

# The Computed-Aided Judiciary – How the Contemporary Technologies Change the Courtroom Design?

Grazyna Hryncewicz-Lamber

Wroclaw University of Technology  
Faculty of Architecture

grazyna.hryncewicz-lamber@pwr.wroc.pl

**Abstract.** The introduction of multimedia electronic systems changed the legal practice over the last decade. The presence of computer-aided techniques such as information booths, digitalized case lists and land registers, e-courts in selected case categories, and electronic registration of the proceedings have entered the courts. Juristic buildings are permeated by sophisticated technologies, some of them influence the spatial organization of the courts. Has this change impacted courthouse architecture and furnishings? In order to answer this question the paper presents some implications of the implementation of computer-aided jurisdiction. The paper concentrates on the problems of architectural and acoustic requirements for the courtroom in view of electronic registration of the court proceedings; spatial needs for new types of rooms ie. electronic land register reading rooms, e-courts, secure teleconference and hearing facilities, server rooms; spatial and ergonomic requirements for the location of electronic information devices such as secure info-booths and electronic case lists.

**Keywords:** architecture, IT in courtroom, spatial organization of courtroom.

## 1 Introduction

The image of the courthouse is one of the most traditional institutions conceivable. Law court is often depicted as a historic building, whose architecture conveys the concept of reliability, permanence, and venerability, whereas the institution itself has undergone a very serious change, largely due to the introduction of contemporary technologies. To quote F. L. Lederer: “the impact of technology on courtrooms and courthouses is, and will be, multifaceted. (...) A proper understanding of its effects on courtroom and courthouse design requires a review of contemporary courtroom technology. Courtroom technologies can be divided into the categories of administration, interpretation, court record, counsel communications, remote appearances, information/evidence presentation, jury room deliberations, assistive technologies, and infrastructure”[8].

The introduction of IT equipment does not only change the functioning of space, and bring new furnishings into existing rooms, it has broader implications, perceptible

to an architect. Traditional courtroom space was conceived without considering such architectural questions as: ergonomics of furniture and fixtures, acoustics, sightlines and light control. The functionality of existing space without any changes seems doubtful. In order to provide proper working conditions in a courtroom, adaptation of existing rooms for IT purposes should be associated with extensive refit. Conversely, the technological revolution did not to date, change the basic functional patterns, like access zones, functional clusters of rooms and like, some innovations, like emergence of e-courts, have no architectural impact at all.

## 2 Architectural, Lighting, and Acoustic Requirements for the Courtroom in View of Electronic Data Presentation and Registration of Court Proceedings

Until the dawn of the 21st century the courtroom was basically a traditional space, often in a historic building, with few technological improvements such as sound amplification systems. From the onset of the 21st century, many countries experimented with different tools for automation of the court records [14] in search of the most effective and least time-consuming procedures. For more than 10 years now the Research Center for Legal and Economy Issues of Electronic Communication at the Faculty of Law of Wroclaw University (later referred to as CBKE) has been developing IT solutions for Polish justice system. One of research fields of CBKE was electronic civil court procedures recording system, being now implemented throughout the country. Polish Ministry of Justice regulations as to the court records since 2010 instigated digital recording as the obligatory form of court record of all civil cases in appellate and district courts. The technology is put into operation in nearly 500 existing courts as well as in new ones [6], without any guidelines for architectural refit of adapted spaces as yet.

**Architectural Considerations.** The introduction of IT technologies in the juristic system is viewed by a vast majority as purely technological innovation, unrestrained by the architecture of courthouses. However, it is the comfort of work, not the access to technology, that is at stake while launching IT systems in the courtroom. To quote one of the court IT systems pioneers, hon. Justice Janis Graham Jack, US District Judge Southern District of Texas,: “technology (in court) can be very efficient, very exciting, it can also be very disruptive”[5]. Court electronic technologies and courtroom fittings have to match in order to form a working environment. This working environment cannot be properly designed without architectural refit, even if many faults of the surrounding space may be overcome by technological solutions.

Architecture has to accommodate the new requirements of the space by designing:

- ergonomic placement of permanent and movable equipment,
- adjustment of sightlines for better perception of projection screens and/or computer screens,
- corrections of room lighting,
- adjustments in building acoustics,
- aesthetic blend of the IT environment and justice facility interior design standards.

Architectural design determines the level of flexibility of the space of a courtroom by adding well chosen finishes and fittings, like raised access flooring, adaptive suspended ceiling elements, acoustic wainscoting, location of additional sockets, and movable furniture [12].

**Adaptive Reuse Problems.** Extensive use of IT equipment within historic buildings may cause serious problems with the hardware[12]. The most challenging, apart from the functional issues are: placing of ducts for HVAC and computer cables, furniture upgrades, window blinds, and acoustic adaptation. Any works, conducted within a listed building should be reversible, ie. allow the future generations to restore the original state of the building. This rule of conduct poses a very hard task for the designer and calls for very flexible solutions with as much movable elements, as possible.

**Courtroom Acoustics.** To design a functional courtroom one has to decide on its physical dimensions considering desirable sightlines and acoustics. These should be augmented by the choice of finishes and equipment as well as furniture. Courtrooms are considered by the acoustic science as small to moderately sized rooms, therefore their proportions can be derived from Bolt's conditions: a tool for dimensioning rooms with good acoustic characteristics [15], and furnished with so-called acoustic adaptation finishes.

Good quality of court acoustics can be achieved in courtrooms where reverberation times do not exceed 1 sec.(0,7 – 1), and background noise level at 20-25 dB [10], with RASTI index no less than 0,6 [15]. With the implementation of video recording of court proceedings, and the introduction of extensive amount of electronic equipment the requirements as to the courtroom size, finishes and their acoustic characteristics changed only slightly. The main considerations remain: reverberation time, speech transmission, and acoustic insulation of the justice building and its elements [2].

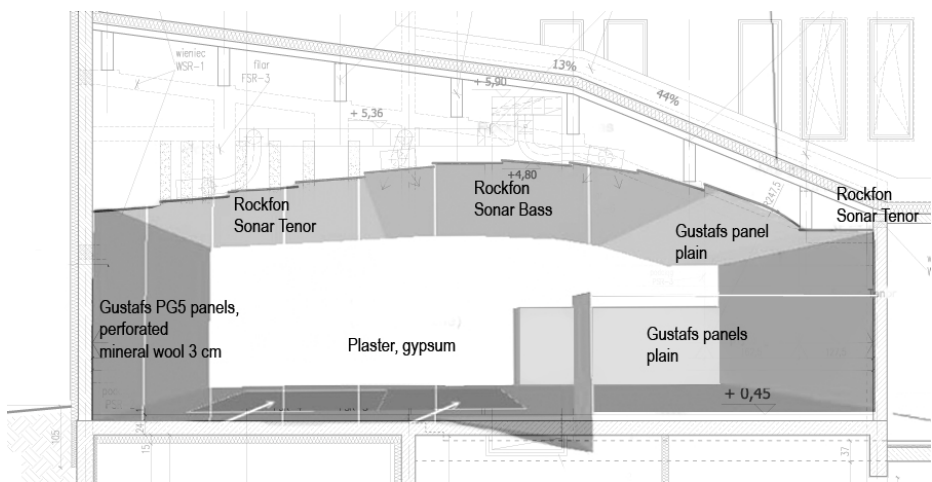
In a very small courtroom the main source of sound is direct sound propagation, but within room larger than 150 m<sup>3</sup>, the reverberated sound prevails. Acoustic conditions of hearing are associated with sound absorption, of which 90% is provided by the persons present [10]. Courtroom designer should take into account the problem of decreasing number of people attending court proceedings, and consequently, allow for a larger amount of absorbing surfaces in the room to attenuate this effect (see Fig 1).

Currently, the main design problem is the quality of the recording of court proceedings. Acoustics for the best hearing conditions is not the same as the proper acoustics for recording. To obtain the preferred recording conditions shorter reverberation time (RT factor lower than 0,6 sec) is desired, which may be considered in the architectural design of new premises; the undesirable effects of indistinct speech in existing buildings can be eliminated by the use of directional microphones for recording, and directional loudspeakers within the room.

High speech intelligibility seems to gain importance as well as the use of acoustic absorbers to exclude long reverberation times, and provide comfort zones for counsel. Although the judge, litigants, counsel and witness are located within the area of good direct sound propagation (up to 10-15 meters from each other), the recording of the proceedings may suffer from noise, long reverberation times, fluttering echoes within

the courtroom. Sense of privacy in consultation between the litigants and their legal counsel within the courtroom and for the judges should also be considered in the high-tech court. The principles of room acoustics require that the front part, containing the judges' bench and seating for litigants should be furnished with sound reflective surfaces for early reflections, esp. from above [1], while for obtaining the aforementioned privacy there should be overhead absorbers introduced [3]. Alternatively, acoustic comfort may be drawn from the introduction of sound screening noise, a solution, that has been lately put into practice in some US courtrooms.

Although Polish courtrooms are in general considerably smaller than US courts, because of great variety of their dimensions and finishes it was not attempted to draw guidelines for acoustic adaptations of courtrooms [3]. To avoid problems with acoustic refit, the in-situ experiments of CBKE, conducted in a historic courtroom in Wroclaw District Court were concluded with highly technological solutions. A method of recording separate sound tracks for 4 different zones of the courtroom: the judges, litigants and witness, electronic mixing and noise reduction, was chosen and later established as the official requirements of the Ministry of Justice for courtroom recording technology[4].

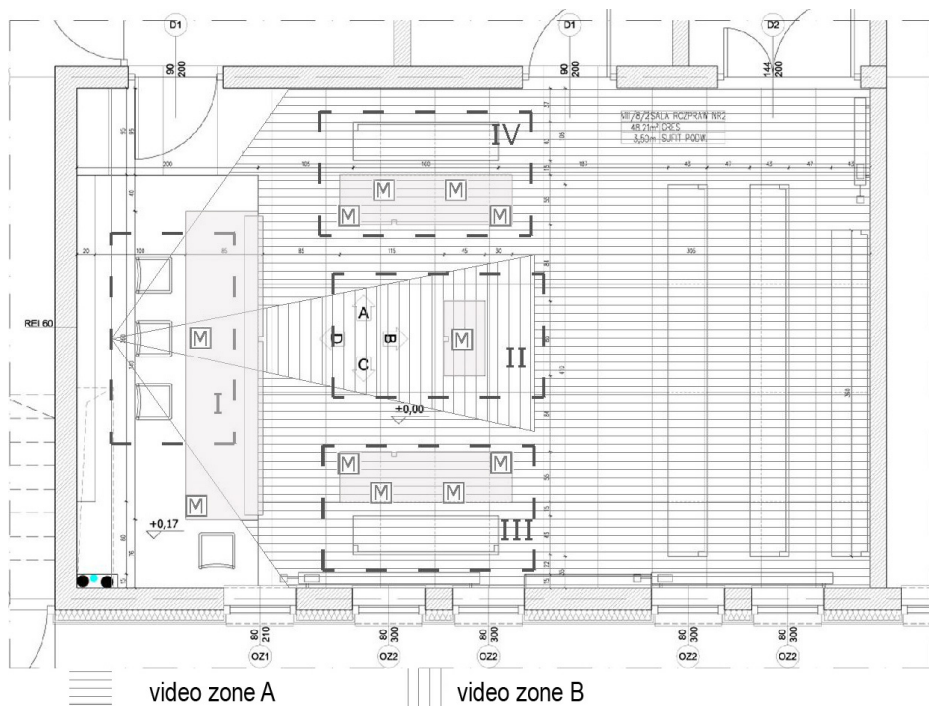


**Fig. 1.** Acoustic adaptation of a conference-type courtroom in Zabkowie Slaskie, architect: R2 Biuro Projektow Rubik L., G. Hryncewicz-Lamber et al., acoustics AVProjekt, P. Barczynski. Area; 124m<sup>2</sup>, volume: ca. 550m<sup>3</sup>, RT-0,7, average RASTI-0,62 at 40% audience present, sound system to be provided by the user (author's own drawing).

**Sightlines.** The viewing range of the public, and litigants in the IT courtroom are different to the ones in traditional courts. While the role of the judge's and jury sightlines are still the most important issue, a new point of focus is added. The screen, or screens placed in the room play an important role, one of the exhibit / evidence presentation place, which has to be clearly perceived by all parties involved in the trial.

Technological inventions enable easy evidence observation for the participants with the use of scanners and document cameras focusing at exhibit tables, although the equipment employed may in itself be of quite large dimensions and require a location within the courtroom well, not obstructing the sightlines.

Real-time recording of the proceedings is a new concept in many countries, although not in the US. Video recording augmented by extensive use of computer technology will shortly be the main medium of court records, therefore a secure placement of cameras in the courtroom, providing the view from the judge's perspective is extremely important. Overhead cameras, installed in the majority of Polish courtrooms provide a composite view on the screens: wide view of the the room (recording a view comparable to the peripheral sight range of the judge) is complemented with a inlet of detailed view of witness or expert lectern [6].



**Fig. 2.** An example of Polish audio-video court recording system technical requirements: I-IV audio recording zones, M – microphone locations, A- wide view camera range, B-camera focused on witness's range (author's own drawing).

**Lighting.** Introduction of IT technologies brought about two major changes in courtroom lighting: the increase in required light intensity and the need to control the amount of daylight.

The requirements concerning proper lighting for workspaces furnished with computers are more demanding than those for other workspaces (light intensity of 500 lx at table surface). Judge's bench and counsel tables, as well as jury seats should be

considered as computerized workspaces, which means that the lighting of many existing courtrooms may prove insufficient.

Moreover, the lighting should be operational to work with overhead projectors, turning off or dimming of selected light sources required, while watching exhibits or documents on screen. Courtrooms with natural light should be equipped with window shades, allowing for blackout, and partial screening of daylight.

With a large number of light sources, cameras, and projectors it is advisable to rethink the type of architectural lighting and finishes introduced to avoid glare and uncontrolled reflections. Surfaces with satin or matte effect are recommended [9].

### 3 Spatial Needs for Data Storage and Transfer, Remote Appearances and E-Courts

With the shift from paper data to the electronic ones, the courts face the same challenges, the libraries have undergone before. These are: the digitalization process, the change from paper to digital data storage requirements, server room within the building and remote location, remote appearances environment, spatial needs of e-courts.

**Digital Data Storage.** Change from one mode of collecting data to another, apart from procedural problems, is at the initial phase rather space-consuming. For instance, nowadays apart from digital recording at Polish courts, there still exist written records, and beside the server-hosted data, each case paper folders with essential information have an attached CD-ROM of the recorded files [4]. The shaft in data processing is neither absolute nor fast, transcriptions to paper being used in some cases. The digitalization is a lengthy procedure, with specific requirements for office space, and specialized equipment needed, some paper documents need conservation and repairs before digitalization. In Polish courts there are data migration offices, formed when switching from paper to electronic land registers. Contemporary architectural solutions should be as flexible as possible to allow for functional change and adaptability, as such temporary uses may take place in any digitalized court department.

Server and data storage require locations in separate rooms. These should be placed in different fire zones than the rest of the court administration, with separate HVAC system, independent electric energy sources (generators, batteries), advanced fire extinguishing systems (gas or water mist of high pressure). The same requirements apply to the local servers for different court departments or different storey, which should be located centrally for technological reasons.

**Remote Appearances.** New technologies in courthouses bring about dubious functional inference, namely the deliberations on dematerialization of the physical space of the adjudication facilities [11]. Although it may seem futuristic, the remote appearance technologies have already been used in court, which leads to opening of a discussion on the shape of the courthouse of near future. Teleconferencing can be performed in IT courtroom, as long as there is an appropriate space at the remote location, prepared for suspect interrogation, or expert appearance. Most of the courts

with video recording apparatus and large screens are properly equipped for remote appearances, and the technology allows for recording of teleconference data obtained via internet connections. The criteria for lighting and acoustics of IT courtroom apply, proper distribution of microphones and loudspeakers being a key issue.

**E-Courts.** For an architect, the electronic courtroom is one of the administrative rooms with workstations, and possibly, a larger allowance for data storage. The space for e-court does not require any special features, apart from IT equipment dedicated furniture.

## 4 Spatial Needs for the Reception Areas

**Court Reception Areas.** In the 20th century the justice facility with its luggage scanners, and electronic gates at the entrance gained the image of a fortress. Nowadays however we aim at different perception: the image of a more user-friendly institution is looked for [11]. To achieve this, a blend of architecture and IT is needed. Better orientation for the citizens in the courthouse is established by the introduction of automated information and electronic case lists in the building common areas. Above head location of electronic screens in the court's waiting areas and alongside the courtroom entrances should provide good viewing conditions: the size of screens in proportion to the viewing distances, studying their contents should not obstruct movement of other court customers.

**Info-booths.** Self-help information booths, connected to the court IT system are also a new feature in the courthouse circulation areas. These information points are often equipped with computer screens, and printers, sometimes they also provide the opportunity of court payments (cash or card). Location of these elements within the court's main hall, must not obstruct neither normal circulation nor fire evacuation, and be in monitored areas. [13].

**Court Information Offices, Legal Help Offices, and Reading Rooms.** Fully computerized information desks are transformed into front office areas with customer seating, comparable to spatial solutions found in banks and office buildings. These offices are in some countries accompanied with legal help offices. Since the range of legal help available at courts differs from country to country, the architecture may also vary, basically these rooms should offer privacy of counsel, augmented by the possibility use of computer and printer to fill and print court forms with assistance of a helper. Accessibility should be provided for all citizens to all rooms of the courthouse, providing comfortable workstations for the people with disabilities in front of help desk. Alongside with the opening of the court front offices, on-line communication between the court and its customers is being established, which enables litigants and attorneys to view information about current cases without entering the courts. [13]. Still there is a need to review the mode of data presentation in the court documentation reading rooms. At present every court is furnished with a typical reading room for browsing non-digitalized data in large folders under physical supervision of a court clerk. With the introduction of digitalized data this starts to be

insufficient. Not all the court recordings, and as for now in Poland - only the audio CD-s, are accessible to the litigants outside of the court. Consequently, these recordings have to be accessed in the reading room through the court computer system [4]. Court reading rooms should be equipped with furnishings and technology for the new media, and adapted acoustically to prevent buildup of noise from printers, audio systems and other apparatus.

## **5 Rooms Made Redundant in View of New Technologies**

The children's hearing room, victims' room, and detention rooms for potentially aggressive criminals seem to be surplus in view of remote testimony possibilities. Bringing victims and small children to the court does not help in their psychological recovery after assault or crime. On the other hand transportation of criminals is inconvenient, dangerous, and costly [8]. Even though no courts are designed without detention areas, the victim and children hearing rooms could be in future conveniently transformed into citizen legal help areas if properly located within the building.

## **6 Conclusion**

To an architect introduction of electronic tools into justice system seems a part of a larger whole, a societal change. For centuries justice facilities were held in the highest regard as unattainable institutions of power. Nowadays, in view of the emergence of the information society their role changed to that of civic buildings, where the information technologies bring about the sense of intelligibility of the space and procedures. This means not only mere transparency of glazed walls, and video registration of the trial. Introduction of audio and video recording in the courtroom was a step towards transparency of the proceedings [7] as well as a major factor of changes in the spatial patterns of the justice system [5]. The functioning of the courtroom space is nowadays affected by the use of new equipment, allowing for remote appearances of witnesses, counselors and experts, video presentations of evidence and 3D visualizations of crime scene documentation. With application of the above mentioned technologies, we will have to rethink the rationale of retaining such functional solutions as suspect in holding transportation to the court, victim hearings in the courtroom, data and evidence storage within the justice facility[8; 10]. New technologies of open society call for more flexible use of the courtroom space and for more user – friendly court interface, that is for easier access to data, with a different type of data in store: instead of paper records more and more digital data incl. videos are to be presented to litigants and their legal representatives. These changes will affect mostly courthouses of first instance – local courts with their confined space and those housed within historic locations, where preservation concerns may impede implementation of new technologies. Technological innovation should be housed in a physical environment conveniently adapted, or designed anew.



## References

1. Barron, M.: Auditorium Acoustics and Architectural Design. Taylor & Francis, London-New York (2000)
2. Carvalho, A.P.O., Vidal, D.A.: Acoustic characterization of courtrooms by a multi-criteria method. In: NOISE-CON 2008, Dearborn, Michigan, July 28-30 (2008), <http://paginas.fe.up.pt/~carvalho/nc08.pdf>
3. Golaczynski, J.: Elektroniczny protokół – projekt badawczy w zakresie transkrypcji treści nagrań audio-wideo z posiedzeń sądowych. Na Wokandzie. Kwartalnik informacyjny Ministerstwa Sprawiedliwosci 2(5), 9–13 (2011), <http://nawokandzie.ms.gov.pl/wp-content/uploads/2013/01/na-wokandzie-nr-5-specjalny-.pdf>
4. Golaczynski, J.: Temida i Internet Przewodnik po e-protokole Na Wokandzie. Kwartalnik Informacyjny Ministerstwa Sprawiedliwosci 6(9), 30–31 (2011), <http://nawokandzie.ms.gov.pl/wp-content/uploads/2013/01/wokanda-nr9-calosc.pdf>
5. Judge Janis Graham Jack's Courtroom Technology Video (2009), <http://www.txs.uscourts.gov/technology/corpus.htm>
6. Kotecka, S.: Protokół elektroniczny w świetle rozporządzenia w sprawie zapisu dźwięku albo obrazu i dźwięku z przebiegu posiedzenia jawnego. Prawo Mediów Elektronicznych 3, 22–27 (2011), [http://cbke.prawo.uni.wroc.pl/files/pme/PME\\_3\\_2011.pdf](http://cbke.prawo.uni.wroc.pl/files/pme/PME_3_2011.pdf), ISSN: 2082-100X
7. Karas, G.: Elektroniczny protokół a model pracy sędziego (2012), <http://www.nowemedia.org.pl/joomla/index.php/component/k2/item/833-prawo-nowych-technologii-we-wroc%25%82awiu-video-wyst%25%85pienia-z-konferencji-cbke>, <http://www.youtube.com/v/ty6BM8fuFks>
8. Lederer, F.L.: The Courtroom in the Age of Technology. In: Flanders, S. (ed.) Celebrating the Courthouse. A Guide for Architects, Their Clients, and the Public. W.W. Norton&Co., New York (2006)
9. Logsdon, E.L.: Hearing the Hearing, <http://www.aia.org/akr/Resources/Documents/AIAB095456>
10. Lord, P., Templeton, D.: The Architecture of Sound. The Architectural Press, London (1986)
11. Mulcahy, L.: Legal Architecture: Justice, Due Process and the Place of Law. Routledge, London (2010)
12. Philips, T., Kliment, S., Griebel, M.: Building Type Basics for Justice Facilities. John Wiley&Sons, Hoboken (2003)
13. Rychert, M.: Obsługa interesanta: przegląd rozwiązań praktycznych. Na Wokandzie. Kwartalnik informacyjny Ministerstwa Sprawiedliwosci 2(5), 9–15 (2011), <http://nawokandzie.ms.gov.pl/wp-content/uploads/2013/01/na-wokandzie-8.pdf>
14. Sielicki, D., Templin, A.: Zastosowanie zapisu audio/video do utrwalania przebiegu rozprawy sądowej – opis eksperymentu. E-Court Electronic Court: Judicial IT-Based Management IST-2000-28199, IST Commission of the European Communities Directorate General DG INFSO, CBKE e-biuletyn 1 (2010), <http://cbke.prawo.uni.wroc.pl/files/ebiuletyn/Microsoft%20Word%20-%20E-Court-%20opis%20i%20rezultaty%20eksperymentu.pdf>, ISSN: 1899-1513
15. Zakrzewski, T., Zuchowski, R.: Kompendium akustyki architektonicznej wraz z przykładami metod obliczeniowych, Wydawnictwo Politechniki Śląskiej, Gliwice (2009)