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Representation and new technologies for the contemporary library, innovating the cultural experience design

The paper introduces issues on design of contemporary library as a multifunctional cultural space combining its original functions, such as learning and research, with the modern concept of information access through technology. The study highlights the approach in interior design to change according to user experience driven by technology. This fruition of the conventional design approach and new technologies transforms modern library spaces into space of cultural and intellectual experience. Intended to provide effective services this space targets its users' needs at first place, offering flexible configurations within the environment. As an example the regeneration of Aarhus harbour district in Denmark was presented in the study to describe the largest hybrid library in the Scandinavian countries. Designed as a covered urban space, the building creates a bridge between citizens, technology and knowledge. The research aims to state design criteria and typological solutions with the possibility of visualizing and verifying design choices with a high level of detail. To achieve this and develop the design and experiential interiors guidelines for a library it was necessary to simulate the physical construction of the building through a BIM modeling and parametric information system. The authors' main objective was to verify, through visualizations and representations, the role of the modern library according to different use cases. Therefore the main points of consideration had been the use of multifunctional space, community services, digital culture and learning environments for different target groups.

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The modern library is nowadays considered to be an open, flexible and multifunctional cultural space available for a wide range of users and giving access not only to products or goods belonging to a collection but also to intangible contents produced through laboratories and visual arts, design and communication projects.

This study intends to highlight how interior design criteria are changing, where technologies and digital content privilege users' needs by providing new services. In this context relationship between the conventional design approach and the contribution of technologies for culture, fruition transforms spaces so that they become more interactive, not only environments for the exhibition of bibliographic collections but also places of making and production of contents. For example, the new libraries built in Northern Europe have successfully introduced an experiential design strategy that emphasizes the role of users within the environment, creating flexible configurations and settings and providing services that use new information and communication technologies.

Dokk1, in the port of Aarhus in Denmark, is the largest library of modern and hybrid ones built in the Scandinavian countries; designed as a covered urban space, the building creates a bridge between citizens, technology and knowledge. This connection is created, for example, by introducing new technologies into the physical space of the library. Technology is not limited to a single installation that visitors can use but multimedia are designed together with structures and spaces, they are omnipresent as a part of the building.

The research aims to state design criteria and typological solution with the possibility of visualizing and verifying design choices with a high level of detail. To develop the design and experiential interiors guidelines for a library, or more generally for a cultural centre, it is necessary to simulate the physical construction of the building through a BIM modeling and parametric information system. The main objective is, therefore, to verify, through visualizations and representations, the role of the modern library according to different use cases, taking into consideration the use of multifunction-al space, community services, digital culture and learning environments for different target groups.

1. LIBRARY AS A PLACE OF EXPERIENCE: TRANSFORMATION OF SPACES FOR CULTURE AND USER-CENTRED DESIGN

Learning space in the past, libraries nowadays become laboratories where visitors can directly experience something new. Thanks to the design innovation and application of new technologies the user experience is set in the centre. New spaces open more functions and therefore become digital laboratories, where experiments with tools and applications allow personalized training, experimentation activities and user involvement actions. In the age of digital culture transformation of services happens bringing new technologies for communication, sharing and managing multimedia contents and hypertextual information quickly, simply by accessing the web. Cultural spaces, to live and develop a hub of knowledge, must be designed considering some conditions that determine their future development. Meanwhile, the existence of a system of universal access to culture is available to the public and not limited to a few specialists. A continuous training strategy is able to promote the learning of digital systems and applications being the basic tools for the conscious use of a cultural space and its resources. The use of flexible, popular and low-cost technologies should guarantee the quality of information and multimedia resources. These conditions require a change of approach and often lead to economic difficulties, but above all, they are linked to the modification of the design rules, to the adoption of flexible set-up forms with manageable materials, resistant and more linked to the needs of comfort and use of the environments.

Since the Hellenic era until the present day, the library has preserved its main features over the years: collecting books and documents, preserv-

Fig. 1 - Art Spaces. Multifunctional spaces for design and contemporary art in Russia, Polina Mironenko, 2017.

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ing them and being a place of reading and study. In recent years the need to create community spaces, such as libraries, which become increasingly cultural centres, has been dominant (Figure 1).

Over time, the library has also become a place of socialization for the population, offering, in addition to books, spaces for parking, reading and refreshment in a protected environment, rooms where one can listen to music in multi-purpose environments with digital workstations.

As a result of the changes taking place in the world of information, the library aims to guarantee the greatest possible degree of flexibility, understood as the possibility of adapting the space to the various functions required, to technological change, to the evolution of products and the activation of new services. All this is made possible by the use of modern technologies that have also led to the birth of digital libraries, which become spaces with new features where technology is predominant over conventional interior design.

William Arms offers an interesting definition of the digital library: digital libraries are created with the hope that they can improve access to information compared to the past. The digital library brings information directly to the user. The visitor can conduct an advanced search, copying and manipulation of information. The digital library also allows quick access to information that is always up to date and available within 24 hours and reduces, or eliminates, the physical spaces needed to make information available when compared to a traditional library. The natural evolution of a digital library is to offer multimedia services. Offering multimedia services means investing in updating tools and software, a costly and potentially critical factor for managing public resources (Arms,2000). Library services not only promote reading and information literacy but also the development of user skills in the field of new media which also requires significant training for library staff. Another key aspect of multimedia is the possibility of automation of services: to implement the automation of loan lending and book return systems (for example through the RFID technology), video surveillance and access control systems, as in "Danish Open Library", which makes information available for statistical processing and activity planning.

The multimedia library makes it necessary to rethink the interior layouts to facilitate the autonomous search for documents on the shelves, review the methods of displaying books and rethink spaces to make them more autonomous and flexible even from a distribution and technological system point of view.

2. DESIGN PROCESS, COLLABORATIVE DESIGN AND INTERACTIVE ENVIRONMENTS. THE CASE OF DOKK1

The experiential design for a cultural space promotes a mediation between environments, cultural contents, intangible heritage (the contribution of users, their testimonies and abilities but also the values of the territory) and the users' community allowing multiple forms of interaction and development.

The design process changes as in the paradigmatic case that comes from Aarhus, the second-largest city in Denmark; the project is called *Dokk1*, the largest modern and hybrid library in Scandinavia designed as a large urban piazza for people's well-being, their learning rather than as a

Fig. 2 - *Dokk1*, Aarhus Harbour, Denmark. A bell says shallo to new life in Aarhus. The Gong is a tubular bell that has an arm, which parents can activate from the maternity ward at the Aarhus University Hospital when a child is born.
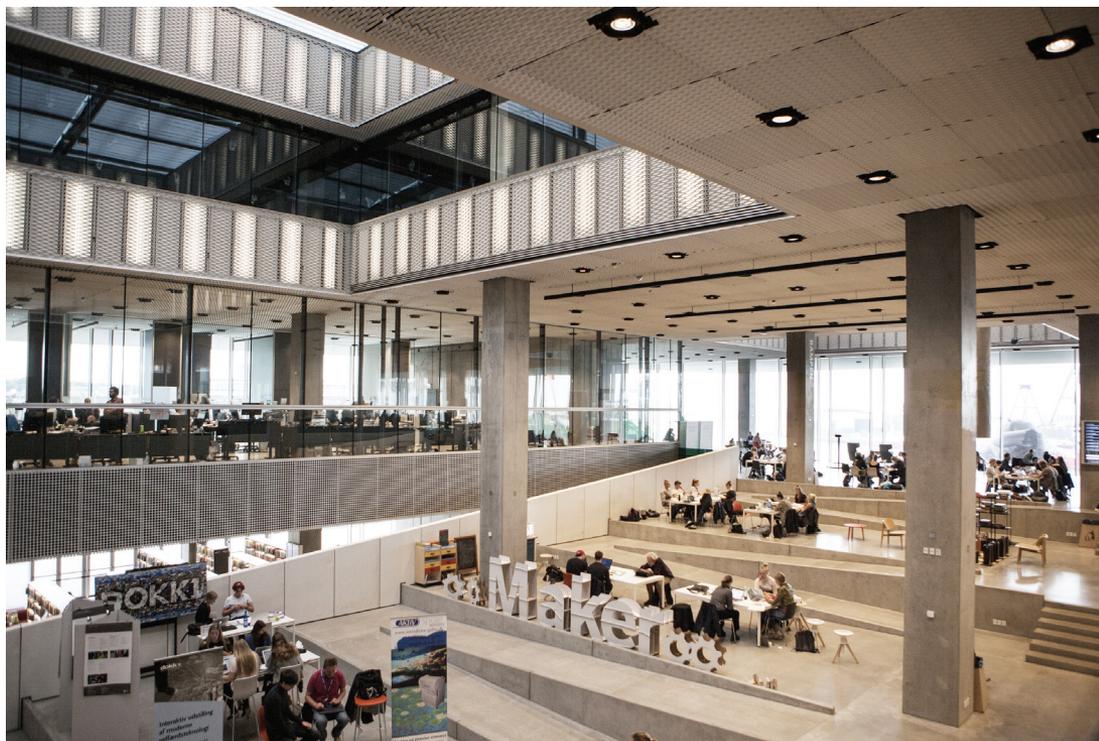
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Fig. 3 - *Dokk1*, Aarhus Harbour, Denmark. The so-called media ramp is centrally located in the building, beneath a large skylight. This has fiv e different platforms catering to various functions and leads to the second floor, where the children's and young adults' library is found.

place to store books [1]. The complex is 28,000 sqm, 18,000 of these occupy the library and the *Citizen Service*. *Dokk1* is a cultural centre located close by the Aarhus Harbour, which contains both the city's main library and the *Citizen Service*. The actual users have been important players in relation to the interior design of the building, and the result is a dynamic library intended to last at least 100 years. Opened in 2015 after a ten-year consultation process, the annual visits reach approximately 1.3 million. The library in *Dokk1* gives "free access to the world of information, inspiration, learning and entertainment, it is a centre for knowledge and culture which disseminates and

helps a variety of media stay alive across genres and formats. The library is the citizens' house", says the official website (Figure 2).
Designers worked for 10 years within the Transformation Lab to support the design of the library as a space for innovation and to realize physical prototypes and visualization of the future library. Before the opening of *Dokk1*, in the foyer of the old Aarhus Central Library, was reset into a lab to share visions, illustrations and tangible models verified directly by both employees and library users: for example interactive floors, new technologies for children, new learning environments, the *People's Lab* (Figure 3).

A further lesson from the *Transformation Lab*, as a consequence of the active involvement of users in the design process, has shown that it is functional to leave some unprogrammed places, within the library, to an open space, not completely designed and never completely set up, and therefore these places can be flexibly changed at short notice. The concept aims to create an area that could accommodate temporary set-ups and experiments in collaboration with partners, confronting users with ideas that could be tested immediately. In this context, technological solutions transform the physical library by creating a connection between interiors, layouts and knowledge. Technology is omnipresent, a constituent part of the building, a link between interiors and between the various users, a bridge with the community and the city, it is never just a single installation.
Among the technological installations, the civic role of the new media is privileged, their use as a sharing platform, for example using Instagram and the #dokk1 tag, stories of involvement and participation in the life of the library can be created, occupying a virtual and cultural space at the inside the physical space.
At the centre of Dokk1 is a large tubular bell with a gong; every time a child is born, parents can press a button in the maternity ward of the local hospital to send a signal to Dokk1 and make the gong sound. The bell has been cast in bronze and is 25 feet long, 2.5 feet wide and weighs close to 3 tons, which makes it the largest of its kind in the world. The work of art is located almost as a centrepiece in *Dokk1* hanging above the media ramp, the large inner stairway connecting levels 1 and 2.
The interior landscape virtually and digitally connected, also becomes sounds thanks to the installation that creates an interactive sound environment that welcomes users inside the library. Some sounds are processed with the surrounding area data and the users themselves interactively participate to create an inclusive atmosphere that tells the mood of the day.
Technological solutions make the content of the library more accessible, even to children who love learning through play and physical activity. The

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interactive floor allows children to use hands and feet to play and carry out activities while other installations such as vending machines for books, floors and interactive tables highlight the work of librarians: reviews, news, and suggestions created by the library system to promote knowledge in a differentiated and interactive way. Users can add elements to the digital layer in the building, there are platforms and spaces for partner activities, artists or students experimenting with new technologies and new media to create new experiences for users. The sound environment, the great digital ceiling of the *Great Hall* and all the digital walls can be programmed by external subjects hosting content and installations.

It is a project that today defines itself as smart, in the technological sense but above all in the less common meaning of building intelligence, that is, discovery, connection, relationship, awareness. There is also artificial intelligence, motion sensors, access points and cameras providing relevant data on how the building is used. The systems of machine learning create evidence-based knowledge in the context of social practice and on library user needs to enhance the effective use of common spaces. The goal is to optimize the user experience, interior design, communication, facilities, programs and services in the library building - based on factual data related to library users. These facts explain why the *Dokk1* design and construction process has to be participatory and engaging. In light of these developments, libraries are moving towards a new innovation practice that focuses on co-creation with users and that presupposes the inclusion of the users themselves and the activation of that knowledge that they might not be aware of having.

Would the *Dokk1* be a success even if it has been a more traditional library? Perhaps, but the importance lies in the fact that it is the most innovative library in the world today. Not so much because there are many new technologies, works of art, many good services: all this is there, still it is not the most important thing. The most important thing is that in a digitalised world a library must offer good reasons to go there and then distrib-

ute paper books on the loan is not enough. Good reasons can only be on the side of activities that a place of knowledge can offer: services to citizens, courses, workshops, seminars, games and more. *Dokk1* today it is the most innovative library in the world: it offers help to those in need, a political mission is to make life easier for citizens.

3. THE DESIGN PROCESS OF AN EXPERIENTIAL LIBRARY

The study describes the criteria for setting up a library considering strategically the role of technologies for experiential access to cultural contents and giving priority to user needs in relation to social changes.

We live in a technological era and in particular in a period dominated by digital technology. For many, digital technology seems to have the power to fulfil our every desire, improve our lives, multiply our possibilities and also transform the society in which we live, which becomes the Information Society or Knowledge, to the point of redesigning the course of history. For others, instead, digital technology is a factor of strong discontinuity with a past that one would like to keep unaltered or of which, in any case, one would like to defend some "values" that seem to be lost. Digital libraries are born and developed in this context (Tammaro, 2005).

The public library has taken on the role of a gateway to the global information network and is transformed by placing more emphasis on services than on structures. A reference is the document *IFLA Public Library Service Guidelines* (the 2nd edition of *The Public Library Service IFLA/ UNESCO Guidelines for Development*) edited by Christie Koontz and Barbara Gubbin (Koontz, Gubbin, 2010). The authors describe the concept of a public library understood as an integrated and multi-purpose structure which, while maintaining its focus on access to knowledge and knowledge services, is primarily connoted as a place of cultural sociality, where it is possible to implement one's own individual abilities, social skills, and own interests in various fields [2]. The library,

Fig. 4 - *3D visualization from the BIM environment of the library layout according to the three main functional areas.*

therefore, as a service based on a local basis, is ideally placed at the centre of the community, it can determine its profile also in relation to social and demographic transformations, analyse their needs, according to strategies and public policies of heritage. The IFLA also pays attention to the importance of management, public relations, and marketing, underlining the importance of information technology and telecommunications for its development. Reference should be made to the training of users, in particular in the use of IT tools

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and to define the role of the public library for the preservation and development of cultures.

The active involvement of users in the design process makes it possible to configure spaces according to a wider or common sensitivity to groups of people, in extreme cases it is possible to leave some places inside the library free to be modified without warning and during their use through forms of interaction design. In this context, technological solutions transform the library by creating a connection between the interior spaces, intended as a covered square, a city forum and the users who alternate during the day. The idea is to have an area that can host set-ups and temporary experiments in collaboration with partners, giving users the opportunity to express their ideas.

This study offers design references for the typological solutions and the experiential installations of the new library of Morciano di Romagna, whose spaces will be distributed on two levels for a total surface area of approximately 1,000 m2. Inside the services for schoolchildren and students (training, preparation, and creativity), practitioners (courses and workshops), retired people (place of aggregation and socialization, pastime) and families with children (creativity, socialization, hobbies) must be available.

The library must have an adequate articulation of the interiors respecting modularity criteria and a series of general requirements that will be of particular relevance for the effectiveness of the project itself; beyond the formal choices, the quality of a polyvalent cultural space is evaluated in its spatial value, volume and morphology of the building complex, relationship between the outside and the inside and possibility to modify its configuration in relation to the different functions to be installed. The organization of spaces and functional paths must respect continuity and perception of the environments between external and internal; this can be ensured by the choice and selection of materials and finishes, the design quality of the fittings and furnishings but also by the correct management of artificial light in relation to the natural light.

Therefore, three functional areas have been hypothesized: the culture square, multi-purpose space for reception, information, municipal services, access to the different areas and refreshment areas; the memory factory, a flexibly designed library area to host study, reading, open-shelf consultation and access to multimedia contents, assuming rooms for individual study and spaces for small group activities. Finally, the workshop for learning is very important, a laboratory with multi-functional rooms equipped with variable dimensions, with 15-20 seats each, flexible and partly aggregated with movable walls, to form larger rooms and spaces for socio-cultural activities based on the transfer of practices, training, creative and performing activities.

3.1 THE CULTURAL SQUARE

The entrance area must be configured to facilitate encounter, exchange of information, with access to various areas of the library and also to allow refreshment in a comfortable space.

This area has a large number of visitors and is aimed to provide reception and orientation services but also as a point of offering services for the community.

The input sector, from the functional and architectural point of view, must-have characteristics of accessibility, recognizability, informality, and centrality with respect to the other functions.

This space will have to assume a seductive value, of inclusion, of representation of the community and of the values that it intends to convey. Visible from the entrance it is recommended to place a screen with a bulletin board function that informs the visitors about what happens or is about to happen. The information point where the services of registration to the library and cultural initiatives will be located, or study and reading spaces are booked. Adjacent to the entrance a refreshment area with cafeteria and small meals will be set up. This area continues the waiting space and must favor, through the preparations, the maximum fa-

Fig. 5 - *Environmental mood board and design references for the Morciano di Romagna library: food area, co-working and common spaces.*

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miliarity with the library. For example, it will be possible to read newspapers and magazines while sipping a cup of coffee: it is not an area of silence, it is a space to relax by reading a magazine.

3.2 THE MEMORY FACTORY

The reading room contains services conventionally provided by libraries: reading, consultation and study area. It is furnished with workstations equipped with a computer to allow access to databases and digital documents for general consultation. It has a less traditional approach: it is not only intended for reading and studying, but also for socialization. It has interstitial and flexible spaces, intended for activities of various kinds (cultural, recreational, study, research, social gathering) as well as thematic islands where the documentary offer is periodically renewed.
The shelving provided for the preparation of the library must be characterized by a modular system that varies according to the type of support and the use they must perform. They are mainly characterized by size, capacity, surface finish, materials, number of shelves and inserts. The shelves are chosen on the basis of functional and safety elements: they can be accessible, or not, to the public in relation to their destination: an "open" shelf accessible to all, an archive shelf, an office shelf for librarians.
For the use of particular multimedia systems, ad hoc multimedia stations must be designed. This group of furnishings includes exhibitors, trolleys, special containers for CDs and DVDs, etc., shelves with wheels, modular systems, containers for multimedia readers, wardrobe furniture and storage of personal effects.
In the library, large and bright open spaces dedicated to socialization, reading and relaxation, flexible and informal spaces and others more structured, with ergonomic shelves for the display of books and other media, tables, armchairs, and chairs for reading texts. This particular environment is in constant motion: composed of different spaces that can be modified several times a day to accommodate the most diverse activities in
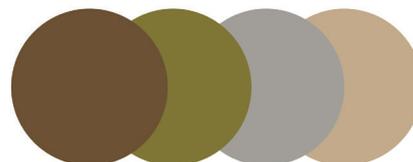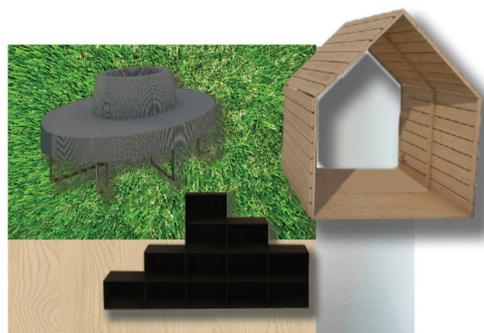

Fig. 6 - *Environmental mood board and design references for the Morciano di Romagna library: reading area and common spaces.*

one place. It is dedicated to people of all ages who read, chat, relax and socialize.
The library have to integrate a family space dedicated to children and young people of all ages; walls of this area can, for example, be painted with a paint that has the function of the traditional slate blackboard: those who want can leave messages, draw, write stories. In continuity with the multipurpose rooms, the digital library is created, whose layout transforms the library from a mere deposit of books to a complex system and an evolving living organism.
As with the multi-purpose rooms, the library's furnishings are transportable and equipped with integrated multimedia elements.
This solution allows real-time access to the information relating to the textbooks displayed and to be able to contact the library staff.

Technologically advanced workstations offer internet connection, audio headsets, sockets for recharging mobile phones and multimedia devices in general, etc. For the digital library, we suggest installing an interactive virtual theatre, an immersive (semi-open) room with projections on the walls that allows writing, drawing, painting, interaction with images and virtual objects also using voice commands and learning through play systems.

3.3 THE LEARNING WORKSHOP

A large part of the library must be allocated to socio-cultural activities based on the transfer of experiences, training, creative and performing activities through the design of multi-purpose rooms. Thanks to the flexible layout and the mo-

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Fig. 7 - *Environmental mood board and design references for the Morciano di Romagna library: informal meeting area.*

bile furnishings it is possible to adapt the rooms to different needs: different scenarios can be created to stimulate users and actively involve them in cultural activities, such as exhibitions, digital communication laboratories, social media use, audio-visual culture, etc.

Panels and mobile furnishing transform the space according to the activities to be developed (temporary exhibitions of furniture, ceramics, contemporary art, presentation of books and magazines, workshops, screening of conference room videos, etc.). This space can ideally be inspired by the 1961 Fun Palace project by Cedric Price, a multi-purpose building and for the highly technological era, set up with movable elements - an assembly kit - whose position could be modified and modulated thanks to rails placed on the floor. In this way, the compositional structure could be com-

pletely transportable and allowed ample freedom to choose the most appropriate size. As Prince Charles himself explains: "We are building a short-term toy in which we can all realize the possibilities and pleasures that an urban environment of the twentieth century owes us. It must last no longer than we need." (Obrist, 2011).

The building was never built but was a strong inspiration suggesting imitation and new achievements at the dawn of the modern project of cultural spaces, such as the Pompidou Centre in Paris.

The laboratory area can ideally be divided into 3 equipped multi-purpose rooms, of variable size, with 15-20 seats each. The three spaces can be combined with each other by means of movable walls with built-in screens and various types of multimedia set-ups (such as touch screens, au-

dio systems, interactive whiteboards, screens for video projection, etc.).

4. BIM DESIGN SYSTEMS FOR ADVANCED REPRESENTATION AND ENVIRONMENTAL SIMULATION

As with all other activities related to the design, construction, and management of buildings, the building information modeling graphics systems also have an impact on the way interior designers' work. The BIM has offered a series of benefits to designing the interior spaces, especially in the visualization and verification of complex projects during the various project phases. Constructing a public library, it is necessary to operate in three distinct phases: preliminary project, present and define the qualitative and functional characteristics of the work and to highlight the most significant aspects, final design, the realization of graphic and descriptive drawings accompanied by economic evaluation.

Finally, the executive project defines all the architectural, plant and structural elements that characterize the interventions including the site operational plan and the procurement plan. In case of the need for updating or modification of substantial elements, the BIM application has made it possible to automatically regenerate this reference on each document and representation. Through the design simulation with a BIM system, it is, therefore, possible to be immediately informed of the potential impacts of changes to the architectural, plant or structural characteristics of a project and to share them in turn with all the subjects by verifying the project's functionality and compliance with the general concept.

Another fundamental advantage of the BIM is the possibility of managing collaborative design sessions during the planning cycle or allowing the sharing and development of the project between specialists considering that it will be necessary to design with definitive architectural/structural, mechanical, electrical and energy diagnosis and related calculation parameters, the geological relationship and the executive design of fixed and

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internal and external furniture.

In the case study, an overall paper was developed in the BIM, usually displayed in planimetric projection, as a detailed map, from which it was possible to extract elevations, profiles, and sections, realistic photo representations integrating the chromatic selections and textures from the environmental mood board.

The *ArchiCAD* software produced the preliminary documentation for the preparation of guidelines and design criteria preliminary to the design phase that the public administration will put out to tender. The documentation is also accompanied by schedules of materials, furnishings and interior solutions with the related costs and necessary quantities. This is possible by using the wide availability of component libraries provided by manufacturers on online catalogues and directly integrated into the *ArchiCAD* work environment (Figures 5, 6, 7, 8).

Another fundamental element for a library is the possibility of integrating the architectural and interior design with the characteristics of the technical lighting system in relation to the different functions and the degree of flexibility required. In the design of a complex spatial system, a reference is made to the main choices for the layout that are summarized and compared in the so-called environmental mood board. The chromatic concept and the choice of materials for the interior design must have a visual characteristic that reflects the mood of the interior and therefore must be considered as a crucial aspect in the realization of the project. "As part of the determination of the meaning and identity that the institution must take, it is fundamental that part of the work that deals with the concept of colour, in which the same must be deftly planned as it involves all the visual and tangible elements of the project." (Broletti, 2015). In the concrete case, for the identification of the criteria related to the concept of colour it is necessary to analyse the user profiles, the functions that are performed, the methodology for carrying out the various activities, the materials of the architectural and design components. In

Fig. 8 - *Environmental mood board and design references for the Morciano di Romagna library: facilities for workshop and makers' area.*

practice, the colour project mainly applies to the following physical elements: shelves, display units, furniture, signage, worktops, control panels, screens, seats for staff and workstations for users, sofas, chairs and armchairs, cushions and other furnishing accessories. In general, it is recommended to choose a gradation of neutral colours, as well as white, beige, grey and black for the areas dedicated to study, research and work. For multifunctional areas, for the flexible and informal ones, the brightest colours are used to emphasize the individuality of the space (using shades of green, blue, yellow and red).

As for the finishing, materials to make the floor, wall coverings and ceilings it is recommended to use the materials available on site that correspond to the urban and architectural context. Glass, wood, linoleum, stone materials, and synthetic

materials must be chosen among those capable to guarantee functionality, durability, and safety.

The BIM application allows to quickly manage and verify all these solutions also in relation to the size of the spaces and to the light component that ideally must integrate the artificial sources that selectively illuminate the areas and the natural light that must guarantee a diffused and permanent lighting along the main part of the day, that of greater use of the library. The lighting of large spaces poses specific problems due to high ceilings to the aforementioned mixing of artificial light and natural light, to safety and multi-functionality to take full advantage of the environment. Within the multifunctional spaces, where different types of activities are carried out, different lighting scenarios are provided depending on the activity to be performed. The new teaching methods and

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new multimedia technologies ensure that the spaces are used in a flexible way, with the consequent need to often have to adapt lightning to real needs. Starting from this concept, a specific colour tone is provided for each room and for some rooms there must be the possibility to change the colour of the light source (multi-coloured LED). Lighting must guarantee maximum energy savings and visitor comfort, using LED technology lighting elements capable of adapting the light component to the real needs. In particular, in every room there is a light sensor that automatically adjusts the luminous flux of the lamps so as to reach, together with the solar radiation, the set point value set. A centralized control panel allows the operator to vary the lighting parameters and the colour tone to allow different experiences depending on the specific function implemented by an environment at a given moment (e.g. talk, workshop, cultural event, etc.). Intuitive controls are also available that use a simple button to activate different scenarios previously configured such as lowering the light for educational projections or resorting to a more intense illuminance index for the lessons on the board.

5. CONCLUSIONS

The research methodology has combined, through advanced representation methods, the needs of the public administration in a preliminary planning phase, identifying a use scenario for categories of users, set-up functions and access to content by defining the functional organization chart: from the analysis of existing technologies and experiences, to the study of materials and colours for environmental well-being, to solutions for furnishings and lighting. Through the advanced representation in BIM environment, the preliminary simulation of the library and the functional verification and efficiency of the spaces according to an environmental mood board was performed. The three-dimensional modeling and the collaborative design with BIM tools allow to immediately visualize the environment designed as a prototype of fitting solutions and functional areas. The main

objective was therefore to verify, through visualizations and representations, the possible configuration of a modern library according to different use scenarios, including digital transformation of spaces and collections, imagining a multifunctional space and new community services for culture and training during the life cycle.

6. ACKNOWLEDGEMENTS

NOTE

[1] Architects are Schmidt, Hammer and Lassen, the interior design is by the City of Aarhus & Schmidt Hammer Lassen Architects, Paustian.

[2] The Italian edition, *Il servizio bibliotecario pubblico: linee guida IFLA/UNESCO per lo sviluppo*, was edited by AIB - Commissione nazionale Biblioteche pubbliche in 2002.

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