” and in a digital surrounding gives infinite possibilities in the arrangements. The songs can be changed almost anyhow afterwards even without any re-recordings. Sections can be copied to several parts of the songs and even to other songs. The entity suffers if this is made blindly and this has to be made carefully keeping the big picture in mind. In editing process the several different kind parts were connected and the edges were smoothened. In this phase many sections could be cleaned from the unnecessary instruments. Mistakes were still easy to be corrected as everything that was not used was cut out and the general sound was cleaner. After the comprehensive editing there were some tracks still recorded to reach the target.

3.6 Mixing

The mixing was started with drum tracks. The aim was to create a tight heavy sound to the whole set. In heavy genre the cymbals are usually mixed relatively low and the bass drum and snare are highlighted. In this case the trend was followed and they were also highlighted in total mix.



Figure 3 Mixing in Cubase 1

3.6.1 Drums

Luckily the mixing and editing was started with the drums because right after the beginning of the process, the Windows collapsed in the used computer and during the restoring of the data all of the drum tracks were lost excluding the edited and mixed stereo track in every song. The sounds in these mixes were luckily so close to the wanted sound that the drums were not needed to be recorded again. If some corrections were needed to be made they were handled with the stereo track that brought some challenges but nothing overwhelming.

Two screens helped the mixing process, when the other screen handles the tracks and other handles the effects and mixer. The used Loudspeakers were Behringer Truth B2030A and headphones were Bayerdynamic DT880. In this case it was balancing between the pros and cons on the use of headphones and

loudspeakers. A small room brought some challenges with the standing bass waves. Sound was a somewhat corrupted with the loudspeakers, but finally the balance was found.

The drum tracks were modified the most in the mixing process. To find credible sound the original sounds were mixed with the samples that needed to be done with triggering/sound replacing software. Bass drum consisted of 3 different tracks. Two of those tracks were samples and one was the original sound. All of them had own roles in the sound, one represented the low end, one represented the tightness and the original sound brought richness to the total mix of those tracks. The used two samples were rock and heavy sounds that combined created the needed full sound with edge and boost. The processing of these tracks contained compressing and some equalizer adjustments. The compression was relatively big, which eroded the dynamics, but made the sound more heavy oriented. This was found the correct decision to the style. Track 2 suffered a little on the drum sound, but in terms of the entity this was a good decision.

The snare sound was also built with three tracks. Again two of them were samples and the one was the original. The target was the same with the bass drum. The tracks were split to find the tight sound (sample), mid frequencies/low end (sample) and the richness and the authentic sound (original snare). The mix had quite hard compression as well. In the snare drum the dynamics played more important role than in the bass drum. This affected some changes in the tracks and some of them were doubled in order to get some sections with the better dynamics and thus more genuineness in the sound. In the snare sound the reverbs played also important role. Aim was to create more dramatic and big snare sound with a stadium reverb.

The toms were handled with the samples that were compressed a little but otherwise the samples were good. The rototoms caused a minor problem as the overhead microphones were mixed rarely low level and thus the rototoms lost some richness from their sound. The situation was corrected by mixing the

rototom tracks to have higher gain and the sound was adjusted a little with an equalizer.

As said above the overhead tracks were mixed fairly low. The low end was cut a great deal because of the leaked snare sound. At the same time the cymbal sounds got much brighter and much less dominant. Normally the overhead sound should not be cut so much in order to get the original drum set to sound realistic, but in this case the drum set sound was wanted to be more recognisable heavy sound. Even though the drum tracks were lost with the Windows collapse the sound that ended to the CD was quite much what was reached for. Only the mutual levels of different drums could have been better.

3.6.2 Other instruments

The rhythm distortion guitars ended up to the CD rather pure. Mid and high tones were adjusted a little with the equalizer in order to get them to sound more raw and edgy. The clean rhythm guitars got some reverb on them to make them livelier.

Almost all lead guitars were handled with low or remarkable reverb. This aimed for a melancholic atmosphere, which was reached in most cases. This was found problematic in the mastering part. We discuss this issue in the next chapter.

The basses were compressed in order to get the sound more levelled and vigorous. In the atmospheric sections the sound was mixed to be softer but still clear. In this phase it was very important to get the two different players to sound as they would have played the parts at the same take. This was done mostly with level adjustments but also some equalizer trimming was done.

The piano sounds were handled with reverb. The Cubase plug-in offered good range of great sounding reverb that imitates some general playing environments. The solo pianos got a hall reverb that sounded more or less concert hall and they succeeded well. It is almost unbelievable how realistic the pianos sound when

comparing that the most of them were recorded in a small flat with 3 octaves USB-pad.

3.6.3 Vocals

The vocal tracks were recorded last and they were mixed last to the songs. The most of the parts with vocals were mixed already keeping in mind that the vocal tracks are included, but in some cases vocals needed some space in the background tracks. In those cases some the other instrument levels were lowered as well as some mid tones were cut simply in order to get the vocals to reach out from the mass.

Along with the lead guitars the vocals caused a problem in the mastering phase with the massive reverbs. Especially the background vocals were mixed with a reverb. Some vocals also got double delay where the sound is doubled just after the original line. These delays also had a stereo effect and thus the sound bounces from the right to left channel.

All songs with vocals had also parts where the track was adjusted heavily with the equalizer to sound like an old radio. This is usually in presets in the equalizers and it is made by cutting heavily the low and high end and increasing somewhat the middle tones. This is a great effect that is easy and powerful. However every effect will lose the effectiveness if used repeatedly. In general, vocals in this CD got three levels: a sensitive sound, heavy sound and rough sound, and dramatic and symphonic reverb sound.

3.6.4 Entity

The entity aimed to sound big. The guitars were spread wide in the stereo picture, the drums were voluminous and the vocals had reverb all over. The drums and guitars got the loudest part in the CD. The vocals were adjusted to be “visible” when there were singing but finally the role of the vocals turned out to

be much less than was imagined. The reason to this was partly because the arrangements were so instrumental oriented and partly because the vocals were recorded after the instruments and inserted to the entity as “an external” function.

Finding the balance between the factors was the toughest job. Every listening sounded somewhat different and the line was missing. However, taking a break from the mixing did the job. Getting some distance to the songs helped to hear the entity with bright ears and the line was found. The drums were located more to background and the orchestrations and guitars received bigger role. This was the right decision even though the drums lost some character. Rest of the adjustment was done in mastering.

3.7 Mastering

The mastering was done by Mr. Pekka Rännäli. This was only section in the process that was totally outsourced. The decision was made partly because the technical means and mastering skills were not good enough, as well as project needed some professional external factors to tune the album.

Mr. Rännäli asked to have the pieces divided in three tracks: drums, vocals and the rest of the instruments. This is one thing that divides artists to two groups; other group does not want to give too much adjustment possibilities to mastering engineer. In this project it was good chance in order to get as balanced end sound as possible.

The wish to Mr. Rännäli was to make the master to have volume, bright high frequencies and a good bounce in low frequencies. Eventually the dividing of every song in three tracks made possible to find the good characters out from every factor.

Mr. Rännäli commented the process: First thing was to listen and analyse the frequency response of the songs. Then the holes and peaks were levelled in order

to get the general sound more pleasant and convenient. This was done by balancing between the compromises in different factors and the instruments. Secondly the stereo picture was widened widest possible without getting anything out of phase. In this task the track separation came in handy. Bases were turned into mono tracks under 80hz, which helps to increase volume and clears phase errors. Then the start and the end editing with fade ins and fade outs. After this the volume was maximized with limiter and the files were turned to the needed form including the file information and ISRC-code. (Pekka Rännäli, 2010)

The result was much better than could have been imagined. The frequency balance was adjusted better and the general sound was much authentic. The volume was raised closer to general level of commercial music. The software collapse during drum mixing caused that drums lost some character in the master, as the reverbs were too loud and the balance between different drums was wrong. The vocals suffered from too loud reverbs, but in the end some sections received even more drama from the emphasized reverbs.

Eventually, the master was really good. Still something left to be made better and the general sound could have been even brighter. Those things were not ruined in mastering but the mastering brought them up. Once again was proved that the mastering should be fine tuning, and it should not to fix anything. This time Mr. Rännäli had to fix a numerous things and in addition to this he managed to create a positive final product.

3.8 End product

The actual costs turned out to be app. 205€. The duplication and pressing was 80€, the label printing cost 30€, the mastering was 50€ and the designers took in total 45€. It was clear right from the beginning that this is going to be a 4 song demo album. Almost everything else was open 'till the ending line. All artistic decisions as well as the formats and the physical product decisions were done along the way.

The CD ended up being in a slim jewel case, with only 1 two-sided cover page. The finalized product was wanted to be simple and short, but convincing, both music point of view and as physical product. Bright slim jewel case supported the idea really nice. The information on the covers fitted easily to the back cover. The information contained only the titles, durations, artists and the implementation personnel. The email address and MySpace address were also included for the possible future use.

The duplication and the CD-pressing were handled by Pro Soundia. The quantity of the CD's ended up to be 30 copies. This amount was enough to cover all of the players and the few needed give away. Some CD's were left over to send for some magazines and interesting music representatives to introduce the project. The CD-press confronted some problems as the CD label turned out to be fairly challenging. Finally a compromise had to be done, but the result was still elegant and close to the idea what was reached for.

The cover press was done by Kopijyvä Oy. This process did not bring any surprises and the result was correct and good looking. The paper quality could have been classier, but in this case the result was more than decent.

The license decisions were left to the end of the project. The result was that the songs were not reported to Teosto. Copyrights belong to the composer without the Teosto report and now when the songs are hardly played in commercial media, the Teosto license was not needed.

Only license that was applied for was the NBC license for audio product copying. This was done with the web application, through Teosto's homepage. It contained the rights owner, titles and durations. Now that the album is no commercial, the mechanical copyright will not be charged.

The CD was sent to couple of Finnish music medias in order to get a professionals opinion about the music in the CD. It was also sent to Mr. Arjen Lucassen, to show

respect to the idol and hoped for his opinion. Only Soundi's review made to this report (attached in Finnish). Mr. Nissinen from Soundi gave respect to skills and melody sense, and criticised the arrangements and some production issues. In general the review was very positive and it gave good constructive feedback. The review gave hope and strength for the future projects. Otherwise the CD was marketed in the social medias: Facebook (www.facebook.com/sites/endofabyss), MySpace (www.myspace.com/endofabyss) and in Mikseri (www.mikseri.fi/endofabyss). Besides these medias the distribution included only free copies to the artists involved, friends and acquaintances and the CD was not sold at all.

4 CONSIDERATIONS AND SUMMARY

Every process in this project could have been done somewhat better. That is unfortunate, but at the same time very comforting. To know where to improve, the next album project will be even more rewarding and fruitful.

The investments to technology, caution and hardworking practise, experimenting and general making will improve the result easily. Nevertheless this project was a success, and a matter to be proud of.

Of course, it is disturbing to find issues from the product that could have been improved with a tiny change and focusing. Fortunately, these mistakes are and were seen, because self criticism is an issue that the world is lacking in times of Idols, Talent and XFactor.

The whole project took at least 2 years. When exaggerating every produced minute as ready song took at least 4 weeks of work, but every minute was worth it. The frustration, tiredness and desperation simply spiced up the great experience of creating something very personal. As a lesson the project was priceless. Everything that was learned and everything that this project left to be learned encourages reaching higher again in the next project.

Only one of the outsider opinions of the album made to this study, and it is seen important in terms of development in the future. Even though this was more a study of the methods, skills and processes, it was also an attempt to create successful music that someone would adore. That is an issue that only time will show.

Personally this project was highly rewarding. The progress of the project could have been more fluent, especially on the last half a year period, but otherwise major setbacks were avoided. Biggest concern was the lost of the drum tracks,

which was then covered with the pre-mixed stereo tracks. Every phase left a numerous issues to be studied and issues that could have been done better, but the most important issue was to notice already, how the final product could have been done better. One of the easiest ways is to prepare the project better. The finalising of the songs and the careful practising can be heard easily in the final product. These are already been planned for the future development and the future releases.

5 REFERENCES

Ahokas Paulina, Frisk Tom, Hyvönen Ville, Jaakonmaa Eeva, Nieminen Pekka, Nikula Jone and Pesonen Raimo, Artist ABC (T2 Promotions Oy, 2004)

Annual report 2008, PPL, www.ppluk.com

Fowler, Charles B. (October 1967) *The Museum of Music: A History of Mechanical Instruments*

Gronow, Pekka & Saunio, Ilpo: *Äänilevyn historia*. Porvoo Helsinki Juva: WSOY, 1990

Hirsjärvi Sirkka, Remes Pirkko and Sajavaara Paula, Tutki ja kirjoita, Kustannusosakeyhtiö Tammi, 2000

Jenkins, J.J., Masters on mastering, <http://emusician.com>, 2003

Katz, Bob, Mastering audio, Elsevier Ltd., 2007

Kot, Greg, Future of music summit (Chicago Tribune, 2009)

Lempinen, Mikko, Interview (December 2010)

Mäkelä, J.Pekka, Kotistudio, (Like, 2003)

Owsinski, Bob, Mastering Engineer's Handbook : The Audio Mastering Handbook 2nd Edition, Course technology, 2007

Pisano, J., MIDI standards, a brief history and explanation (www.mustech.net, 2006)

Rosen, Jody (March 2008) *Researchers Play Tune Recorded Before Edison*, New York Times

Recording industry in numbers 2009, IFPI, 2009

Rännäli, Pekka, Interview (December 2010)

Shepherd, I., Mastering techniques, <http://mastering-media.blogspot.com>, 2008

The history of recording technology, www.recording-history.org

Yogesh Bakshi, How to write a pop song, www.suite101.com, 2007

www.ncb.dk

www.teosto.fi

6 APPENDICES

- Introduction to End of abyss (2010) CD.
- Review from Soundi, Sami Nissinen (May 2011)

