# Infinite Expansion, Unlimited Access, Encompassing Comfort: An Analysis of the Effects of Digitalization in Libraries after 1995

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# Infinite Expansion, Unlimited Access, Encompassing Comfort. An Analysis of the Effects of Digitalization in Libraries after 1995

*Alina Wandelt & Thomas Schmidt-Lux* [*]

**Abstract**: *»Unendliche Expansion, unbegrenzter Zugang, allumfassender Komfort. Eine Analyse der Auswirkungen von Digitalisierung in Bibliotheken nach 1995«.* The objective of the paper is an analysis of the temporal patterns of digitalization. Looking at a specific field, the built environment, and a specific architectural typology, libraries, we ask what has changed in library architecture after 1995 and what types of patterns of progression are evident in this context. Up close, digitalization exhibits more nuanced changes than the catch-all-term suggests. We propose three phases of digitalization: (1) a phase revolving around *infinite expansion* (1995–2005), (2) a phase revolving around *unlimited access* (2005–2015), and (3) a phase concerned with *encompassing comfort* (after 2015). With regard to these refiguration processes, we identify both trajectories, turning points and cyclical patterns. Our study highlights the importance of empirical studies and time-sensitive social research in the context of studies on the digital age.

**Keywords:** Digitalization, library, temporal patterns, architecture, space, discourses, materiality, practices.

## 1. Harsh Disruption, Gentle Change? Competing Conceptualizations of Digitalization and their Temporal Patterns

The tension between societal change and continuity has always been a central theme in sociological research (Strasser and Randall 1981; Boudon 1986). It is therefore hardly surprising that these two concepts are also employed in the context of digitalization. The question whether digitalization should be

classified as a continuity or a disruptive change has dominated the discussion on digitalization in social sciences since the 2000s. Essentially, there are two opposing viewpoints: One that conceptualizes digitalization as a structural and disruptive change of modern society (e.g., Benkler 2006; Shirky 2009; Reckwitz 2017; Baecker 2018) and a second perspective that regards digitalization as a continuation or intensification of well-known processes (e.g., Nassehi 2019; Krämer 2020). This continuation might come with changes too, but in a much less dramatic way than perceived in the beforementioned perspective (for the field of politics, see Bijker 2006).

Against the background of this discussion, we ask what changes can be observed *empirically* with regards to digitalization. Following Reckwitz (2017, 229ff.), we understand digitalization as the interplay of (1) computing, the (2) digitization of media forms, and (3) the communicative networking on the Internet. More specifically, we look at the ways the architecture of libraries in the digital age has changed. Pinpointing the year 1995 as a turning point in digital history (Schmitt et al. 2016; e.g., Lang 2017; Häußling 2020), we limit the period of our investigation to the time after 1995, that is when the Internet and the World Wide Web became commercialized in a large number of countries and personal computers, the basic hardware of the digital age, became affordable for private households in the Global North.

While there is effectively no doubt that digitalization has far-reaching consequences for architecture, the effects of digitalization on architecture have been primarily described for the production of architecture and the architectural field rather than the buildings. Libraries are suitable case studies for examining the digital change because they are traditionally institutions that specialize in knowledge. Libraries collect, organize, catalog, and provide information. Assuming that digitalization has had a severe impact on the order of knowledge (Bunz 2012), changes ought to be reflected in libraries. Libraries also provide a particularly susceptible case for a historically informed analysis of these changes for they have not just recently emerged but look back on a very long history and can, hence, be studied in the *longue durée*.

What is missing in the current debate on digitalization in our view, is not yet another abstract theory of digitalization, but a more precise account of the actual changes brought about by digitalization in specific contexts. Thus, we ask in particular which temporal patterns of digitalization emerge out of this analysis. Rather than discussing digitalization as either continuity or disruption, we offer an empirical study on the changes of the built environment over the course of the last 25 years.

In order to explore the question of change in library architecture in the digital age and the question of what course the digital transformation has taken, we put forward an analytical framework that conceptualizes architecture as constituted of discourses, materiality, and practices. Firstly, we ask how the discourses in and on libraries of the last 25 years have changed in the digital

age. To this end, we have conducted a historical discourse analysis of handbooks and manuals on library architecture that set out how libraries should *ideally* be built. Secondly, we turn to the material dimension of libraries and examine whether and how the architecture and design of libraries has changed. To this avail, we have reconstructed the architectural histories of libraries on the basis of an analysis of documents, floorplans, and photographs of libraries. Thirdly and finally, we ask how the practices in libraries have changed. Employing ethnographic research, we have looked at library statutes and opening hours in libraries over time and conducted participant observations on the ground. Based on our analysis of the continuities and discontinuities in the talk about the materiality and the practices in libraries, the materiality and building of libraries, and the practices and uses of libraries over the course of the last 25 years, we propose a specification of three phases of digitalization. We identify (1) a phase of digitalization revolving around *infinite expansion* (1995–2005), (2) a phase of digitalization revolving around *unlimited access* (2005–2015), and (3) a phase of digitalization concerned with *encompassing comfort* (after 2015).

Following Baur's distinction of turning points, trajectories, and cycles (Baur 2005), our research shows that all three types of patterns of progression are evident in the change of library architecture after 1995. While the discourses on library architecture seem to be characterized by cyclical patterns, the changed architecture of newly built libraries after 1995 underscores the year 1995 as an actual turning point. The practices in libraries, on the other hand, are characterized by both trajectories as well as turning points – also depending on the specific type of library. The digital age as the historical period after 1995, as we conclude, can therefore *not* be characterized as a continuity or disruption, nor is it shaped by one specific temporal pattern. Instead, our findings suggest that different temporal patterns simultaneously co-exist.

The remainder of this paper proceeds as follows. Synthesizing key findings from the literature on digitalization and architecture in the digital age, section 2 sets out to define how we understand digitalization and the notion of the digital age, as well as laying out the reasons why we decided to look at architecture as a specific domain for our empirical analysis and the methods and methodology we have applied to do so. Section 3 proceeds to outline why and how we specifically study libraries as a case and architectural typology. In order to explain what changes have occurred after 1995, in this section we also address the question of what typically characterized libraries *before* 1995. In section 4, we present the results of our study on the changes in libraries along the three phases of digitalization we have defined. For the sake of clarity, each phase is illustrated by means of a specific example of a newly built library of that time. The picture that emerges of digitalization is not that of a homogeneous, static age with a set of specific characteristics. Rather, it is that of a sequence of different phases characterized by very different

technologies, as well as engendering different temporal patterns. This also has implications for the very concept and talk of digitalization and the digital age. Section 5 finally discusses what temporal patterns can be empirically observed with regards to the changes in library architecture in the digital age.

## 2. Digitalization and Architecture

Existing conceptualizations of digitalization tend to either focus on the invention and implementation of specific technologies or provide for a more general definition of digitalization as a sort of cultural technique. Sybille Krämer, for instance, regards of digitalization as a set of symbolization practices that essentially function as ordering systems to arrange confusing amounts of information in such a way that targeted and rapid access becomes possible (Krämer 2020, 1). As such, digitalization can be situated at the very beginning of human history itself – with the first cave paintings and the alphabet as its prototypes (Krämer 2020).

In a similar vein and seeking to find a functional explanation for the triumph of digital society, Armin Nassehi places digitalization at the root of modern society. With the advent of nation-states, a larger number of people had to be governed, in turn necessitating the need for accurate information on the population's behavior: the birth of statistics (Nassehi 2019, also cf. Foucault 1978). Statistics, as a tool for the observation of regularities in human behavior for forecasting, can thus be regarded as an early precursor of digitalization. Like Krämer, Nassehi does not understand digitalization as a phase bound to the invention or implementation of a specific hardware or software, but as a kind of structural feature of modernity itself, namely the search for patterns in human behavior. While positions that highlight digitalization as a continuity may not equate to a standstill, they tend to underscore the quality of changes along somewhat predictable paths. These positions aim to explain the origin and emergence of digitalization but self-evidently remain rather broad historically. Why and how libraries changed over the course of modernity remains a puzzle in the light of such conceptualizations.

Positions accentuating digitalization as a disruption, on the other hand, engender a temporal pattern of digitalization as a fairly spontaneous, historically unique transformation, usually linking digitalization to specific technologies that offer more precise perimeters. Reckwitz understands digitalization as the interplay of algorithmic processes of computing, the digitization of media forms, and the communication network of the Internet (Reckwitz 2017, 226); Baecker explicitly links digitalization to the invention and implementation of the computer (1941), the television (1950), the personal computer (1976), the Internet (1989), the smartphone (1994), and the Internet of Things (Baecker 2018, 12).

In our view, these definitions offer more viable specifications of digitalization, while at the same time evading overly formalistic definitions that define digitalization as the transformation of analogue into digital signs (Pasel and Neubauer 2018, 232, FN 7) or solely linking it to the emergence of actual digital technologies (Lupton 2015). Although such narrow definitions are of course not wrong, it seems to us that the extensive use of computers, digital media forms and in particular images, and their networked interaction via the Internet have more far-reaching consequences than the translation of data from one format to another. Furthermore, they fall short of providing for an exact historical allocation indispensable for empirical studies. We therefore opt for a narrower delimitation of the digital age after 1995, that is, the year around which the Internet and the World Wide Web became commercialized and personal computers, arguably the basic hardware of the digital age, became affordable for private households in a large number of countries in the Global North. Historians have accordingly pinpointed the year 1995 as a turning point in digital history (Schmitt et al. 2016; e.g., Lang 2017; Häußling 2020).

## 2.1 Researching Architectural Change in the Digital Age and its Temporal Patterns. Architecture as a Three-part Heuristic of Discourses, Materiality, and Practices

Following up on traditions that consider architecture to be a particularly important expression (Elias 1969) and significant code of society (Castells 1999), we look at architecture as a specific domain to study the changes induced by digital technologies and the temporal patterns of these changes. Conceptualizing architecture as that part of the built environment with a somewhat intentional design (Steets 2015, 10), we assume that architecture can neither be defined as a passive and secondary, nor as an active and determining form of the social but must be examined as a part of society (Delitz 2010, 317). In order to research how library architecture has changed, we put forward an analytical framework that operationalizes architecture as constituted by discourses, materiality, and practices (also cf. with Lefebvre 1974).

To analyze what has changed in library architecture over the past 25 years on these three levels, we have looked at three types of data: The first data type we analyzed were library manuals that set out how libraries should ideally be built. The statements in these manuals are what constitutes the discourses on library architecture. To analyze what has changed in terms of the architecture of libraries, we have, secondly, looked at newly built public libraries that are or were considered particularly successful, best-practice examples of libraries at a certain time and place in the architectural discourse. This refers to libraries that have received a particularly large amount of publicity in journals, have been honored with awards, or have otherwise been symbolically

enhanced in some way. For each of these libraries, we have reconstructed the architectural history of the building on the basis of an analysis of documents, floorplans, and photographs of the architecture. The reoccurring patterns in the design and construction of these buildings is what constitutes the materiality of the libraries. Thirdly, we ask how the practices in libraries have changed. To this end, we have employed ethnographic research, aiming to find out what is and what was considered permissible, legitimate, respectively "normal" behavior in libraries at a certain place and a certain time. For this, we have looked at documents such as library statutes, user regulations, and opening hours as well as testimonies of visitors or blog posts alongside participant observations in selected libraries.

Particularly following on from Elias and Foucault (but also many others engaging in historical discourse analyses), our analysis is informed by procedural steps developed in the context of historical discourse analyses. Methodically, our approach specifically draws from procedures put forward in the field of the sociology of knowledge (Keller 2015; Landwehr 2008, 2010). We rely on these steps while explicitly extending the scope of the notion of discourse to materiality and practices (also cf. with Renggli 2007). Our approach may, thus, also be described as a dispositif analysis (Bührmann and Schneider 2008). Defined as a decisively heterogeneous ensemble of various elements, including discourses, institutions, architectural facilities, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral, or philanthropic tenet – in short: what is said as well as what is unsaid (Foucault 1978, 119) – the term dispositif thereby reflects the importance of an integration of both discourses and material structures in the analysis of historically bound social constellations.

The collection and analysis of our data can be summarized in three procedural steps: First, a definition of a certain corpus of data. Second, a comparison and analysis of texts *across documents*. In what ways are certain terms, topics, or objects addressed? Which explicit and implicit classifications are thereby made? What causal links do these constructions imply? (Diaz-Bone 2002, 202). Third, a comparison and analysis of structural features found in these comparisons *across time*. Which statements, architectural elements, and practices remain the same over time and which ones do not? If there are changes in the discourses, architectures, and practices across cases over time, around what point in time do they occur? And to what causes do these changes possibly refer? This step implies a more thorough interpretation of the context in which these discontinuities occur. Even though the history of some technologies for instance may date back much further, we argue that it is with the enforcement and dissemination of these technologies that they become relevant with regards to actually observable changes.

Resorting to the vocabulary of the sociology of temporal pattern analysis, we interpret our results against the background of the distinction of

trajectories, turning points, and cyclical patterns. Nina Baur distinguishes temporal patterns according to two dimensions: First, their duration, whereas three types can be differentiated: (1) short-term social processes that unfold in moments, hours, or days; (2) medium-term processes, covering years, decades, or generations; and (3) long-term processes, evolving over centuries or millennia (Baur 2005, 126; Million et al. 2021, 3). The second dimension that can serve to distinguish temporal patterns targets the relationship between difference and repetition incorporated in processes of social change. Again, three types are distinguished: (1) trajectories, that is, social processes that are patterned in a systematic way or develop path-dependently; (2) turning points that occur between different phases of a process or after abrupt changes such as innovations or crises; and (3) cycles that describe social processes that are characterized by repetition (Million et al. 2021, 4; Baur 2005, 125-42). The aim of the article is to unpack the temporal structures of digitalization.

## 2.2    Digitalization and Architecture and Libraries in the Digital Age

There is effectively no doubt that digitalization has far-reaching consequences. This also applies to the field of architecture. While the term architecture generally refers to both the architectural field (Jones 2011, 12 ff.) and production of architecture (Yaneva 2009, 2013), as well as the buildings that emerge out of these activities, the effects of digitalization on architecture have been primarily described for the architectural field. Studies have for instance examined the changed practical work of architects through digital design software (e.g., Höfler 2016; Schnell 2016; Wandelt and Schmidt-Lux 2021), new forms of collaborative design and planning on digital platforms, and changed building forms and construction methods evolving through new manufacturing processes (e.g., Picon 2010; Arantes 2012; Carpo 2013, 2017). An analysis of those changes pertaining the actual architecture, however, is still pending, particularly when it comes to architectural typologies that existed *before* digitalization. Libraries are a suitable architectural typology to carry out such an investigation. After all, libraries are dated back in their origins up to the year 2000 BCE (Jochum 2007) and have existed for most of human history (albeit in very different forms). At the same time, libraries constantly describe themselves as highly versatile agents of change (Schuldt 2022), just as they are increasingly conceived of in public discourse to be in a state of flux due to digitalization processes (e.g., Graf 2018; Bös and Marx 2018; Tausche 2019).

From a digital history standpoint, libraries are a very insightful case because they traditionally represent institutions concerned with and highly specialized in dealing with knowledge: its storage, its classification, and its provision are among the traditional functions of libraries (Rösch et al. 2019). If

one follows the assumption that digitalization has consequences for the order of social knowledge (e.g., Bunz 2012), it consequently ought to be reflected in libraries as well. The specialization of libraries in knowledge is the very reason why many authors have attested to a rather uncertain future for libraries at the beginning of the 21st century. Once necessary as places and repositories of knowledge Michel Serres for instance argues, in a gloomy forecast, in the digital age memories would no longer need a place, treasures no longer a depository, and people no longer need an address (Serres 2000, 1). Such anthropomorphic diagnoses often declared libraries to be "dead" in the digital age (Serres 2000). In spite of such diagnoses, however, libraries have not disappeared. While smaller libraries have been closed or merged (particularly in the early 2000s), a lot of new, spectacular library architectures have been erected after 1995. New library buildings in Sendai (2001), Seattle (2004), Stuttgart (2011), Birmingham (2013), Aarhus (2015), Helsinki (2018) and many others testify to the living presence of libraries today, having become iconic architectures in many cities all over the world. Why and how libraries have survived is therefore a puzzle whose solution can also make digitalization itself and its temporal structures more comprehensible.

## 3. Libraries as Repositories for Books. Discourses, Matevriality, and Practices in Libraries before the Digital Age

In the history of the modern library, that is, between 1850 and 1995, *storage* played an eminent role (e.g., Jochum 2007; Naumann 2015; Rösch et al. 2019). Modern libraries first and foremost aimed to grant a safe and sound storage of books. In this sense, the history of the modern library, has largely been a history of books. Only in the 1980s and 1990s, this begins to change. Even though inventions such as the vinyl record and the television had in some cases expanded the library's focus on books before, it is only with the invention of new digital storage media such as CDs and DVDs and eventually the MP3 that the exclusive focus on printed matter is shifting.

For a fairly long time, the adequate storage of printed materials therefore remained the greatest concern in libraries. And following the tremendous influx of scientific production, the discourse on library architecture largely revolved around the question of how to deal with the plethora of books libraries increasingly face (Leyh 1929, 2). The underlying assumption was that the number of books will continue to interminably increase and that libraries are to accommodate for this seemingly infinite expansion of books. Furthermore, libraries did not provide for a separate architectural assignment. They

were located in monasteries or castles but did not exist as an architectural typology of their own.

Both architecturally and technically, the library Sainte-Geneviève in Paris, designed by Henri Labrouste and completed in 1849, exemplified a turning point. The fact that Sainte-Geneviève was the first building specifically designed as a library (Schneider 2010; Wagner 2015) does not only reflect and enforce a greater prioritization of knowledge and knowledge acquisition in society of that time (Kleefisch-Jobst 2016) but also points to the vast increase in printed matter. The separation of administrative areas, the reading room, and the stacks of the library, implemented for the first time in the library Sainte-Geneviève, thereby served to maximize the use of space in libraries. Shapes that cannot be easily expanded (such as round or organic shapes) are rejected from the point of view of functionality and efficiency (Wagner 2015; Naumann 2015). The ideal library was a simple box, cube or a square that can be expanded infinitely. Up until the 1990s,

> a good library is akin to a warehouse or loft building. It should be as open and flexible as possible with a minimum of permanent walls. The services and collections of a library are organic and changing and the building that houses them must allow easy change and growth. A plain box, flexible and expandable, furnished with attractive, functional, and durable furniture and equipment is eminently preferable to an architectural monument that will not work properly. (Pierce 1980, 20)

Technically, the library Sainte-Geneviève exemplifies a *turning point* in Baur's sense, as it is the first library with artificial lightning, toilets, and a heating system in the reading room, allowing for longer stays in the library. These material conditions accommodate for a use of the library even after sunset – a paradigm shift that Ullrich Schneider describes as a change from building libraries for *books* to building libraries for *people* (e.g., Schneider 2008, 2018). This shift marks an important turning point in the endeavor of the 19th and 20th century in making the library available for longer periods of time and for a larger group of people. Particularly in the second half of the 20th century, librarians find that the barriers between people and books should be eliminated so that no feeling of stiffness or strangeness should stand between them (Liebers 1956, 37). Libraries, in which the collections are freely accessible on shelves, increasingly replace the system of closed stacks, where librarians had the exclusive access to books. This development gains momentum in the 1950s and 1960s and reflects, but also enforces, more general efforts to democratize the educational system of that time. This entails an overall increase in the number of students enrolled at universities and eventually an increase in university libraries in the 1960s and 1970s (cf. Liebers 1968).

While the access to the library collection generally becomes more convenient over the course of the 20th century and accessible for a greater variety of people (Cramme 2019), users are increasingly expected to remain silent in

libraries. This norm and practice gradually evolves over the course of the 20th century, as the following engraving of 1859 (Fig. 1) and the photo of the reading room today (Fig. 2) of the library Sainte-Geneviève can serve to illustrate in juxtaposition. While the engraving of the scene in the library Sainte-Geneviève depicts people reading, but equally a hustle and bustle in the library of men standing around or chatting with another at the large table, the desks today (following a replacement of the interior in 1930) face in one direction, so that concentrated and, above all, quiet work is facilitated.

**Figure 1**   Engraving of the Reading Room in the Library Sainte-Geneviève



Source: Unknown Artist.

**Figure 2**   Reading Room in the Library Sainte-Geneviève



Source: Marie-Lan Nguyen.

## 4. The Impact of Digitalization on Libraries

Looking at newly built library architectures after 1995 – arguably those directly impacted by digitalization – we find that there is no such thing as *the typical change* through digitalization in libraries. Instead, the distinct changes we observe must be differentiated into more specific phases of digitalization. Based on our analysis of the continuities and discontinuities in the talk about the architecture of and the practices in libraries, we propose a specification of three phases of digitalization. As a result of our study, we identify (1) a phase of digitalization still revolving around *infinite expansion* (1995–2005), (2) a phase of digitalization revolving around *unlimited access* (2005–2015), and (3) a phase of digitalization concerned with *encompassing comfort* (after 2015). In a nutshell, we illustrate the results of our study on the refiguration (Knoblauch and Löw 2021) of library architecture in the digital age as a sequence of the Sendai Mediatheque (2001), the Seattle Public Library (2004), and the DOKK1 in Aarhus (2015).

These examples are self-evidently outstanding examples of library architecture. Considering the variety of the field, our sample consisted of more than just these famous libraries. We researched 20 different libraries, which varied in terms of size, age, and location. Nevertheless, here we focus on the libraries in Sendai, Seattle, and Aarhus. Even though they are outstanding, they are at the same time particularly striking and influential examples. They show in a pointed manner how the conceptions of what libraries should be, look like, and how they should be used have changed over time. That way, the largely "opaque and monolithic concept of digital transformation" (Hergesell, Baur, and Braunisch 2020) can be shelved in favor of a more differentiated history of digitalization.

### 4.1 Infinite Expansion. Libraries as Mediatheques (1995–2005)

While electronic data processing technologies in libraries date back to the 1960s (Rösch et al. 2019), the use of computer technology did not instantaneously change libraries. EDP technologies initially streamlined internal work processes by simplifying cataloging work and borrowing procedures rather than modifying practices or adding new ones. The discourses, the material appearance, and the practices in libraries remained more or less the same until the 1990s, when, with the invention and dissemination of digital media in the 1980s and 1990s, things changed noticeably.

In the 1990s, libraries began to very prominently refer to a development that was then usually referred to as the information age, suggesting an economy that would generate its revenue primarily through information. The sources of information at the same time became varied and digital media formats, including the CD-ROM, were established. Interestingly, however, while

the CD-ROM is based on digital code, it did not actually contribute to the emergence of a new and disruptive model of music consumption. Rather, it followed a conventional pattern common to the entertainment industry, replicating "the production, distribution and consumption dynamics that had characterized the record industry since the invention of the phonograph in the late nineteenth century" (Balbi and Magaudda 2018, 162). The same seems to apply to libraries of that time. While the diversification of media does lead to a storage of different media formats, libraries seemed to adhere to their core function of storing information in the first decade of the digital age. Libraries in the early 1990s, hence, may have no longer revolved around books, but storage remained at the center of attention. On the part of users, practices changed with the diversification of media formats. Viewing and listening complemented the conventional practice of reading and writing in libraries, but silence, on the other hand, remained largely intact as the predominant situational norm within libraries.

With the diversification of media formats offered in the library, the practices in libraries eventually entailed a greater involvement with different types of media technology. So-called online public access catalogs (OPAC) increasingly began to replace the then-common type of library catalogs in the form of analog card catalogs, which librarians had formerly used to catalog and manage books. But it was only with the Internet that this change became visible to users, when library catalogs were not only accessible via terminals on local area networks, but also accessible through websites on the Internet. In order to access information, users were ultimately not necessarily required to visit the library to access its stock. Previously largely dependent on the expertise of librarians, users now increasingly came into the position of accessing the catalog themselves.

Architecturally, this entailed more than the addition of computer labs to libraries. A prominent example that illustrates this quite well is the internationally acclaimed Sendai Mediatheque in Japan designed by Toyo Ito in 1995, which was completed in 2001. On the part of the architect, the Sendai Mediatheque was designed as a "manifesto for libraries in the information era" (ARCH+ 1999), a "forward-looking media library for the 21st century." Functionally, the library features a conventional book-lending library, but also includes an extensive collection of film and audio recordings with stations for both viewing and editing, a theatre, a café, and a bookstore, all of which are housed in the cubic glass enclosure. Even though libraries have existed before as part of a cultural center, for example, this comprehensive integration of functions into libraries rather than *alongside* libraries is something new. While the floor plan of the library remains rather simple, the construction of the Sendai Mediatheque is what strikes the critics. The supporting structure on the side of the building consists of irregular "tubes." These tubes constitute the skeleton of the building and are designed with the help of specific

software. The fact that they are designed with the help of software is communicated very clearly by the complex shape of the structure that could not have been calculated without it. Architecturally, the Mediatheque in Sendai in this sense does not only resemble a computer in its form and texture, but visually also exposes the technology it has been designed with.

**Figure 3**   The Sendai Mediatheque



Source: Ange Urbain.

**Figure 4**   Interior of the Sendai Mediatheque



Source: 準建築人手札網站 Forgemind ArchiMedia.

Libraries between 1995 and 2005 primarily developed against the background of a strong diversification of different types of media at that time, but it is only with the commercialization and the dissemination of the Internet that things changed on the level of discourse, architecture, and practices. In 1997, following the invention of a variety of digital media formats, the librarian Michael Brawne states that "two primary functions occur in libraries: the storage of the information source – books, journals, maps, recorded music, CD-ROMS and so on – and the opportunity of having access to that information by individuals at time of their choosing" (Brawne 1997, 6).

The second part of Brawne's quote accounts for more of an actual turning point in terms of the ways functions are defined in libraries, and it marks a transition to the next phase of digitalization, which will be described in the following section. Libraries, as he states, should provide "the opportunity of having access to that information by individuals at time of their choosing" (Brawne 1997, 6). Following the commercialization of the Internet, which allows for access to information at all times, the quote indicates in what ways libraries entered into competition with other commercial service providers concerned with information management. The way the Internet works becomes an expectation of the way the library is supposed to work. This poses new challenges for libraries. Whereas books only have to be opened to be read, access to information on other media formats requires specific hardware. With the commercialization of the Internet in the mid-1990s, this requirement becomes a pressing issue in libraries, since the necessary hardware in the form a computer is something that only few people could afford at that time. The provision of this hardware expands the requirements for libraries that increasingly seek to be at the forefront of data technology development (Jochum 2007, 222).

## 4.2    Unlimited Access. Libraries as Information Stores (2005–2015)

After 2005, both the storage of different types of media, meticulously collected under the heading "mediatheque," as well as access to the Internet were no longer primary concerns in libraries. A large proportion of people now had the necessary hardware and software to use the Internet at home and a number of older media types were already in retreat, increasingly being replaced by MP3 and other formats. While formats such as the CD were based on digital code, but replicated conventional patterns of production, distribution, and consumption, the MP3 radically changed these patterns leading to a new digital paradigm with far-reaching consequences. This new paradigm was mainly embodied in three elements: the compressed MP3 digital format; the iPod or, more generally, MP3 players; and internet-based tools for the online exchange of music contents, such as file sharing platforms (Balbi and Magaudda 2018, 161). In terms of the meaning, architecture and function of

libraries, significant changes emerged. Media increasingly becomes information, which is supposed to be made "legible" by the library.

This can be well illustrated with reference to the Seattle Public Library, designed by the Office of Metropolitan Architecture (OMA) and completed in 2005, in which, on the one hand, the concern continues to be the storage of media. Modelled upon the Dewey Decimal Classification, an ordering system based on a strictly hierarchical, logical sequence of numbers (Zürn 2015), it is particularly the "innovative organizing system for an ever-growing physical collection" (OMA 1999) that is praised and emphasized by both the architects and the critics of the library of the time. This specific organization of the media according to the Dewey decimal system in the Public Seattle Library is a typical expression of the need for order in a time when information is perceived to be exuberant.

At the same time, access to information is becoming more important. In an "age in which information can be accessed anywhere" (OMA 1999), the ideal library is supposed to store and effectively order a wide variety of media, but also to facilitate access to it in a new way. In an ambition to "redefine the library as an institution no longer exclusively dedicated to the book, but rather as an information store where all potent forms of media – new and old – are presented equally and legibly" (OMA 1999), department stores are becoming role models for public libraries, and library users take on the role of library customers. This is particularly evident in the case of the Seattle Public Library, which partly resembles and borrows from the architectural typology of warehouses, designed to sell services or products to customers. This resemblance of warehouses and libraries of the time includes shop-sized windows but also architectural elements such as escalators typical for department stores and a presentation of the media very similar to that of shops. This shows the extent to which libraries at that time situate themselves and are placed in relation to other offers against which they must compete. With the Internet, information is no longer available exclusively in the library, so that they are seemingly under threat to make and display their offer in the most appealing way.

With its striking form, the Public Seattle Library epitomizes a *turning point* in library architecture, as well as architecture more generally. Evoking associations to a loosely stacked pile of books (Zürn 2015), the library in Seattle represents a shift from the formerly standard angular or rectangular floor plan, which would have been apt to be expanded at any time. The rather complicated façade design of the Seattle Public Library does similarly not allow for easy alterations or expansions. While any deviation from basic rectangular forms was considered highly inefficient for libraries that first and foremost were supposed to store different types of media, sculptural forms are increasingly in demand and awarded architectural recognition. Ideal libraries are no longer those that efficiently store various types of media, but those

that offer a unique and innovative form. Libraries more and more become and seek to be spectacular architectures that photograph well and attract visitors. The library in Seattle may be the best-known but is by no means the only example of a series of spectacular, new library architectures, such as the IKMZ in Cottbus (2004), the new library in Stuttgart (2011), or the library in Birmingham (2013).

As early as the 1990s, cities were said to increasingly rely on large-scale projects in order to stand out in a growing competition for corporate relocations, tourist flows, and wealthy residents. This "festivalization" of urban development, previously aimed at long-term goals, would be increasingly geared towards events of limited duration such as trade fairs or the Olympic Games (Häußermann and Siebel 1993). While this development is another explanation for the fact that libraries such as the Seattle Public Library today also function as tourist attractions and are advertised as such by city municipalities, it is only with the Internet that a previously unknown quantity and circulation of images is encouraged and architecture begins to play such a large role in the deliberate revaluation of places through spectacular buildings, also referred to as the "Bilbao-effect" (Alaily-Mattar et al. 2018). Good architecture is increasingly architecture that photographs well, and specific architectures are praised because they are more photogenic than others (Arantes 2012, 7).
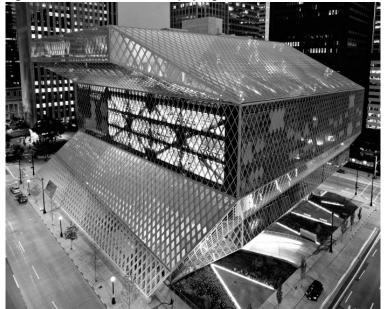
This reinforced the importance of the appearance of sculptural forms, as well as skins and surfaces of architecture, previously considered outdated and unfashionable (Gleiter 2002). The invention and establishment of a bundle of social media platforms, including YouTube (2004), Facebook (2004), and particularly Instagram (2010) boosted this development. Subsequently, architectural qualities are increasingly assessed according to their visual impact. Sharing photos of architecture on Instagram is no longer a "chance by-product of a photogenic design, but a primary concern that drives the ambitions of clients and designers" (Wainwright 2018). Architecture is increasingly supposed to be "instagrammable" and the idea of "doing it for the 'gram' has moved from the preserve of Like-hungry teens to board meeting discussions and multimillion pound budgets" (Wainwright 2018). The Instagrammability of architecture does not leave libraries untouched. The Seattle Public Library today is as much a tourist attraction that people photograph, circulating its pictures on the Internet, as it is a site that people visit to borrow media. Photos of architectures shared by users on Instagram are now often included by default on the websites of architectural firms.

**Figure 5**   The Seattle Public Library at Day, © David Zeibin



Source: David Zeibin.

**Figure 6**   The Seattle Public Library by Night



Source: P. Ruault.

### 4.3    Encompassing Comfort. Libraries as Living Rooms (After 2015)

In terms of the appearance and outer form of the library, library architecture after 2015 becomes even more diversified than before. The bigger changes, however, are taking place on the *inside* of libraries. Library spaces are increasingly designed to be as inviting and as comfortable as possible. This development, as well as the developments preceding this concern, cannot be understood without recourse to the particular technologies prevalent at that certain time. With the smartphone (2007), the evolution of personal computers into alternative tools based primarily on mobile, individual use began to take concrete shape (Balbi and Magaudda 2018, 62).

Digital media are no longer stationary but mobile, and Internet access is not tied to computer workstations but is virtually always available via individual smartphones, facilitating the accessibility to information from any place at any time. As a result, libraries are increasingly aspiring to be cultural centers and public living rooms, rather than spaces for storage, mediatheques, or information stores. This momentum is multiplied as the free content online encyclopedia Wikipedia is gaining traction. Launched in 2001 and rapidly growing in size, since 2005, Wikipedia is the most popular reference website on the Internet.

Architecturally, this translates to a greater concern with the quality of the actual space libraries provide, in particular the interior of the library. Libraries are now to be a public living room (and less of a media library or information store) with cozy spaces and comfortable furniture. The focus is on the quality of the space and the architecture itself, which should ideally provide for comprehensive comfort. In terms of the actual design, this entails a use of brighter colors, upholstery materials, and a greater use of wood in order to create a more pleasant atmosphere.

More than ever before, libraries are concerned with the specific *quality* of library architecture. The most striking example for such a reframing is the very much acclaimed and internationally renowned library DOKK1 in Aarhus, Denmark, designed by the architectural firm Schmidt Hammer Lassen and opened in 2015. Cushioned furniture, lounge chairs and sofas, and sheltered reading corners and chairs expand the range of uses in the library. The practices these ideal libraries after 2015 afford are, hence, much more varied, continuing traditional functions such as working, reading, and writing, but equally expanding its range to gaming, leisure time, and so on. An increased number of events such as readings, concerts, etc. take place in the premises of the library. The furniture allows for different scenarios, such as individual work, work in groups, focused work, and communicative exchange; chairs and tables can be moved. At the same time, this does not necessarily mean increased flexibility. Partly because it is too costly to equip entire buildings with the same possibilities for electricity and Internet, areas are

preconceived according to certain user scenarios. The increasing penetration of buildings by technology and the presence of digital technology therefore does not necessarily lead to more flexibility, but also reduces it.

**Figure 7** DOKK1 from the Outside



Source: Villy Fink Isaksen.

**Figure 8** Inside the DOKK1, © Charlotte Henard



Source: Charlotte Henard.

Rather than offering specific objects, libraries are now supposed to offer *experiences*. Makerspaces, that is, rooms set up as collaborative workspaces

equipped with resources for activities such as laser cutting, computer programming, and 3D printing, but also sewing machines or musical instruments are becoming a trend. Relying both on high tech as well as no tech tools, the characteristic feature of makerspaces is that libraries for the most part do not predetermine the offer and the activities that take place here, but only provide for the environment and resources, the room and the infrastructure, for activities that users determine independently. This rationale can be directly linked to the development of specific technologies, in particular the enforcement of a new economic logic that has been referred to as platform capitalism (Srnicek 2017; Staab 2019). Platforms, broadly defined as "infrastructures that enable two or more groups to interact" (Srnicek 2017, 43) and the set of new work modalities along these lines (Liang, Aroles, and Brandl 2022, 1) seem to have had a severe impact on libraries.

Characteristic for the new economic model and logic of platform capitalism is the fact that companies no longer offer products, but simply provide for the infrastructure that customers and suppliers use to conduct trade quasi independently. eBay does not sell products, Uber does not have cars, and Airbnb does not have houses. Libraries are increasingly adopting this logic. Offers modelled upon this logic include events in which services are not directly offered by the library but only facilitated, such as the coupling of library users literate in IT-skills with others in need of assistance with regards to them, or more open formats in which only the space and infrastructure are provided by the library, while the content and implementation are left entirely to the users. Overall, events, as well as partnerships with other institutions, become a crucial concern in libraries. In the attempt to offer something that cannot be offered online, libraries become cultural centers revolving around a variety of events (Oestergaard 2016) rather than mediatheques and information stores.

## 5.  Discussion. Trajectories, Turning Points, and Cycles as Temporal Patterns of Digitalization

Following Reckwitz (2017, 229ff.), digitalization can be broadly defined as the interplay of computing, the digitization of media forms, and the communicative networking on the Internet. Viewed in this way, digitalization processes in libraries can be traced back to the 1960s, when library catalogs were logged with the help of electronic data processing technologies and internal work processes in libraries became streamlined. The discourses, the architecture, and the practices in libraries, however, did not change instantaneously when computer technologies entered the library.

The comparison with the modern library, prevalent as type after 1850, instead shows in what ways the library has long developed along established trajectories. Roughly between 1850 and 1995, libraries were all about storage, easily expandable architecture, efficient shelving, targeted information retrieval, and quiet reading and working. Changes have occurred in a relatively orderly fashion during this time, particularly in the form of an increasingly efficient shelving and increasingly functional architecture. It was not until the 1990s that changes at the level of discourses, architectures, and practices became evident. Digitalization processes in libraries can therefore not be understood as disruptive forces across the board. Following Baur's distinction of trajectories, turning points, and cycles (Million et al. 2021, 4; Baur 2005, 125-42), it is instead apparent that all three types of patterns of progression are evident in the development of library architecture.

*Trajectories*, describing processes of social change that are patterned in a systematic way or develop path-dependently, are evident in libraries in those areas where developments have evolved in a relatively orderly fashion or along predictable patterns. The fact that libraries have persisted altogether, although commercial information service providers have taken over and substituted some of the former basic functions of libraries, can be explained by the fact that libraries have for a long time been responding to the (real or imagined) expectations of library users.

Considering that books still make up a large part of the fabric of libraries equally emphasizes the somewhat orderly progression of digitalization processes in libraries. In fact, the sector of publishing has been one of the longest-lived media sectors and has remained relatively stable over the course of more than five centuries (Balbi and Magaudda 2018, 168). Digital media may have even had a positive impact on the dissemination of books in those terms. Printed books are not only some of the most efficient media (as they do not need electricity, are distinctly hard wearing – shock, cold, and partially water resistant – and made of simple, while increasingly scarce, materials available in many parts of the world), but have also entered into an apex with digital technologies in production and printing terms (Balbi and Magaudda 2018, 176). Platforms such as Amazon are to some extent even encouraging the purchase and exchange of paper books. The death of paper books and the death of libraries, hence, remain a recurring theme in media history, but are not empirically evident. Instead, there is a "co-existence and stratification between analog and digital, old and new technologies, luminous screens and yellowed pages" (Balbi and Magaudda 2018, 176).

Likewise, the evolution of practices in libraries appear as *trajectories*. Since the onset of the modern era, and particularly in public libraries, more and more different groups of people are allowed to enter and explicitly welcomed to the library. At the same time, an increasingly wide range of activities is admissible and encouraged in the library. Activities that would previously

have been considered too informal for the library, including eating and drinking, chatting and gaming, lounging and lying, are not only allowed, but stimulated and afforded by specific furnishings. This development can be seen as part of a longer-lasting process of informalization in the 20th century (Elias 1976), in the course of which more and more forms of conduct and behavior have become acceptable.

The trajectory in academic libraries, on the other hand, is exactly the consistent focus on quiet work. While there is a certain convergence between public libraries in terms of their external appearance and interior design, the codes of conduct and the practices that take place here are in many cases still geared toward quiet, concentrated work. The Bavarian State Library, for example, has also been furnished with (informal) lounge furniture, but it is still used primarily for concentrated reading and writing, shielding users from the outside world.

An important *turning point* can be identified with regard to the architecture of libraries. Starting around 1995, newly-built libraries were constructed with increasingly spectacular architectural designs. Newly built libraries in Sendai (2001), Seattle (2004), Stuttgart (2011), Birmingham (2013), Aarhus (2015), Helsinki (2018), and many other libraries testify to that. In some of these libraries, the buildings have converted from functional edifices to tourist attractions and are marketed as such by cities and municipalities. Architecture has undergone a symbolic enhancement and significant reappraisal. These developments can be attributed to different but very specific technologies, media, and platforms of the digital age. It is only with Instagram that the importance of photos in architecture is taking on such significance that it is influencing the construction methods and external form of libraries. And it is only with smartphones and Wikipedia that information becomes so ubiquitously accessible that libraries devote themselves to the actual quality of the interior of the library, which is supposed to offer *encompassing comfort.* These developments underscore the year 1995 as an actual turning point.

At the same time, *cyclical patterns* can be discerned with regards to technology and the discourses surrounding them. Passoth has elaborated on how – as new technologies are introduced – the same patterns of response to them recur (Passoth 2008). As for architects, it seems that new technologies are enthusiastically welcomed by initially quite literally translating it into their work. The Mediatheque in Sendai does not only resemble a computer in its form and façade but does display the use of the then latest technology: the software used to calculate and design the complex load-bearing structure of the library. The organic form of the tubes clearly exposes and visualizes the extent to which they have been calculated by software. Beatriz Colomina makes a similar point in arguing that modern architecture in the beginning of the 20th century has been shaped by the dominant medical obsession of its time – tuberculosis – and the technology that became associated with it – X-

rays – whose technology, according to Colomina, produced a new and widespread change in the conception of space and the relation of inside and outside (Colomina 2019, 10). There is nothing new about this kind of reaction. Just as the abundantly visible steel structure in the library Sainte-Geneviève, the first of its kind, exposes and visualizes the new material steel, shaped by the then modern invention of artificial lighting and steel beams, the Mediatheque in Sendai seems to have been shaped by the dominant obsession with new forms of media and the Internet and its hardware in the 1990s.

The phases we have delineated and the temporal patterns of difference and repetition we have found are self-evidently simplifications. The changes in libraries we have described did not take place overnight, nor along a linear path. After all, libraries are not just passive recipients who are affected by digitalization, but also active players in a refiguration process, whose impulses are implemented in different ways and associated with different consequences. These processes are unfolding differently and at a different pace in rural areas, smaller towns, and villages when compared to those in metropolises and capital cities. For the most part, libraries do still, first and foremost, engage in storing books and are for the most part housed in architectures that are neither new nor necessarily purposely-built as libraries. In Germany, for instance, almost all public libraries (with the exception of municipal libraries) offer computer workstations with Internet access, offer an inventory of library media online, and make digital media such as e-books, e-papers, and e-audios available, but at the same time one in four public libraries did not offer public WLAN as of 2018 and had no plan to do so (Rat für kulturelle Bildung 2018, 24). In other words, not only do not all libraries have makerspaces that they offer in the spaces of spectacular new library architectures, but they may not even have Internet access.

Looking only at those new built public libraries that have received a wide attention in magazines, have been honored with awards, and are repeatedly cited as role models on the part of both librarians and architects has nevertheless allowed us to disentangle some of the common structural principles that can be identified in the development of library architecture over the course of the last 25 years. After all, regardless of the size of a library, whether it is housed in a new building or existing architecture, and what its function is, these libraries are the ones that act as particularly influential landmark buildings in the field of library architecture and therefore have a large impact in terms of the development in libraries more generally.

The simultaneity of different temporal patterns indicates that empirical analyses of the actual impact of different digital technologies are more important than a general classification of digitalization. A historical approach is the appropriate choice for this kind of questioning. This implies both a retrospective, as we have undertaken by looking at the example of the library Sainte-Geneviève in Paris from the 19th century, as well as a more precise

delineation of what should be considered the "digital age" in the first place. This approach helps in determining which aspects of libraries actually changed with the advent of digital technologies and which aspects are, on the other hand, best accounted for as continuities. Substantially, our study suggests that the phase of the last 25 years needs to be described in a more nuanced way than the catch-all term digitalization is capable of. The digital age of stationary computers and digital media such CD-ROMs and DVDs is certainly not the same as the digital age following MP3s and Wikipedia and eventually the Smartphone and an economy modelled upon platforms such as Instagram.

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