Chapter – II

Technological usages in the development of South Indian Music

South Indian Music has a long tradition. Its origin dates back to time immemorial. It has always accepted changes and renewed itself along with the passage of time. In the present day too, it has accommodated changes so as to later to the needs of the modern man. The present day has witnessed the enormous growth of science and technology. Many technological equipments have come into existence and South Indian Music has adapted itself to accommodate the technological changes.

Music technology might be defined as any form of technology which helps a musician to make music. To be specific, the invention and evolution of sampler’s synthesizers and computer technology has changed the way music is now produced. However, the spirit of the South Indian Music essentially does the same thing changes that have taken place in the methods of presenting and spreading it. Let us have an overview of the new technological arrivals. There are several devices and equipments introduced to the general public due to advancement of technology. No doubt certain devices have already been in existence, the improvisation towards the devices through the development of technology has brought about great revolutions in many industries including the field of Music. To understand this development, we can briefly analyse the devices and equipments used commonly and their benefits and usage in our daily affairs including the south Indian music field.
2.1 Technological devices

2.1.1 Microphones

Microphones are transducers which detect sound signals and produce an electrical image of the sound, i.e., they produce a voltage or a current which is proportional to the sound signal. The most common design today uses a thin membrane which vibrates in response to sound pressure. This movement is subsequently translated into an electrical signal. Most microphones are used today for audio use electromagnetic induction (dynamic microphone), capacitance change (condenser microphone, pictured right), piezoelectric generation or light modulation to produce the signal from mechanical vibration. The most common microphones for musical use are dynamic, ribbon or condenser microphones. Besides the variety of basic mechanisms, microphones can be designed with different directional patterns and different impedances.

2.1.2 Equalizer

Equalizers are used primarily in audio equipment, allowing fine tuning of the signal to compensate for distortions such as weak response or oversensitivity at various frequencies. A graphic equalizer uses a set of controls that determine the level of boost or suppression of individual frequencies. The controls are usually sliding faders, set up in a row from lowest frequency to highest frequency, so that the final settings resemble a graph of the frequency response of the equalizer. A parametric equalizer consists of one or more filters whose characteristics can be controlled, such as the frequency to be
manipulated, whether to boost or suppress the frequency, the amount of boost or suppression and how much nearby frequencies are also affected¹.

2.1.3 Amplifier

The next in the audio system is the amplifier. The term ‘Amplify’ also means to magnify. That is to take energy of lower level and when sending it through output it should be in the magnified form. Basically the amplifiers collect all energy that needs to be transported to create the sound output. It mainly consists of the circuit that carries the raw energy through its wires, accumulate it together so that the final sound output is emitted from the speakers. The level of amplifiers is measured in terms of sound watts. They are produced in various sizes and certain shapes. The amplifiers may come as part of the system or then as additional accessories. And apart from the sound amplifiers there are also the power amplifiers.

2.1.4 Loudspeakers

The Loudspeakers are always the limiting element on the fidelity of a reproduced sound in either home or theatre. The other stages in sound reproduction are mostly electronic and the electronic components are highly developed. The loudspeaker involves electromechanical processes where the amplified audio signal must move a cone or other mechanical device to produce sound like the original sound wave². This process involves many difficulties and usually has to perform the
most perfect steps in sound reproduction. Even with a good enclosure, a single loudspeaker cannot be expected to deliver optimally balanced sound over the full audible sound spectrum. For the production of high frequencies, the driving element should be small and light and to be able to respond rapidly to the applied signal. Such high frequency speakers are called ‘tweeters’. On the other hand, a bass speaker should be large to an efficient impedance match with the air. Such speakers called ‘woofers’ must also be supplied with more power since the signal must drive a larger mass.

Another factor is that the ear's response curves discriminated against bass, so that more acoustic power must be supplied in the bass range. It is usually desirable to have a third mid-range speaker to achieve a smooth frequency response. The appropriate frequency signals are routed to the speakers by a crossover network. Thus the desirable sound is achieved when all the musicians are connected from their respective microphones to the amplifier and the audience favours every second of the music they listen.

2.1.5 PC Computers

PC’s (Personal Computers) or more commonly known as desktops and they are commonly used devices in this modern era. This device has produced great impact on the developments in music industry\(^3\). The usage of desktops enables musicians to share their media works such as compositions, sound editing, pitch modulations, audio, video, data documents and other technical works that involves the usage of these technical devices. Desktops can be connected to other musical equipments such
as Keyboard, Violin, Viola, Tambura, Sitar, Mridhangam, Ghatam and others. The music composed can be recorded and saved as a soft copy.

2.1.6 LCD display with CPU

LCD refers to Liquid Crystal Display which uses the light modulating properties of liquid crystal. These liquid crystals are commonly used in manufacturing television, computer monitors, instrument panders, aircraft cockpit, panels and many other gadgets. These are used in such devices to project a clear resolution of the picture quality. LCDs are more efficient in supplying energy and has a safe disposal and it consumes low electrical power. These devices are used in the music field to project good picture quality while recording for movie is playback singing. Apart from this, the LCD screens are also used during the teleconferencing where screen projection of the person whom we are about to communicate with will appear clearly on the screen. According to display, bank LCD TVs become the majority with a 50% market share of the 200 million TVs forecast to ship globally in 2008\(^4\). By this the communication and the subject matter will be discussed effectively.

2.1.7 Net connections

Net connections have become a part of modern life for all purposes. It may be for home users or for corporate use, its function is to connect people at various locations. Net connection companies provide their connections and services to public for their usage to enhance the communication, promoting several types of plans used for home and corporate consumers\(^5\). For instance, chatting via Skype, allows people
to save their time and money on phone calls that are costly these days. While talking through Skype other tasks can also be performed simultaneously. This is known as multitasking. Sharing files and musical worksheet makes the task of composing, learning and other musical work such as recording via net much easier. For example, when the recording studio is far away for the singer and the accompanying artist to be present at, they can also do the recording on their own and email their segments of recording to the music director. This saves time as well as flight charges and other travel expenditure.

2.1.8 Projector

Projector is one of the useful equipments for our music used to deliver visual based lesson. It is a way to entertain, communicate and educate music people on a large scale. The use of the projector is to submit a presentation on a creative and effective way. Projector has a number of options and sophisticate gadgets to allow the presentation to be attractive and lively in concert for the audience. The reason for projector to be used is to make sure the message presented to reach the ears and vision of the audience clearly. Projector has the basic function such as, projecting images and text using high resolution\(^6\). The projectors can be configured with a computer system or a DVD player and it can be also connected with the satellite system with a specific cable.
2.1.9 Headphones

Headphones are gadgets that are very commonly and widely used in the music industry. There are ways to categorize the headphones produced in the market. This judgement is made through determining the style, power, sound quality or the brand. Apart from all these qualities, the two basic categories are the dynamic or electrostatic quality of the headphones. The Quality of sound produced by these two types of headphones is based on two types of technology that is being used. The Transducer principle used in this technology is the difference in these two types of headphones. The sound projection is based on how the headphones convert the electrical signal from a media player into sound waves that are being heard. Dynamic headphones are common type of headphones used by average music listeners, professional studio mixers and musicians. It works the same way as how two miniatures operate. It has standard jack that is being used to transmit the signals. Sony, Bose, Audio, Technica, Philips are most popular manufacturers of these dynamic headphones in the music industry. Electrostatic Headphones are considered far better than the dynamic headphones in terms of sound quality. These headphones require an amplifier to create an electrical field.

2.1.10 Laptop

Note books and Laptops are terminologies that are used very frequently and interchangeably. These equipments are mobile computers that are widely used for corporate and personal use. As the development of technology expands very rapidly,
the needs of these Note-books and Laptops are becoming very essential equipments for many including musicians and music orientated courses. The term note-book actually refers to a mobile featured device which is ultra-thin and ultra-light, which can have instant net connection without the need of a modem or even wireless modem or USB modem. The size of this device may be as big as a mobile phone. Even though such devices have been introduced, some still prefer to use laptop. The screen resolution is way much bigger than a mini size notebook. The basic features of surfing, typing and webcam facilities are still part of the laptop structure. These devices mentioned can be used in various ways in the music field such as for recording, video watching, some do install software for editing purpose and many other features.

2.1.11 New Activities with Laptops

- More collaboration especially wireless interaction.
- Working at one’s own place.
- Information literacy activities in all music courses
  (e.g., Music history, Resources in music education, etc) through the Internet.
- More extensive homework assignments.
- Evaluate more shareware and demo software.
• More use of ear-training software.

• More student music arranged for varied class activities.

• Greater use of voice and instrumental performance analysis more in-class ensemble work using computer performance.

• Greater use of courseware management software.

  (e.g., WebCT or Blackboard)

• Take class outside on the yard.

• Instant student demonstrations from their Laptops.

  (Especially with remote desktop management software)

2.1.12 Touch screen

  Touch Screen is the latest technology widely used in Mobile phones, Computer monitors, Aircrafts, PDAS and in many departments for security purposes\(^9\). Some have even implemented this technology into the music industry especially in recording studios, concerts and classes. Rather than having an additional device called mouse, the touch screen system saves a lot of space and cost. With the touch of the finger on the screen, data needed is being displayed on the screen. The touch screen items such as I-Phone, Palms, PDA and Monitors produces much clearer and quality pictures and display as it does not need two panels and it transmits more light so.
2.1.13 Interactive whiteboard

An Interactive White Board is a large White Board mounted on the wall, with built-in computer processor that allows user to interact directly with computer through contact with the screen. There are special markers used to write on these boards. Compared to the normal white board where dry erase markers are used, the basic essential items specifically used for this Interactive Board are Projectors, Screen and Computers\(^\text{10}\). Interactive Boards are usually used during paper presentations that require high resolution equipments. It is also used during effective audio, video Music seminars, music classes and lecture demonstration in institutions. During the process of selecting this Interactive White Board, there are several aspects like the size of the room, type of presentation and the level of audience anticipated must be taken into consideration.

2.2 Softwares

Many Version and types Of Software are used in the technological world these days. Software are available in Retail software, OEM software, Shareware, Demo software, Adware software, Spyware, Freeware and many more. Most of these Software are purchased at a particular cost. Some software are used as main programmes for the daily corporate affairs. Some are available from the internet for free on common website called www.downloads.com\(^\text{11}\). There are software which can be only used by one user who is the main administrator of the organization or company. Apart from these versions of software, there are software that has the option to share with more than one user. These software differ from one another based on the
license given for it. The software runs on a trial basis where the usage period lasts for 30-60 days only. After this particular time frame, the software has to be purchased legally.

2.2.1 MIDI Files

Musical Instruments Digital Interface or in short MIDI is common electronic language ‘spoken’ between Electronic Instruments and controlled by Computerized devices during performance\textsuperscript{12}. This technology allows an instrumentalist, for example, a keyboardist to stroke off a drum synthesizer with just one key. In some occasion, the computer is used to store composed notes and pieces as MIDI files which will make the performer on stage to perform easily without any difficulty. Initially before MIDI files were developed performers by profession had faced difficulties to coordinate, as the keyboardist would often need to set up the towering banks of synthesizers, piano, organs and other electronic instruments in order to perform live. It is not quite suitable for Carnatic music as it has many limitations in moving over range of notes for producing ‘Gamakams’ and some of the MIDI commands required for full fledged Gamakams which do not work in all sound cards. As the music is produced from data instead of storing it as digitised samples the package is quite small.

2.2.2 Webtool

A Musical Performance stored in a Digital Audio format can be automatically analyzed and described by using computational tools. Prototype of Dunya, a music browsing tool designed to support the exploration of a Carnatic music collection by
using concepts relevant to the Carnatic music tradition. This web application displays the typical information shown in music playback systems but also includes related information collected from a variety of sources and representations of the music that have been automatically computed from the recorded audio and that are specific to Carnatic music. The existing tools which can be used for Tonic Identification, Melody Extraction, Intonation Analysis and Raga Recognition. We also present the specific tools for melodic analysis and visualization that have been incorporated into Dunya$^{13}$.

SwarShala is a wonderful tool for anyone interested in South Indian classical Music, whether beginner or advanced, by providing means of learning, practicing and composing this style of music. Such a user will be able to create fully customized practice sessions with the required instruments, cycles, pitch, tempo, acceleration, etc and select them to be played at wish. Fusion Music composers will also acknowledge SwarShala as the best tool to create tracks of most South Indian instruments for their compositions. Version 3.1 provides them with a tracks view on which they can sequence rhythmic and melodic components to create long tracks which can then be exported as wave or MIDI files$^{14}$. Also those who are more familiar with the western notation will be able to switch to a standard piano roll view.

2.2.3 Platforms

- Windows XP/Vista/7/8.
- Mac OS X version 10.5 or higher.
• Carnatic edition* with 18 South Indian instruments and a Carnatic tutorial.
• Extra edition with 74 instruments from all over India and both tutorials. These different versions can be ordered at our online shop.
• Currently only full & extra editions are available on Mac.

2.2.4 Best Apps for Classical Musicians

Aaron Green says “Thanks to modern technology and apple, music apps which aid all types of musicians are plentiful and readily available. Here are the best apps for classical musicians. From chord progressions keeping the beat, these awesome iPhone and iPad apps for classical musicians are definitely worth checking out”.

1. ‘Polychord’ is a music APP made exclusively for the iPad. It's essentially a chord maker, great for singer/song writers and composers. The app allows up to 10 fingers at once functionality to create ‘chord progressions, melodies, and harmonies’.

2. ‘Cleartune’ is a great music APP for musicians that allow the users to tune their instruments quickly and accurately. The Cleartune music APP can tune a variety of instruments including the Acoustic Guitar, Piano, Bass, Strings, Woodwinds, Tympani and more, using the built in mike on our iPhone and iPad. iPod touch users will have to use an external mike. The APP also includes a pitch pipe.

3. ‘Metronome’ with a tempo range of 30 to 208 beats per minute and a variety of preset rhythms, this APP boasts a lag time of less than 1 millisecond. The
Metronome can be set by either dragging the pendulum weight or by inputting the desired tempo into the app. Preset rhythms include 5/4, 7/4, 9/8, 12/8, Son Clave, Rumba Clave, Bossa nova Clave and Tinku and you can also manually adjust the time signature.

4. ‘Pro Keys’ is another useful music APP for composers. This highly rated music app is able to record your compositions as well as your own voice. The APP features a variety of Instruments, Pitch bend, Drum pads, Adjustable keyboard sizes and more. It can also be played in dual mode with your friend.

5. ‘Opera Book’ is loved by the Vocal students and Opera lovers, we can really appreciate this APP. It holds a wealth of information for 50 different operas including the composer, premiere date, librettist(s), duration, setting, character descriptions as well as the synopsis broken into acts. In the past few years many new software applications have been developed specifically for Carnatic music on web and mobile platforms: on-line distribution systems, education portals, discussion forums, mobile apps for learning, mobile apps for live performance... However most of these applications are the result of small initiatives and are having a difficult time developing sustainable models.

6. A new mobile APP has targeted the popularizing Indian classical music among youngsters. Santoor maestro Pandit Tarun Bhattacharya’s new album comprising Bhajans and other tunes will be launched this month—end in the
form of a mobile app and Quick Response code (QR code) while the QR
codes are called ‘Celestial Santoor’.

7. ‘Camatic music mobile application on Android’ and is developed by
Sivakumar Loganathan, a graduate student in Entertainment Technology at
the Carnegie Mellon University is gaining popularity in the Android APP
market. Camatic Raga provides reference to about 968 ragas used in Carnatic
music and lets you search for a raga from a single note. The APP provides the
Arohanam (ascending scale) and Avarohanam (descending scale) of each
raga, most of them free for download, helping traditional music aficionado's
stay connected to rare raga's and their favorite performances. Sivakumar says
“Carnatic music system is very rich. It is important to preserve our cultural
heritage and spread knowledge through technology”15.

8. Notation App

The Carnatic Music Notation typesetter is a web-based application that
allows you to typeset high quality notation sheets for carnatic music. Carnatic
Music Notation Typesetter is an open source software that will let to perform
other non-listed topic tasks. It is free for both personal and commercial use,
thus the perfect choice for those who want an alternative for Other/Non-listed
topic programs. In order to download Carnatic Music Notation Typesetter you
just have to click on the Free Download button above and you will be able to
save the 0 setup on your computer. The latest version was released on 2011-
08-04 and is compatible with WinXP, WinVista, Win7 x64, Win7 x3216. If
we have any questions about using this program we are free to ask the other
users on this Software Support forum.

9. Three applications on this arunk’s WordPress is based on this website.

- **Typesetter**, with which you can typeset carnatic music notation and generate
attractive looking notations like you see in carnatic music notation. You can
even typeset notations in Tamil, Telugu, Sanskrit and Kannada.

- **Transliterator**, with which you can have the lyrics of carnatic music
compositions printed out in Tamil, Telugu, Sanskrit and Kannada. For this
purpose, the application uses a common transliteration scheme for all these
languages. You type in the lyrics in English, by following this scheme and
then with a click of a button, you can have the lyrics rendered in Tamil,
Telugu, Sanskrit or Kannada.

- **Gamaka modeling with MIDI**, a purely experimental application which lets
you model *gamakas* as any arbitrary curve and have your computer play it
using MIDI. This application is a Java applet. Arun Kumar has provided a java
applet for graphically defining a gamakam and generating MIDI files\(^{17}\).

10. **Carnatic Raga APP**

    This application provides reference to over 950 ragas used in Carnatic
music that includes Melakarta (fundamental) and Janya (derived) ragas. The
most interesting feature of this app is that you can search for a raga from its
svaras (notes) and vice versa. It also provides the Arohanam (ascending scale)
and Avarohanam (descending scale) of each raga that can be played with flute instrument or female vocals. Carnatic Raga is a must have app for any Carnatic music enthusiasts. Upcoming features: Tala reference, Carnatic instrumentalist’s biography, Carnatic lessons explore, learn and enjoy. If we want more details and any questions about South Indian Music free to ask through www.carnaticraga.com/iphone/contact and suggest a new feature that you would like to see in the future updates. You can also follow this app on facebook\(^1\).

11. **KrithiBook APP:**

   It is an essential companion app for all Carnatic Music connoisseurs. It is a handy quick reference to more than 4600 songs (*krithis*) featuring most of the major Carnatic Music composers. For each song, the title, the raga (with *Mēkā, Arōhaṇa, Avarōhaṇa*), the tala and the composer is provided. All information is cross-referenced in multiple ways resulting in a simple, yet powerful storehouse of knowledge. Lyrics and word-by-word meaning are provided for all Tyāgarāja krithis\(^1\) and lyrics are provided for all Muttusvāmi dīkṣitar krithis\(^2\). It is bound to come to handy to many of us during carnatic music concert to look up information about songs being rendered. However, even at other times, it is an invaluable knowledge-based on Carnatic music. The song title, names of ragas, talas and composers are shown using roman diacritics and thus conveying accurate pronunciation detail. The song detail page also shows the information in Tamil (iPhone, iPad & android), and
Devanagiri (at present only in the iPhone & iPad versions) scripts. It also features a "fuzzy" search that is extremely flexible and can find a song even if you provide only an approximation of its spelling. For example, Sitamma Maayamma, Seetamma Mayamma, Seethamma Mayamma will all locate the song \textit{Sitamma Mâyamma} by \textit{Tyāgarāja}. Indispensable to Carnatic music rasikās with Smart phones all over the world expand the knowledge on composers, krithis and ragas. Now it is available at both the iPhone App Store as well as the Android Market. Click on the icons at the bottom of the page to go to the iPhone APP Store/Android market link for KrithiBook.

2.3 Development in Recording

2.3.1 Studio Recording

The quality of recordings has been improved and technology has helped the music industry promote DVD's and CD's during the 20th century. Many composers made use of this new technology to experiment with musical sounds. Technology has revolutionized the method of music recording too. High level precision and clarity are achievable with the help of modern technology. Studio Recording is a sound recording done in a professional recording studio. Ideally the space is specially designed by an acoustician to achieve the desired acoustic effects. The typical recording studio consists of a room called the ‘Studio’ where instrumentalists and vocalists perform; The ‘Control Room’ which houses the equipment for recording, routing and manipulating the sound. Often, there will be smaller rooms called ‘Isolation Booths’ present to accommodate loud instruments such as Nadaswaram,
Mridangam, Thavil, Saxophone to keep these sounds from being audible to the microphones that are capturing the sounds from other instruments or vocalists. We have developed technologies to analysis and describe melodic and rhythmic aspects of the music and have also developed a web platform with which to use these technologies to explore a data repository composed of audio recordings plus related information about the music. A recording studio may also include additional rooms, such as a vocal booth - a small room designed for voice recording as well as one or more extra control rooms.

Recording studios generally consist of three rooms, the studio itself where the sound for the recording is created (often referred to as the "Live Room"), the control room where the sound from the studio is recorded and manipulated and the machine room where noisier equipment that may interfere with the recording process is kept\textsuperscript{21}. HCL Technologies, done some really transformational work for the music industry, providing technology solutions (including Application Development, Maintenance and Infrastructure) to top 3 of the 4 world's leading recorded music companies of world music.

### 2.3.2 Equipment found in a recording studio commonly includes:

- Mixing Console
- Multitrack Recorder
- Microphones
- Two way speaker system to communicate with the artists.
• Reference Monitors, which are Loudspeakers with a flat frequency response Digital Audio Workstation.

• Music workstation Outboard effects such as, compressors, reverbs or equalizers.

Current software applications are more reliant on the audio recording hardware than the computer they are running on. Therefore typical high-end computer hardware is less of a priority. A sizeable portion of both commercial and home studios can be seen running PC-based multi-track audio software. An isolation booth is a standard small room in a recording studio which is both soundproofed to keep out of external sounds and kept in the internal sounds and like all the other recording rooms in sound industry. It is designed for having a lesser amount of diffused reflections from walls to make a good sounding room. All rooms are soundproofed such as with double-layer walls with dead space and insulation in-between the two walls, forming a room-within-a-room. All rooms in a recording studio may have a reconfigurable combination of reflective and non-reflective surfaces to control the amount of reverberation. Recording on tape, allowed composers to record sounds, then change and rearrange them to create a new musical work. The piece was then played back through loudspeakers. This meant that the composer did not need performers to interpret the music. Many composers now use synthesizers and computers to create sounds. Others have composed pieces using a mixture of electronic sounds and traditional instruments.
2.4 Current Recording Techniques

2.4.1 Live Recording

Recording live-to-2-track, we'll need a 2-track recorder. Currently the main types are:

- Minidisc recorder
- Flash-memory recorder
- Laptop computer with a sound card and sound editing software.

2.4.1.1 Minidisc Recorder

Hi-MD Mini disc recorder records uncompressed CD-quality wave files on low-cost Hi MD Mini Discs. One gets up to 94 minutes recording time on a 1 GB disc. They come with a stereo microphone and ear bud headphones. Because mini discs cost little and are removable, a mini disc recorder is a good choice, if one is recording in the field for a long time and can't dump a flash-memory recording to a computer. The Sony software provided can be used to copy mini disc files to a computer. Mini disc recorders can skip, if bumped so one needs to hold the recorder steady.

2.4.1.2 Flash-Memory Recorder

A Flash - Memory Recorder is a portable digital recorder with no moving parts. Also called a solid-state recorder, it records into a flash-memory card such as a compact flash or secure digital (SD) card. It has a 2 GB card which records 2 hours of 24-bit/44.1kHz wave audio files. Flash-memory recorders can record MP3 or uncompressed PCM wave files (which are CD quality or better).
These recorders have a number of features to consider. Power comes from replaceable or rechargeable batteries. Available mike connectors are XLR, 1/4" phone (6.35mm socket) or 1/8" phone (3.5mm socket) with or without 48V phantom power or plug-in power. Some units come with built-in or plug-in stereo microphones. After making a recording, the UP port in the recorder should be connected to the USB port in a computer. The recorder shows up as a storage device on the computer screen. The recorded sound files can be dragged and dropped to the computer's hard drive for editing and CD burning. The files transfer in a few minutes. Then the flash-memory card is empty, free to make more recordings. Nearly all Flash Memory Recorders include a mike-gain switch to accommodate both quiet and low sound sources. Low gain or low amplification (0 to 15 dB) is for recording loud sounds (rock concerts); medium gain (25 dB) is for recording medium sounds (acoustic music, lectures, or rehearsals); high gain (50 dB) is for recording quiet sounds (nature, quiet talking). Most recorders have AGC (automatic gain control) which sets the recording level automatically depending on how loud the sound is. Some units include a limiter to prevent recording above 0 dB level which otherwise would cause distortion.

2.4.1.3 Laptop Computer with a Sound card and Sound Editing Software

Another stereo recorder is a laptop computer with recording software. To get audio into the computer, a two-channel audio interface is used. This is a mike pre-amp with two mike inputs and a USB or fire-wire port which connects to a similar port in the laptop. If the computer lacks that port, a USB or fire-wire PC card adapter can be used. It
is a PCMCIA card with a USB or fire-wire port. The card can be plugged into the
laptop and its port can be connected to the audio interface. Another option is a card Bus
card which is an advanced PCMCIA card with faster speed. Some examples of
recording software are Adobe audition, MOTU digital performer, Steinberg cubase SX
and Nuendo, Digidesign pro tools, Cakewalk music creator and Home studio. When a
laptop recording is done, it is ready to be edited. The wave files need not be transferred
from recorder to computer as with other methods.

2.5 Multi-Track Recording

In the 2000s, many performers have recorded albums using only a personal
computer as a tracking Machine. This is all that is needed to use a computer as a
digital multi-track. Alternately, the standard analog to digital interface in a personal
computer can be used to capture sounds, although with less fidelity. This is done
simply by connecting either a microphone to the microphone input jack, if a vocal
track is to be recorded or a stereo cable from the electronic device (such as a
synthesizer or a instruments amplifier) to the line input of the sound card. Computers
with appropriate software and hardware can record multiple audio tracks at once. This
audio interface hardware sends audio signals to the computer and may interface with
the computer via a PCI card, USB or FireWire connections. There is a range of analog
to digital interface options available. Popular brands include Apogee, Digidesign,
MOTU, Lynx and Prism. Multi-track recording makes it possible to capture sound
from several microphones or from different 'takes' to tape or disc with maximum
headroom and quality, allowing maximum flexibility in the mixing and mastering
stages for editing, level balancing, compressing, limiting and the addition of effects such as reverberation, equalisation, flanging and many more.

Multi-track recording also allows any recording artist to record multiple ‘takes’ of any given section of their performance, allowing them to refine their performance to virtual perfection. A recording engineer can record only the section being worked on, without erasing any other section of that track. This process of turning the recording mechanism ON and OFF is called ‘Punching In’ and ‘Punching Out’.

South Indian Music recordings started using playback singing techniques. The artist can first record the percussions and strings without his / her presence and then dub the voice. Background music for Carnatic music records also came into an effect. A new genre of music directors for Carnatic albums emerged. People started enjoying listening to music with background scoring. During multi-tracking, multiple musical instruments and vocals can be recorded, either one at a time or simultaneously, onto individual tracks, so that the sounds thus recorded can be accessed, processed and manipulated individually to produce the desired results. Today a sufficiently dedicated and talented artist can literally produce an album in his/her own bedroom, using only his/her personal computer as a professional tracking machine. In order to use a personal computer as a multi-tracking device, a minimum of three items is required:
1. A personal computer which has a sound card

2. Multitrack recording software is installed and running on the computer. Suitable software is available at low prices or even free, in the case of free and open source software.

3. At least one or more recording sources such as a musical instrument, a good microphone to record the vocals of a singer and any other sources of sound to be recorded $^{23}$.

The instruments and singers voices are recorded as individual files on the computer’s hard drive and function as tracks as per traditional multi-tracking. Effects such as reverb, chorus and delays can be applied by the computer software. When the musicians are happy with the sound, the multiple tracks are mixed down onto two clean tracks, again within the multi-tracking software. Finally, the final stereo recording can be burned to a CD which can then be copied and distributed.

2.5.1 Multi-track Software Using Computer

Adobe audition, Pro-tools from Digidesign, Sonar from Cakewalk, amplitude from Magix, Cubase from Steinberg and Logic Pro from Apple$^{24}$. Mixcraft from Acoustica, Reaper from Cockos and N-track from FA-Soft are affordable alternatives to high end multi-track software. Audacity and Ardour are popular open source programs for multi-track recording. Jokosher (open source as well) is quite new but seems to be gaining popularity among Linux users. The 2007 Songs galaxy has
released an audio multi-track format that is delivered in a single file which loaded into the player software gives the user the ability to mute or adjust the volume level of individual instruments. Tracks can be exported as an individual .WAV files can then be loaded into other multi-tracking software for further editing. Also though the percussions might eventually be mixed down to a couple of tracks, each individual percussion instrument might be initially recorded to its own individual track. The percussion combined can occupy the largest number of tracks utilized in a recording. This is done so that each percussion instrument can be processed individually for maximum effect. A common percussion effect is the slow back and forth panning of a percussive instrument's sound in the stereo field from the left to the right channel in a song. Equalization (or EQ) is often used on individual percussions, to bring out each one's characteristic sound. The last tracks to be recorded are usually the vocals (though a temporary vocal track might be recorded early on either as a reference or to guide subsequent musicians). One reason for this is that singers will often temper their vocal expression in accordance with the accompaniment. For classical recordings (particularly instrumentals) where multi-tracking is chosen as the recording method (as opposed to direct to stereo) for an example a different arrangement is used, all tracks are recorded simultaneously. Sound barriers are often placed between different groups within the orchestra, e.g. violinists, percussionists, etc. When barriers are used, these groups listen to each other via headphones.
2.5.2 Swar Studio

Swar studio is the first sequencer primarily aimed at music from India, whether modern or ancient. It includes both Indian and western virtual instruments to allow you to create your favourite songs from the film or classical repertoire without the need of any additional tool.\textsuperscript{25} With swar studio, you'll be able to reproduce your favourite popular hits of the past or present days or create your own personal songs for a fraction of the price of setting up an expensive home studio. Audition them in sync with your host, then drag & drop them on your tracks. Simple as that from version 1.2 onwards, swar studio also includes karaoke features so you can record your own voice on a new audio track or just sing along with friends.

2.5.3 Swar Studio in a Glance

- Fully featured, cost-effective DAW (Digital Audio Workstation).
- Audio tracks for recording or dragging audio loops.
- Instrument tracks for recording from keyboard or dragging MIDI loops.
- 41 built-in virtual instruments.
- Accepts custom Vsti/audio units synths
- Library panel with hundreds of included MIDI loops
- VST and Audio Unit effects
- Piano Roll editor for midi loops
• Link to external tools
• Quantization
• Drag loops directly from Swarshala or Swar librarian
• Export to audio or midi files
• Karaoke panels to view/create lyrics in different notations, including Indian scripts.
• Windows and Mac OS X
• Free updates

2.5.4 Built-in Virtual Instruments

The built-in virtual instruments are Accordion, Bansuri, Bass, Bells, Dhol, Dholak, Drums, Electric Bass, Electric Guitar, Ghatam, Guitar, Harmonium, Manjeera, Piano, Saxophone, Sitar, Synth Pad, Tabla, Tambourines, Tanpura, Trumpet, Tumbi, Vibraphone, Violin and Whistle.

2.5.5 War-Trax

Add Indian voices to our sampler keyboard or to our favourite sequencer when it is plugged in VST it won't work for our MIDI setup, so Swar-Trax (or Swar Trax) is the right solution for you. Through its Akai S1000 CD (Reason NN-XT, Motif and Tyros versions also available), users of EXS24 sampler or specific keyboards will be able to load our 74 Indian instruments within minutes. Once they do, they can use our
large collection of included MIDI files and create tracks with their own creativity, through the included Swar librarian software\textsuperscript{26}.

2.5.6 Platforms

- Windows XP/Vista/Windows 7&8
- Mac OS X version 10.4 or higher

2.6 Audio Restoration

The Audio restoration is a generalized term for the process of removing imperfections (such as Hiss, Crackle, Noise, and Bbuzz) from sound recordings\textsuperscript{27}. An Audio restoration can be performed directly on the recording medium (for example, washing a gramophone record with a cleansing solution) or on a digital representation of the recording using a computer (such as AIFF or WAV file). Record restoration is a particular form of an audio restoration that seeks to repair the sound of damaged records.

Modern audio restoration techniques are usually performed by digitizing an audio source from analog media, such as lacquer recordings, optical sources and magnetic tape. Once in the digital realm, recordings can be restored and cleaned up using dedicated, stand alone digital processing units such as De-clickers, De-cracklers, De-hissers and dialogue noise suppressors or using digital audio workstations (DAWs). DAWs can perform various automated techniques to remove the anomalies using the algorithms to accomplish broadband de-noising, de-clicking and de-crackling as well as removing
buzzes and hums. Often audio engineers and sound editors use DAWs to manually remove ‘Pops and Ticks’ from recordings and the latest spectrographic 'Retouching' techniques allow for the suppression or removal of discrete unwanted sounds. DAWs are capable of removing the smallest of anomalies, often without leaving artefacts and other evidence of their removal. Although fully automated solutions exist an audio restoration is sometimes a time consuming process that requires skilled audio engineers with specific experience in music and film recording techniques.

2.7 Digital Recording

Digital audio has emerged because of its supreme usefulness to sound recording, manipulation, mass-production and distribution. The modern day distribution of music across the internet through the on-line stores depends on digital recording and digital compression algorithms. The digital audio chain begins when sound is converted into electrical signals 'on or off' pulses rather than electro-mechanical signals. The advantage is the ability to be copied or transmitted more conveniently and with lower loss. In a digital recording system, sound is stored and manipulated as a stream of discrete numbers, each number representing the air pressure at a particular time. The numbers are generated by a microphone connected to a circuit called an analog to digital converter or ADC. Each number is called a ‘sample’ and the number of samples taken per second is the sample rate. Ultimately, the numbers will be converted back into sound by a digital to analog converter, connected to a loudspeaker. The numbers are in the binary number system in which only two characters are used, ‘1 and 0’.
Digital sampler (MS I Ronald) is a device, through which one can record or sample any acoustic instrument. The recorded sound can be adjusted to any pitch, svaras and could be availed for any purpose. For instance, in the advanced versions of digital samplers, if we record a stroke of veenai, this sound can then be changed, stretched and used to necessary svaras. Hence recording a single stroke will enable us to have the sound of veenai in the required pattern without actually recording the pattern live. The tonal quality of this recorded material is said to have more richness than original recording.

The most recent and revolutionary developments have been in digital recording, with the invention of the first purely electronic consumer recording format, the MP3 digital music file accompanied by the invention of solid-state computerised digital audio players like the iPod. New technologies such as Super Audio CD and DVD-A continue to set very Hi-fi digital standards.

Modern Hi-fi equipment usually includes digital audio signal sources such as CD players, digital audio tape (DAT) and digital audio broadcasting (DAB) or HD radio tuners, an amplifier, a pre-amplifier and loudspeakers. Some modern Hi-fi equipment can be digitally connected using fibre optic TOSLINK cables, Universal Serial Bus (USB) ports (including one to play digital audio files) or WiFi support. One Modern Component that is making fast gains in acceptance is the music server consisting of one or more computer hard drives that hold music in the form of computer files. Resolutions which exceed CD quality are capable with lossless files and appropriate playback equipment. If the Hi-fi system includes components such as a projector, television, satellite decoder, DVD
player, surround sound amplification and multi-channel loudspeakers, then it is often called ‘Home Cinema’ or ‘Home Theatre’ system.

2.8 Digital Editing

A digital audio editor is a computer application for audio editing. These editors are the main software component of a digital audio workstation. For use with music editors designed for use with music typically, allow the user to do the following:

• Record audio from one or more inputs and store recordings in the computer's memory as digital audio.
• Edit the start time, stop time and duration of any sound on the audio timeline.
• Fade into or out of a clip (e.g. an S-fade out during applause or after a performance) or between clips (e.g. cross fading between takes).
• Mix multiple sound sources/tracks, combine them at various volume levels and pan from channel to channel to one or more output tracks.
• Apply simple or advanced effects or filters including compression, expansion, flanging, reverb, audio noise reduction and equalization to change the audio.
• Playback sound (often after being mixed) that can be sent to one or more outputs, such as speakers, additional processors or a recording medium.
• Conversion between different audio file formats or between different sound quality levels.
Typically these tasks can be performed in a manner that is both non-linear and non-destructive. An Audio signal processing, sometimes referred to as audio processing is the intentional alteration of auditory signals or sound\textsuperscript{31}. As audio signals may be electronically represented in an either digital or analog format, signal processing may occur in an either domain. Analog processors operate directly on the electrical signal, while digital processors operate mathematically on the binary representation of that signal.

Audio broadcasting (be it for Television or Audio Broadcasting) is the biggest market segment (and user area) for audio processing products globally. Traditionally the most important audio processing (in audio broadcasting) takes place just before the transmitter. Studio audio processing is limited in the modern era due to digital audio systems (Mixers, Routers) being pervasive in the studio. In an audio broadcasting, the audio processor must prevent over modulation and minimize it when it occurs, maximize overall loudness and compensate for non-linear transmitters, more common with medium wave and shortwave broadcasting.

In Carnatic music, when the artist sings with Manodharma it is very difficult to sing to exact timings. A very proficient audio engineer who also has a good knowledge of music can edit this so that it is within the time limits and also has the continuity. Editing is done mainly for aesthetics but proper editing also keeps a listener's attention.
2.9 Technological Developments in Music Concerts

In the eighteenth and nineteenth centuries, musical programmes or ‘Kutcheris’ took place in a different environment that none of the current methods can match its tediousness. During those periods, kutcheris were performed at the temples witnessed by the kings. There are several issues that one can observe in this period.

- The difference in venue
- Number of members performed
- The acoustics of the place performed
- The kind of compositions rendered
- The type of audience.

During the periods of the Pallava king, Chola king, kutcheris or music programmes were the modes of entertainment. They either took place in the palace or at the temple’s 1000 pillar or 100 pillar mandapas or halls. The persons responsible for the musical programmes are known as the ‘Asthana vidwans’ or court musicians.

2.9.1 Acoustics for Musical Programmes

Most halls in the palace and in temples are built using granite stones which is a great absorber of sound. With the halls being built with such stones, the halls had natural echoing effects. Apart from this, music has been widely used during deity procession at temples where the Periya-melam was widely used. The processions of deity were followed by the ‘Othuvars’ or singers reciting the hymns of ‘Thevaram’. These were the only mode that public had an access to music and kutcheris. The scope
was less compared to the following years. During the period of the ‘Thyagra
Moovar’, Thirugnana Sambandar, Thirunavukarasar and Sundarar, the kutcheris were
only based on hymns they composed and sang. Apart from it, other composers during
their era only performed at temples during festivals and on request of the ruler at the
palace for the entertainment. These composers did not publish their compositions as
they dedicated them to the deities of temples, which they felt personally attached to.

The trend slowly took diversion in the early twentieth century. Kutcheris were
done at temples in an open air systems. The Public were allowed to witness the
kutcheris and appreciate the divinity in south Indian music. During the period of
Sennangudi Srinivasa Iyer’s contemporary the open air theatre system gained its
popularity. No doubt the audience filled the area, an artist concerned were prepared
for the kutcheris, the number of music set were united where on entire orchestra was
only provided music to be shared among the artist on stage singer in this case took
lead and had the vibrant voice to sing with the accompaniment in open air theatres
with single music.

2.9.2 Acoustically Treated Hall

This type of hall is fully treated to record and reproduce music with high
fidelity - definitely a delight for the musician and the audience is equally happy to
hear quality sound reproduction, since the microphones used are matched properly to
the speaker systems, the distortion level comes down. Also, since a suitably treated
hall will definitely be equipped with suitable audio system so the ambience is near
perfect. The audience also, being undisturbed by other interruptions is able to be appreciative.

Music audiences, on the other hand, have inherited quite a developed expectation of particular sound qualities for various styles and eras of music. Rooms resonate just like organ pipes. The room is an unwanted extra instrument playing along with the musicians. The design goal for a good music room is to minimize this coloration which is strongest at bass frequencies between 20 and 200 Hz\textsuperscript{32}. At higher frequencies the room still has an influence but resonances are much less of a problem since it is much easier to obtain high absorption at higher frequencies. This section deals with acoustic design within the subwoofer band of roughly 20-100 Hz. Barriers, screens and full enclosures can be constructed with the modular curtains. Noise levels can be typically reduced with a properly designed curtain enclosure. Lighter, flexible and less expensive than metal panels, curtains may be right for noise control. Broadcast and recording studios all require acoustically rated sound control doors and windows. Fabric wrapped acoustic wall panels are another option to lower noise. Rigid fibre-glass board wrapped in fabric are attached to the walls or ceiling will provide a nice looking sound absorbing surface. Floating floors, floating ceilings and floating walls refer to a means of vibration which isolates these structures from the surrounding construction. Sound is transmitted through vibrations into spaces where noise is not welcomed. Performance halls, rehearsal rooms, broadcast and recording studios and acoustic test enclosures are typical spaces that require vibration isolation. The diffusers smooth out the reverberation and make the sound reasonably uniform at different seats. The absorptive curtains allow the reverberation time of the room to be
adjusted to control the loudness of ensembles of various sizes. Movable panels
behind the performers serve to group the early reflections and also (probably more
important in this small hall) help the performers hear each other.

Till Now, We dealt how different rooms react to science of acoustics and also
made a study of how a room can be developed acoustically by a musician himself. As
we study further, we now deal with various microphones, amplifiers and speakers to
enhance the quality of listening and how they can be aptly utilized.

2.9.3 Audio Systems and Their Application

An audio system is a playback portion that plays back content and outputs at
least an audio signal, an acquisition portion that acquires an external audio signal, a
generating portion that is based on noise collected by a sound collecting device,
generates a noise cancellation signal to reduce the noise, a switching portion if the
acquisition portion has acquired the external audio signal when the playback portion is
playing back content, switches an output signal from the audio signal to the external
audio signal and a synthesizing portion that synthesizes the output signal from the
switching portion with the noise cancellation signal.\[^{33}\]

2.9.4 Sabhas and Concert Growth

In the old days the rajas and maharajas patronized the arts. After 1947, the
government stepped in but as we all know that patronage had its limits and limitations. In
today's liberalized context, corporate sponsorship has proved to be an effective method for
providing innovative technological and infrastructural inputs for strengthening classical
music. Corporate social ethics should include a responsibility to the environment, social justice and also to revive preserve and innovate in the fields of art and culture. But this is also in the larger self-interest of the corporate world. Corporate contributions on a large and well-orchestrated scale combines with a dynamic vision could leverage this extraordinary heritage and knit it together into a cohesive urban statement and transform Chennai into a global cultural hub, attracting talent, visitors and tourists like Salzburg or Venice. This would benefit the corporate climate too. After the 1990's, the Sabhas have undergone tremendous changes. Usually the Sabhas were visited only by a few old aged people. But today, they attract large number of youth people of both artists and rasika’s. They also attract international audience. The interior of the sabhas have been modernized and amazing sound systems have been installed. The Sabhas have become sophisticated and luxurious with centralized air-condition. Hence, they are now very popular. Thus, the changes in the infra structure of the sabhas has led to the popularity of the South Indian Music. Since the sabhas are given wide popularity, this in turn, leads to an increase in the number of music rasika’s and learners.

Developments in technology made music reach worldwide with the introduction of auditoriums and better sound system acoustics. Several sabhas or auditoriums in Tamilnadu made the initiation to bring the music, composed by the Vaggeya Karas to popular state, by inaugurating the ‘Margazhi Music Festivals’ in the month of December in all the sabhas, especially in Chennai. The sabhas that helped music develop are the Music academy, Naradha ghana sabha, Krishna ghana sabha, Mylapore fine arts, Indian fine arts and many more. These sabhas have set great standards and qualities in awarding the musicians awards such
as the Sangeetha Kalanidhi, Yuva Kalabharathi, Sangetha Bhushanam in order to increase the strength of quality music in the south Indian music area. Certain sabhas have accommodated a small hall for kutcheris but nevertheless, artists never defined that offer as to go to performed at such area is considered prestigious. In the olden days budding youngsters did not easily get a platform to showcase their talent. However, in this age, we have plenty of opportunities through sabhas and television for budding artistes to exhibit their talent and reach out to people. We have always believed that budding talent must be given the maximum encouragement and opportunity. Looking at the names of youngsters who are slated to perform in various sabhas this december festival and in many other music festivals, it is indeed very heartening to note that the youngsters of today are taking keen interest in carnatic classical music, in spite of the overwhelming western influence. Further, we are all aware of the rigors of modern day lifestyle and as to how it has become mechanical and monotonous.

This trend of having kutcheris at halls or sabhas, has developed for the better in the mid twenty first century with the aid of technological advancement to have built such spacious auditoriums with super sound systems. For example, in the 1950’s the Music Academy only had a small hall with minimum seats and at that time, air conditioned halls were very costly to build. The kutcheris, then took place in such environments. Directions took place in the direction providing cushioned seats. The halls were built bigger in space complying with the rules in order to project good sound system and mikes were given for all artists on stage. The halls were air-conditioned. The aim of music academy was to provide good music, comfort for the musicians as well as to the audience in house.
Camatic music established systems of tuition, sabhas and festivals. “This led to the
launch of the first ITC Sangeet Sammelan in 1971 after which they were convinced of
the need to formalise the guru-shishya tradition, which crystallised in the form of the
Sangeet Research Academy set up in 1978” says Ravi Mathur, executive director of
the ITC sangeet research academy. For a larger number of companies, their interest in
music has been a branding exercise aimed at connecting with their consumers.

In India, a few new organisations such as SPIC MACAY and YACM emerged
around 20-25 years ago with the specific aim to create and nurture tastes among the
younger generation and have achieved varying degrees of success. "Almost every
child of an NRI is learning classical music or dance in the US. And, unlike in India,
this has broken the language and caste barrier", he adds. This heightened interest in
Carnatic music could also be explained by the success of the Tyagaraja aradhana
celebrated in Cleveland and in most major cities in the US every year or organisations
like CAMAGA (Carnatic Music Association of Greater Atlanta) and others arranging
for regular music kutcheris (concerts). According to R Ramachandran, founder-
secretary of Hamsadhwani, the NRI sabha started 12 years ago, "each year, they (NRI
artistes) enthral the audience by presenting an improved performance". The sabha,
started in 1990 with 300 members, has seen its membership base swell to 2,700. "We
hold the NRI festival without eyeing the dollar income", he said, and here is what the
government says "The month that has significance to shaivaites and vaishnavites sees
an influx of tourists. The government is looking for tie-ups with sabhas to cater to this
segment. Our dance festival at Mamallapuram is much sought after", said state
tourism secretary V.Iraianbu. A collection of concerts organized by individual
sabhas (music galleries). "I gives also the opportunity to the students to learn from
the masters of the art, be it through concerts or lec-dems", says Kercan. In fact, it is
considered fashionable to be at the music festival which has become a networking
platform for bureaucrats, CEO's etc from the region. N.Murali, president, Music
academy, the premier organisation for promoting Camatic music agrees "Like
duration, the number of people, who visit the city during the period has gone up
rapidly". Srivatsa Krishna an IAS officer and Camatic music buff says, "for having
not just survived but grown stronger with an increasing younger audience base the
very same GenNexT with access to YouTube, Napster and cable TV 24x7". Sure,
from less than 100 concerts in the 1970s to nearly 2000, now, the music season has
come a long way.36

HCL's technology has enhanced the music industry, HCL has also been involved with
the madras music academy in the last few years in a small way. In Chennai the HCL Concert
Series have been running successfully at this very auditorium each month for about the last 4
years now. We have also established the Kiran Nadar Museum of Art [KNMA] in Delhi, one of
India's first private philanthropic museums - not just as a site for display but as a vital platform
for a total experience of art and culture. The Cleveland Tyagaraja Aradhana Committee,
an established and traditional organization is creating an ensemble of North American
musicians for their upcoming celebration in April 2007 who will be trained by well
known senior artists from India using video conferences. Vijay Siva, Bombay
Jayashri, Sanjay Subrahmanyan, Unnikrishnan, Sowmya, T.M. Krishna and Ranjani-
Gayathri, to name just a handful, brought a fresh breeze of creative genius to the
scene. The December Season was rocking once again. Halls were filling up before
one could say Muthuswamy Dikshithar. Ardent fans were queuing up outside sabhas at the crack of dawn to buy a limited number of daily tickets on offer. NRIs from the U.S., sporting Chicago Bulls caps, along with an incongruous Namam or Vibhuthi could be seen waving currency notes at ticket counters. The smiles were back on the creased faces of the sabha secretaries. Even the LCD projection at the mini-hall was fully sold out on some days. A time has, perhaps, come for us to think of creative and technological solutions to meet this resurgent demand for high quality classical music fare. As members and rasikas have been noticing and feeling, the on-going infrastructure upgrading and modernization program has created a vastly enhanced ambience. All this has been possible through the large-hearted and spontaneous generosity of the wonderful donors who have been individually acknowledged earlier. Some of the unfinished work like modernization of the stage is planned to be taken up after the season37.

It is the Margazhi season in Chennai which means a series of Carnatic music festivals for a month. Music buffs can enjoy the concerts with 5.1 digital sound, special effects and pop corn too, because Margazhi ragam, a first of its kind two-hour long concert movie was released in theatres this Friday. "Every time I went for a Carnatic concert, I thought the presentation was not doing justice to the caliber of the musicians and if it is presented better, it will be more evocative and attract audience" says Director, Jayendra and the artistes too are looking forward to this initiative. “I am sure this will create a stir. It’s been presented in such a contemporary and beautiful way, everyone is going to love it" says Carnatic singer, Bombay Jayasree.
"There's a necessity to upgrade the level of presentation of classical arts. In content we are contemporary, classical and traditional but in presentation, we are not as contemporary. This gives a contemporary presentation for the art form that lives today" says Carnatic singer, TM Krishna. With an exorbitantly high ticket rates in these sabhas, a movie theatre could well be a better option for the rasikas (audience) to watch a concert this season and Margazhi ragam might just be leading the way for many more such movies to follow. "During the season, there's a lot of floating population. People from other cities and abroad come to listen to our concerts" said a Carnatic singer, K Gayathri. Sabhas wear a new look in Chennai during this kutcheri season. Corporate banners and hoardings have sprouted up everywhere, trying to maximize their profits. Many local brands like Nalli and Rmkv have been patrons of the Chennai music festival for years now. Not only does it serve their purpose to promote art, it also gives them a platform to reach out to their potential customers who are the NRI’s."People attending the music festival, mostly 100 % of them are potential customers. They buy silk sarees for some occasion or the other at their houses" says Nalli Kuppusamy Chetty, Managing Partner, Nalli Silks.

"Previously one particular year NRIs didn't visit India and our sales fell down nearly 50 percent" he adds. However, it is not just sari and jewellery brands. This time sponsorships have come from national brands as well and the sabhas say this season has seen almost a 40 percent increase in advertising revenues and sponsors haven't just stopped at advertising on hoardings and banners. It now extended to sponsoring entire shows of renowned musicians.
"It is a top class mileage where we get out of this. In a Kutchery like Sudha or Nityashree the number of people, the kind of people that we see there and the selling that happens there gets us a great mileage", says CP Rangarajan, President, Axis Bank.39

2.10 Instruments

Guitar is a western musical instrument, very popular and common in western countries but now it is acquiring its position and popularity in Indian and South Indian Music also. The migration of guitar to India took place through the coastal areas like Goa, West Bengal, Bombay by the Portuguese and the Britishers and gradually spread over to many parts of the country. Two varieties of acoustic guitar are there, Spanish guitar and Hawaiian guitar. Spanish guitar is very popular in western countries & India. It is widely used as an accompanying musical instrument for Indian classical music light music such as Ghazals, Geet, Bhajans & film music in India. The style of playing Hawaiian guitar may be compared with that of vichitra-veena of our Indian instruments. The only difference is that in place of the steel rod, a solid glass sphere (like a paper weight) is used in Vichitra-Veena. There is another variety of Guitar i.e. electric guitar where the sound is amplified by the electric media. Late Dr. Lalmani Misraji (Veena Maestro & Ex- Dean of Faculty of Performing Arts, Banaras Hindu University) did a great effort and was successful in getting the Hawaiian guitar included in the competitive test of string instruments, organized by UP Sangeet Natak Academy, Lucknow in 1976. Hawaiian guitar can afford pure classical abstractions as beautifully as any other plucked instrument of indigenous origin which is now
enjoying pride of place in the galaxy of India’s concert instrument today. We can proudly say that the adaptation of guitar to Indian Classical Music will play a great role in ‘Universal Cultural Integration’ of East & West\textsuperscript{40}.

2.10.1 Sruti Generation

Sruti is the drone which is used in Indian music. This was normally provided by a stringed instrument (tampura) or a small hand pumped reed instrument (Sruti peti). However, for over twenty years, electronic srutibox have been in use by many musicians and learners. They have recently been refined to the present day ‘Electronic Tampura’. In southern India the electronic ‘Sruti Box’ has become essential for any musical persons.

The Sruthi Box and Tambura programs are accessible from the opening screen of Rasika or Gaayaka-Sishya\textsuperscript{41}. 
The program enables you to convert your PC into a sruthi box with sruthis ranging from lower octave of 6 kattai (A) to 8.5 kattai (C# of upper octave). Normally the sa, pa, Sa tones are heard and their relative volumes can be adjusted to suit your taste. For playing or singing in Madhyama Sruthi you can pull down the volume of 'pa' and push up the volume of 'ma'. The total volume can be adjusted from the screen itself. The sruthi box works with the 'MIDI' device of the sound card and the tone can vary from PC to PC. By entering different instruments in the 'Instrument' box, the tone that suits you most can be obtained. The numbers of instruments likely to suit sruthi box are given on the screen. There is an option to save the current sruthi and instrument chosen.
There is also a provision to adjust the sruthi minutely anywhere between two standard sruthi values. This is useful for instruments like flute whose basic sruthi cannot be adjusted.

2.10.2 Tambura

For a great effect you can play both the sruthi box and tambura simultaneously and adjust their relative volumes. The tambura is a similar program with the synthetic tambura sound used throughout the software but here the drone can be generated continuously. The available range is from lower octave of 6.5 kattai (A#) to 6 kattai (A). For sruthis, higher than 6 you can use the corresponding lower octave as the tones are rich in harmonics and will blend well with voices in both octaves.
2.10.3 Tambura program (executable file Tamb6.exe).

With serial numbers RGS202:F50 and earlier the sound does not stop when the 'Stop' button is clicked. It becomes necessary to close the program to stop the sound. However, selecting and playing another sruthi does not require closing the program. The problem has been set right. The revised executable Tamb6.exe may be downloaded. To use this file take the following steps.

- Download the file tamb6.zip. It may get automatically saved in 'Downloads' folder of our PC. If not, save it in a temporary folder.
- Open Windows Explorer. Navigate to the RasikaV2 folder, locate Tamb6.exe and rename it as Tamb6Prev.exe. (If you do not see the extension .exe in your PC it does not matter. Just rename the main part of the file name.)
- Open this zip file/folder downloaded in step 1 and copy the file Tamb6.exe into the RasikaV2 folder. If you had correctly renamed the original Tamb6.exe file you will not get any warning.
- Now the Tambura program will work normally.

We can download Tuner32.zip (about 750Kb) which contains all the 11 files for running the tuning test program Unzip Tuner32.zip into a new folder. Run the program Tune32.exe by double clicking on the filename in windows explorer.
2.10.4 Keyboard

Sathyanarayanan want to become a musician playing Carnatic on keyboard. He went on to give his first concert at the age of six. According to his parents, this child prodigy is otherwise like any other kid at 12. He has already finished over 400 concerts and has done about five carnatic albums on the keyboard. Not only has he won the Pogo Amazing Kid Musician Award recently, the boy has also been featured as the Youngest Indian to pass the 4th grade keyboard examination conducted by London's Trinity College. It might be quite easy to play but understanding the nuances of carnatic music and reproducing them on the keyboard is not a child's play but Sathya's just proved that wrong. He now dreams of getting his name into the Guinness Book of World Records.43

2.11 Global Level

With the abnormal growth of mobile and internet technology, the world has shrunk into a small village. The national Linguistic and Social boundaries have been demolished. The world has also become multicultural. In the past, the different musical traditions remained isolated from each other. There was no contact between one music tradition and another. A great artist was popular only in the region in which he lived. But today, the scene has changed, musicians travel frequently and vastly. The different traditions come into contact with each other. As a result, new avenues are open. Today, an artist is popular not only in his/her region but all over the world.
This has led not only to the popularity of the artist but also to the music. He has a
global audience and the South Indian Music gains global recognition.

Karaikudi R Mani and Ghatam player T.V. Vaasan about the explosive nature
of South Indian 'Carnatic' percussion. Karaikudi R. Mani is one of South India's most
popular Mridangam player and duly a celebrated and respected composer, performer
and educator as well as musical director of several internationally acclaimed Madras
based percussion ensembles. His unique style, virtuosic ability and rhythmic
ideological innovations for the mridangam have attracted the support of students from
around the globe namely the USA, Canada, UK, France, Switzerland, Australia,
Singapore, Malaysia and Japan. "Paul Grabowsky happened to listen to some of my
music and he found that this music is very suitable for jazz. I have always been
interested in western music, recently we went to Finland for the Helsinki music
festival and we played with the Philharmonic Orchestra together with one of the great
composers in Finland. He wanted to do something with this percussion instruments
and the Philharmonic Orchestra, it was very successful that music now is
choreographed for dance companies in other countries. So we are used to it, playing
with these western musicians" says Mani.

The process of learning and teaching Indian classical music while no guns
travel up to South Africa to impart person-to-person training, the South African
scholars have developed a team that has been experimenting with digitising sounds of
Indian instruments. They have succeeded in producing the Gamak of Tabla through
software and are working to perfect the mend. They are confessed that South Africans
whether white, black or coloured are interested in Indian music and would profit if
Indian musicians and scholars would offer to share a part of their heritage. They were delighted by the software that Shri Kiran Vyas has developed over years. This message was echoed by Shri Shankar Ghosh who runs several Tabla schools in France from random parts of the globe through cassettes, e-mail, chatting and on-line conferencing. Well known international percussionist and entrepreneur, Dr. Rohan Krishnamurthy offered the sixth South Indian percussion institutes at the Eastman school of music at the University of Rochester in New York.

Shannon Donald who lives in Mumbai does not mind going for a Carnatic concert these days. And that's not because she grew up listening to south Indian classical music. "I love the singing style now" says the singer who was amazed to see musician Bombay Jayashri being a picture of composure at MTV's coke studio a year ago, "I was a backing vocalist on the episode in which she sang with Bollywood singer Richa Sharma. Though we had a long day when it came to shooting her parts, she nailed every note effortlessly" says Donald about Jayashri who has worked with Egyptian singer Hisham Abbas, done Jugalbandis with Hindustani musicians Ronu Majumdar and sung for Bharatanatyam dancer Leela Samson's performances."I do collaborations because I like doing new things," says Jayashri. According to fellow artists like Flautist S.Shashank, it could have been Jayashri's love for experimentation that helped 'Life of Pi' director Ang Lee zero in on her for the Oscar-nominated project."I got to work on guitarist John McLaughlin's album 'Floating Point' because I work with world musicians. The album was nominated for a Grammy award in 2009," says the flautist who will release an album, 'Here and Now' with Danish guitar maestro John Sund. "What draws western musicians is the ability of Indian musicians
to improvise”, says Shashank who has worked with legendary Spanish guitarist ‘Paco de Lucia’ and with jazz musicians. Shashank loves the freedom to explore the flute outside the traditional concert format of Camatic which is a text-laden system and favours the vocalist. "It is a great learning experience. Also, as India is flooded with film music this is the only way classical musicians, especially instrumentalists, can carve a niche for themselves and establish commercially. These artists still face the criticism that they are diluting pure music. "When, the late Pandit Ravi Shankar did jugalbandis, he was accused of doing the same, now, jugalbandis have become the norm," says Jayashri. To mandolin player U.Shrinivas, collaborations mean more recognition for classical music. "My audience is bigger, my students come from all over the world to learn to Camatic music," he says, and to Shrinivas who is happy and proud of Jayashri's Oscar nomination this could well be the best time for Indian classical music. Carnatic music is at a crossroads on the issue of aesthetic diversity, especially as its international reputation increases. Vocalist Susheela Raman wears her Indian influences like a silken shawl. Well established in England and a gold-selling artist in France, Raman has now set her sights on America, with a new album, Love Trap (Narada) and a series of East Coast concert appearances. Online digital music brings in the maximum global revenue and it has potential for further growth. The gradual proliferation of temples and the mushrooming of associations like CMANA (Carnatic Music Association of North America) and the Tyagaraja Aradhana Festivals held in several major centres such as Cleveland and Pittsburgh keep the interest alive in this great art form. Perhaps the highly materialistic environment in which they are placed drives them to the other end of the spectrum to
seek the harmony awaiting them in Chennai. The author has written this article from New York. That music senses to move east and west. Classical music engages the higher senses it is immensely satisfying at an intellectual plane. “I am looking to merge this with the earthiness of percussion and rhythm to create something that wants to move your body as well as your senses”, says Ponty. She is impressed by the great rhythmic complexity of Indian, especially Carnatic, music. Recently, she is performed with an American Bansuri player and met Tabla player Zakir Hussain and violinists L Subramaniam and L Shankar but confesses disarmingly that she has miles to go before she fathoms the richness of Indian classical traditions.

The violin duo of M. Lalitha and M. Nandini renowned as the only female duo in Asia to perform World music, South Indian classical, fusion and Western classical music. Since both of us were based abroad, we were selected as cultural ambassadors with Fulbright and Charles Wallace trust fellowships, we were in the U.S. and the U.K. respectively. Though we have tried to adapt the strong bowing technique of Western classical to Carnatic music to enrich the music. Carnatic music is special indeed. There is always a sense in which cross-cultural interactions serve not only to broaden one’s horizons but also to set one’s own cultural identity more strongly in relief. Like Carnatic music, Western medieval music is concerned more with the song than with the symphony and indeed the voice must be seen as its supreme instrument as well.

For those who already follow other forms of music, it is easy to make the crossover to Carnatic. For jazz lovers, there are many songs that resemble the brass-
band music of yore. Muthuswamy Dikshitar (1775-1835), one of the greatest composers of Carnatic music wrote songs set to such tunes. He and his contemporaries had a keen interest in music from the Western world, thanks to the British Raj. Dikshitar even composed a song set to the tune of the British national anthem God Save the Queen (Santatam Pahimam, set to the scale of Shankarabharanam ragam).

For those who like the scatting in jazz, Carnatic offers Konnakol, the practice of using vocal cords as percussion, and the improvised rendering of the notes of a ragam by a singer who wants to display its various shades called manodharmam or kalpana swaram.

For lovers of Western classical music, there is a veritable treasure chest of Carnatic compositions. Dikshitar began the experiment two centuries ago and the tradition has continued to this day. An album by the Madras String Quartet—flowing Carnatic melodies on a stream of Western harmony—manages to blend the two systems tastefully. Film musician Ilayaraja has composed an oratorio of Thiruvachagam a set of Tamil hymns to Lord Shiva written in the Ninth Century which has been performed by the Budapest Symphony Orchestra⁵⁰.

2.12 Fusion

Thanks to the advancement technology, many innovative things are implemented in musical programmes have become possible. One such new idea is
'Fusion'. A fusion is a musical concert in which both the Western and Oriental instruments have come together to share the south Indian music platform. A fusion could not be dream of about fifty years ago. Because of amazing developments in sound engineering, it has become possible. Many fusion concerts are coming up every day. When popular film singer Karthik did an album called Music Alike kritis in a modern musical format the feedback was excellent. He took up Saint Tyagaraja's popular composition, Bantureethi Kolu and started working on it. “I treated it more like a Latin song and tried a Latin groove on the kriti. It was an insane idea but it worked really well. I had konnakkol playing in the middle of the song with a dub step groove. For this particular concert, director Rajeev Menon who fixed some beautiful animation visuals to go with it,” he says. When we add chords and rhythms to a popular kriti and package it differently, it makes it more interesting. If you take some Carnatic songs and treat them intelligently, they work well with all kinds of audiences. A fusion music concert held by LK Charitable Trust saw The Elements performing in front of a packed house in Vani Mahal. The group consisted of Haricharan Seshadri on vocals, B.S.Purushotham on the kanjira, S. Muralikrishnan on percussions, Navneeth Sundar on the keyboard and Naveen Kumar on bass. They were later joined by Mandolin U.Rajesh. The concert, keeping true to Carnatic sensibilities, started off with a prayer. Gnana Vinayakane in Gambeera Nattai to Lord Ganesha. Lalitha and Nandhini violin duo also been performing Jugalbandis that involve one of us along with a north indian artiste. Every system has its own beauty, though we have studied a number of musical genres of the world, we see to it when we play Carnatic we do not mix the other styles. Carnatic Music, through its wider
reach has now fused with Western music and a lot of concerts naming themselves as ‘Fusion’ or ‘Jugalbandhis’ are increasing. This creates a loss of essence in Carnatic Music and all concerts tweak the seam ‘Tukhadas’.  

2.13 Webcast

While the concert continues in village Tirupoontuntti, district Thanjavur, webcasts keep you in the circuit. It also signifies the role and value of IT in music, whether it is through recording, continuation and spreading of music in digital format or the use of internet to make music accessible to millions of music lovers and connoisseurs who are separated by distance from live concerts.

2.14 Jingles

His life is proof that music knows no boundaries. Straddling musical genres from classical Camatic and Hindustani to ad jingles, pop music and singing for films in at least five languages, singer Vijay Prakash is growing to be a name to reckon with in film circles. Bhagavatula Vijay Prakash has naturally trained in Carnatic music at home. Vijay Prakash has over 3000 jingles, 10,000 voiceovers for advertisements and scores of popular film songs in various languages under his belt. In the beginning he turned student to Suresh Wadkar was a finalist of Zee TV’s musical reality show Sa Re Ga Ma and started out by doing jingles for advertisements. His recent notable voiceovers are Kabhi chhutpataa for Knorr Soups and Na sar jhuka ke kabhi for HDFC Life Insurance. His repertoire also includes dubbing for Telugu and Tamil versions of Hindi films, performances of classical fusion with Zakir Hussain and Selvaganesh and
composing music. He has also sung for 25 foreign films including a Chinese film. When he was among the four singers who sang the high notes in A R Rahman's Oscar award song *Jai Ho* in *Slumdog Millionaire*. My background in Carnatic music and Hindustani music he learnt later in Bombay helped his analyse and executed the musical scores\(^5\).

Sudha Raghunathan is not only the face of Carnatic music but now also a brand that corporates want to cash in on. Sudha is the brand ambassador for Pothy's Parampara pattu, a role that only film stars and models took on earlier. "It is a dual purpose, One, it is doing a service to the society to art form and the second is that they also get a mileage and pride out of it. It's something they can pat themselves about", says Sudha Raghunathan, Carnatic Vocalist\(^6\).

**Summary of Technology**

South Indian Music was not a mass based art. As such it was seriously pursued only by a small section of society. After technology was implemented that section has certainly grown today both in terms of performers, learners and listeners. Thanks to the modern technology, Carnatic music is now readily available on a tap in the seamless universe of the internet and the globalization of America, Canada, London, Australia, Dubai, Norway, south Africa, Malaysia, Singapore etc, many gigabytes of Carnatic music files flow continually through all feasible living places like home, office, joggers' park, gym, aerobics, yoga classes, spiritual séances, in the car, on the hill, on sea cruise and while flying over the clouds, etc and a wide range of recording devices covering iTunes, Shuffle, iPad, iPod, tablets, PC, laptops, memory stick and CDs.
At the concerts in Chennai in the December season, one sees a fair smattering of young people. They may well be fans of other forms of music as well. There is no need to expect an elite dedication to Carnatic music among Indian listeners, same as new NRI fans for Carnatic music are being created in the West and indeed all over the world. Today’s human musical life is through digital sound technology and information technology using various media. The quality of the tone of a traditional musical instrument is already fixed. A computer can be used for high quality music recording with the help of sound recording software, mixer and microphones. This recording can be done in a normal studio or even in a room. Computer can be programmed to create so many varieties of musical notation, produce music of all the compositions for future reference. But computer is only a machine which requires a musician to produce music. Computer can be considered as a most advanced musical instrument.

Technology has not only attracted the young and new generation lovers only. It has also opened up new avenues for the old and orthodox musicians like Lalkudi Jayaraman, the world famous violinist. Lalkudi who was strict disciplinarian and purist has released a series of albums entitled ‘Lalkudi Thillanas’. These albums are fine examples to show how technology has attracted a traditional Carnatic musician. Thus, technology is universal and it favours the old, the young, the traditional, the modern, the rich and the poor alike.
End Note of Technology in Music


17. Ibid 16.


19. V. Govindan, Error! Hyperlink reference not valid..


23. en.allexperts.com/e/m/mu/multitrack_recording.htm.


34. Lisa Mary Thomson, ET Bureau The Economic Times, For Companies Music is a Branding Exercise Mar 21, 2010.


37. Sri.N.Murali, President, The Music Academy, Madras, At the SADAS, January 1, 2009.

38. Sources by www.ibnlive .in.com.


40. Dr. Kamalashankar was presented the first woman exponent of Hawaiin Guitar in India in December 1992 at the Music Academy, Chennai. Viewed on 5th may 2014 by artnet.com.


43. Ibid-39.

44. Andrián Pertout Speaks Published in the 'Mixdown' Monthly Issue March 3, 1999 Beat Magazine Pvt Ltd.
45. Sandhya Soman has Posted Comments in The Times Of India that the Carnatic Music, Classic Collaborations helps it reach Global Audience on TNN | Jan 12, 2013.


49. This Article appeared in the May 1999 Issue of Keertana, The Newsletter of the Carnatic Music Circle Melbourne. It has since been reprinted in other Indian Publications.

50. Sources by business.in.com


54. Sources by ibnlive.in.com Views on 12.03.2014.
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