OPERATION AND MAINTENANCE OF NEW TECHNOLOGIES IN THE COURTROOM

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1.0   Introduction

The Information and Communication Technology (ICT) Audio-Visual tools had connected people and businesses around the globe in a way never before envisioned and currently is making its way to the courtrooms. In many parts of the world, ICT tools are fast becoming useful in implementing time, manpower and cost management strategies in organization business decisions. Within the judicial services, Judges agree that in order to bring about improvements in justice dispensation, ICT tools are essentially required to drive productivity.

2.0   Courtroom Technologies: An Overview

The use of courtroom technology has changed the justice delivery system landscape over the years. This may not be as new as we may think especially in our own side of the world, for these things has been with us for a while maybe in an analog and obsolete form, although in a way limited in usage.

Courtroom technology usage is dated back to the 1970's when slide projectors, overhead projectors, and videotape players made appearances in trials. They were followed in the early 1980s by the more sophisticated laser disk players that did the same work but more reliably and with better quality. In the early 1990s,

CD players began to offer more versatility, evidence cameras were often seen in big trials, and telestrator units provided the capability to "draw" on the computer screen. In the mid-1990s, the laptop computer gradually began to supplant much that had gone before it, and, with the most recent boosts in chip capacity and storage media, the laptop can now do almost all of the courtroom tasks involved in the presentation of exhibits. Everything lawyers use as exhibits—photos, documents, lists, transcripts, video clips, maps, diagrams, drawings, time lines, graphs, relationship charts, spreadsheets, organizational charts—can now be created, ordered, animated, and projected with surprising ease, and at a fraction of the cost of older methods.

2.1   Factors That Determines Choice Of Technology For Courtroom Use.

 1. **The Visual Display Devices**. These are the screens or monitors on which the exhibit is displayed for everyone in the courtroom. Digital monitors and projection screens come in various sizes, types, and capabilities and can be placed in whatever position in the courtroom that best accommodates the needs of the litigants and the judges.

2. **The Audio Output Devices**. Audio output devices include speakers, earphone headsets, and infrared transmitters that allow everyone in the courtroom to hear the judge, lawyers, and witnesses and to hear the audio from audiotapes, videotapes, or video - conferences used in the proceedings.

3. **The Cabling.** Cables serves as the communication pathway and connectivity links between the visual display devices and other equipment (like evidence cameras and computers) transmitting to them; and also provide the separate connections between the audio output devices and the equipment (such as microphones, computers, and tape players) transmitting to them.

4. **The Equipment Transmitting to the Visual Display Devices**. These are usually evidence cameras, computers, and projectors. These equipments, as controlled by the operator, transmits the image to the monitor or projection screen. In some configurations an evidence camera or a computer transmits images directly to a monitor or set of monitors. In other configurations, the evidence camera or computer transmits to a projector which, in turn, puts the image on a large projection screen.

5. **The Equipment Transmitting to the Audio Output Devices**. Audio input usually comes from microphones at the bench, witness stand, and counsel table; likewise from audio and video-tape players; from computers playing digital audio and video sources; PDA's (personal digital assistance) and from video-conferencing equipment.

6. **The System Controls**. At the heart of this are equipment that does the switching when the need arises, they synch various devices together to make this happen. The system controls include a kill switch at the bench so that the court can control the monitors within view of the jury. The controls also include a touch panel to switch various inputs on and off. For example, if both the evidence camera and a laptop computer are used to display exhibits, the control panel will switch from one of these inputs to the other as required.

2.2   Principles Of Operation Of AV/ ICT Technology In The Courtroom.

We shall be discussing these with reference to the legacy project implemented in the Supreme Court of Nigeria, that is the retrofitted courtroom and with specific emphasis on the installed systems.

2.21 Digital Audio conference system.

The courtroom audio system is the most fundamental form of courtroom AV/IT designs. The microphones devices are with push-to-talk button for mic activation during the court session, other accessories includes speaker module, ear-piece plugin/ volume control and goose neck detachable microphones / microphone plugin module.

As implemented in the supreme court of Nigeria, there is microphone control server that controls all connected microphone units within the courtroom audio system, at the backend were installed in daisy chain and routes the digital audio to the DSP's(**Digital Signal Processor**). The audio control unit is equipped with digital interfaces for professional interfacing with other devices, including ADAT and AES/EBU. With the aid of an RS232 interface the audio control interfaces with camera system using the Extron's control processor (**CROSSPOINT**).

We also have the wireless microphones that helps to cover area within the outer bar of the courtroom that are without the delegates microphones and the wired microphones to support the wireless microphones.

Of note as well is the **Assistive Listening System**. This is used to accommodate people with hearing loss. An infrared hearing assistance system is used in

implementing this. It includes, an infrared emitter panel, A Transmitter, Headset receivers with replaceable batteries.

Other devices used to implement the audio conference system include the **Dante Controller**. This helps us to route the signal between the various audio device to our sound card through the usage of the CISCO Switch thereby producing a digital multi-channel, low latency audio output that is sent to our recording device (FTR). Another associated devices includes the digital signal processor (DSP) which is connected to the Dante network through the cisco switch to the cross-point and other Dante enabled devices within the AV network. We equally have the audio amplifier (Extron NetPa 1001,70v) this receives channel of audio from the Dante network over a standard local area network, allowing for decentralized distribution of audio throughout the courtroom using the audio output device of wall-mounted speakers.
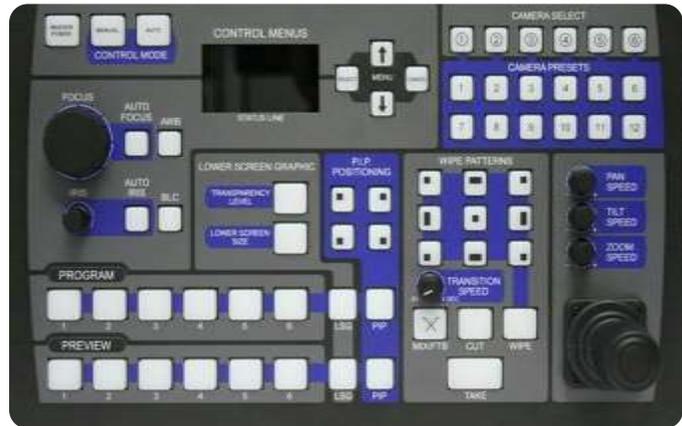
2.22 Camera System.

The cameras are positioned in such a way that it can capture the entire courtroom during each court proceedings. They serve the purpose of transmitting images to the monitors and screen devices in the court room and provide recording functionality to the courtroom.

It should be noted that such cameras must be in the range of HD at the minimum which can be used with PTZ(pan-tilt-zoom) controls used with professional video cameras in television studios, sporting events, and other space. They are commonly referred to as **ROBOS**, an abbreviation of robotic camera.

The camera units are located in the courtroom and the CCU(camera control unit) are located in the rack in the control room. They are remotely control by automation systems, that is through their RS 232 interface.

There is also the production mixer that communicates between the audio conference system and the camera devices. This can be either the digital or the analogue type. It works in collaboration with the camera units and used to programme pre-set viewing positions that have been synched to the microphone units in the courtroom. Once a microphone is active the information is been received by the camera video mixer where the tracking position has been store. This enables the camera to focus on the active microphone that is in use through voice activation programming configuration for discussion system. The current image is what the camera will feedback to the screen via the distribution system.

2.23 The Recording Solution.

The recording system captures the combined auto tracking video and the audio feeds from the camera and audio conferencing system. This is made possible by the combined effort of the video server and the **ForTheRecord**(FTR) the global leader in digital court recording technology application residing on the PC system mounted on the rack in the control room.

2.24   The presentation System.

The document cameras, also known as the visual presenters, are real-time image capture devices for displaying an object to a large audience. Theoretically, all objects can be displayed by a document camera. Most are simply placed under the camera. They are also called evidence camera.

This device work the extron DTP T DSW 4k 333 which is a three input switcher for sending display port, HDMI, or analog video, audio over a shielded CATx cable to the display and audio outputs.

The shareLink wireless collaboration gateway allows anyone to present content from a laptop , smartphone, or tablet on a display, transforming the courtroom into a collaboration space. The shareLink technology deployed within the courtroom, supports simultaneous display of slides, documents, graphs, and photos from up to four devices without physical connetion through a cable. It also includes a moderator mode to ensure only approved content is displayed. In spaces with sight line concerns, slides can be viewed on a personal device via a web browser. The shareLink is compatible with windows and apples computers as well as android and apple smartphones and tablets.

There is the courtroom display screen and a state-of-the-art flush mounted in desk pop-up display monitors to accommodate all presentations to the entire court. This together with other monitor devices displays the

overview of all presentations and the real time court session.

2.25 AV Control System.

The AV control system is an integration of both the back-end central control and management devices that are critical to the overall functionality of the front-end equipment. Under this we have equipment such as:

The Touch Panel(Table Top Touch Link Pro Touchpanel): This is located in the control room and is been used to power on/ shut down the entire AV solution

as well as perform all required function like, streaming, camera view, presentation view and PC view. Also there are other two units in use by the presiding Justice and the court registrar/ clerk. Although the two units have same functionality with the one in the control room except for few admin features that are disabled and varies in sizes.

The touch panel works hand in hand with the extron custom DTP cross-point. It is the central processing unit of the entire audiovisual solution. It allows the various audio and video inputs to be managed and feed to the various output devices like DTP DA8, HD Distribution Amplifiers etc. to the display units.

It should be noted that the touch link panels features and functionality can be design/customize to accommodate the peculiarities of individual courtroom proceedings that is, The High Courts, Court of Appeals And the Supreme Court.

Some of its highlighted features includes:

The Home page, Start button, Court registrar button, Podium button, Wireless Device button, Audio Out Control button, Display Control Button, Power button and the Help option button

2.3   Essential Requirements For AV / ICT Equipment Optimal Operation In The Courtroom.

   a. Efficient cooling

   b. Ensure vents are unobstructed.

   c. Allow extra space around / between amplifiers, e.t.c

   d. Logical cabling

   e. Access to front and real for programming, cabling, e.t.c

   f. Serviceability

   g. Logical cabling and group like cables where appropriate

   h. Reduce inter-rack cabling

   i. Maintain appropriate cable segregation

   j. Place heavy equipment low in the rack

   k. Occupational health and safety.

To ensure continued correct operation after AV system has been equalized and calibrated ,install tamper proof devices over any exposed knobs, switches or other controls on, Amplifiers, AV switcher, Signal processing equipment, Any equipment with front-panel power switch, and Any equipment where operation of front panel controls may affect operations in control system.

3.0   AV / ICT Technologies Maintenance

Generally speaking, Maintenance can be defined as the continuous process of keeping something in good working and physical condition. Although proper operation is essential to any technology however, maintenance is also important for any audio-visual system installation. Without maintenance, an AV/ICT system installation cannot survive. Maintenance includes the correction or prevention of faults in hardware or software and the replacement of parts. This is a daily

responsibility and it includes verifying that technology is fully operational and ready for its original or designed capacity. To this end, the court ought to use an operational checklist to determine, each morning before the court session whether each piece of technology is ready and, if it is not, to take immediate corrective action to include notifying the court registrar and clerk of any problems that cannot be remedied immediately. When possible, full maintenance in a courtroom or other location requires that the associated space be free at the time from judicial and/or high profile activities so as to allow the audio-visual /IT technical support team to perform their job without any disturbance. Maintenance can be classified into three main categories: preventive, corrective, and break-fix.

3.1   MAINTENANCE OBJECTIVES.

- Reduce breakdown and down time.
- Improving equipment efficiency
- Optimizing equipment utilization
- Improving inventory control
- Implementing cost reduction and providing budgetary control.
- Minimize energy usage
- Maximizing production

3.2   PREVENTIVE MAINTENANCE

 Preventive maintenance is an equipment maintenance strategy based on inspection, replacement, dismantling, or remanufacturing an item at a fixed interval, regardless of its condition at the time. Proper preventive maintenance of our equipment is essential in order to ensure that our assets work efficiently and safely. Furthermore, a proactive approach to maintenance will help us to

save you money on equipment repairs and replacement. Traditionally, this occurs once a year. At a minimum, it should include:

- General hardware system checks (e.g video cameras and lenses, pan/tilt heads, lens drive units, including checks of system performance. Replacement of bad cables and connectors
- Cleaning of critical system hardware and video monitors — particularly in those pieces that use cooling fans.
- Checking and adjusting power supplies

However, planning a preventive maintenance schedule, and determining what needs to be done when, can be extremely difficult as you will have to track data manually in order to determine when servicing needs to be performed based on time and usage data. This is where Enterprise Asset Management (EAM) tools can prove to be essential for many businesses.

3.3   CORRECTIVE MAINTENANCE.

Corrective maintenance is required to correct a failure that has occurred or is in the process of occurring. This may consist of repair, restoration, or replacement of faulty system components. Corrective maintenance can be performed at any time prior to equipment failure.

3.4   BREAK-FIX MAINTENANCE

Break-fix maintenance refers to a break in service due to hardware or software that would prevent stable conduct of business operation. If a failure occurs with a hardware or software component, the court should immediately be informed of the system(s) status and how such failures might disrupt court operations / session. If possible, the appropriate system support officer or administrator

should request that the court recess for enough time for emergency repairs or equipment replacement.

3.5   AV / IT Assets Maintenance

IT Asset Management is an important business practice, as it is in other business environment, each of our courts must have an IT assets maintenance policy. IT asset management involves maintaining an accurate inventory, licensing information, maintenance, and protection of hardware and software assets utilized by an organization. Organizations need an inventory of the IT hardware assets used to support their operation and automated solutions. Judicial Bodies including the court must know what IT hardware assets they have and where those assets are located in order to protect them. When determining what information to track for a particular asset, consider the following: Specific information pertinent to the particular hardware asset; Physical location; Unique identifier of the asset; Support contract and information.

Each judicial body should address distribution, purchase, audit, and removal of the licenses used in day-to-day business. Properly tracking licenses facilitates efficient use of resources and reduces the probability of violating licensing agreements and laws.

All judicial bodies should ensure that they establish adequate support and maintenance contracts with all AV/ICT equipment suppliers and vendors. This should also be a determining factor in vendor selection. In addition, AV/ICT equipment's must be adequately labeled.

3.6   AV / IT Maintenance Services Targets.

Dust: Dust is the enemy of your system. AV solutions are about preventing damage, and one of the first – and more critical – potential problems to

investigate is dust. Dust can get trapped in a variety of audiovisual equipment. Over time, this can cause significant problems at the worst time.

Improper calibration: How your machine is calibrated plays an essential role in whether it's going to work when you need it to. AV maintenance services make sure everything is operating correctly.We should have experts among our technical team with understanding of audiovisual equipment to check this for us. It can also be done in collaborations with our AV consultants/support team.

Electrical signals: We should use diagnostic equipment to make sure all electrical signals and pathways are working as they should be. These signals deliver all essential components to your screen and speakers, so they must be taken care of.

Software: We must always check to make sure all drivers and software components are up-to-date. Something as simple as an overlooked software update or out-of-date driver can cause a breakdown during the court session and other important occasions.

Cables and hardware: Torn and frayed cables are a recipe for disaster. Our AV maintenance services should include a check of all physical components in our system. Degrading or frayed cables should be swap out and replaced with new ones. Also check any casings to make sure they aren't damaged. Finally, make sure all cables are properly arranged . This avoids tripping or damage.

3.7 AV/ IT Routine Equipment Check List

Audio

- ☐ Verify audio is working from all program sources
- ☐ Verify audio is working from all microphone sources
- ☐ Test far end audio for teleconferencing system
- ☐ Test far end audio for video conferencing system
- ☐ Test assisted listening system

- ☐ Test audio with recording devices
- ☐ Inspect the general audio cable management
- ☐ Creates back up of DSP programming

Video

- ☐ Verify all cameras sources are displaying on appropriate destinations
- ☐ Test on all monitors
- ☐ Test on all projectors
- ☐ Test on all codecs
- ☐ Test on all recording devices
- ☐ Test all video source inputs
- ☐ Test all cameras
- ☐ Inspects the general video cable management

Control

- ☐ Verify control of all devices
- ☐ Test timing response of user buttons on touch panel
- ☐ Test wireless connection of touch panel
- ☐ Creates back up of control system programming

4.0   Conclusion

Building a technology-enhanced courtroom is a learning experience and depends on the preferences of those in control of the installation.

Effective use of the equipment requires at least one person with a sufficient understanding of the technology to use it for its intended purpose. Therefore, our IT personnel's should be equipped with the proper requisites knowledge and

training for them to be able to operate, manage and maintain the AV/IT equipment's that will be deployed in the various court effectively and efficiently.

It is imperative for court management to take necessary steps in ensuring that the court leverage on modern AV/IT technologies in other to enhance the justice delivery system in our nation.

It's equally advisable that each court management should go for the AV/IT technology that they can afford at the moment; there is always room for improvement at a later time, notwithstanding it should be done in line with proven global best practices. The minimum requirements of the courtroom should be the video display and audio sound systems, input connections for video and sound, and an evidence camera. With just these features, you are ready to host or present the majority of evidence offered in most proceedings.

The post COVID-19 era society will largely depend on use of technology for business and other human activities and as such the judicial bodies especially the court can't afford to be left behind. The time to act is now.

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