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Qualitative analysis of international strategic trends pertaining to the digital ecosystems of libraries

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Abstract: The principal driving force behind contemporary changes is the Fourth Industrial Revolution. While similarly to previous industrial revolutions the Fourth Industrial Revolution radically altered technology, economy and society, the latter displays an exponential growth as compared to the linear development of the former. Consequently, cyber-physical systems emerge blurring the distinction between hardware and software, and take advantage of the options provided by networks and artificial intelligence. Furthermore, communication takes place not only between humans but machines as well (Schwab, 2015). The Fourth Industrial Revolution results in a cultural paradigm shift and dramatically changes how society functions. Since the library has a complex role as an information system and as a culture and value transmitting institution it is extremely sensitive to these developments. Therefore in order to preserve their competitive edge, libraries must continuously and adaptively respond to the given changes. In our essay we explore the impact of the respective paradigm shift on libraries and identify external factors influencing library ecosystems and the related expectations. We will provide a definition for the digital ecosystem of libraries followed by a trend analysis of the given components' actual role and the extent of their effect on library strategies. We base our conclusions on a software supported content analysis of strategic documents issued by several international library organizations (IFLA 2013-2024, ALA 2017-2022).

Keywords: digital ecosystems of libraries; digital ecosystems;

1. Introduction

The principal driving force behind contemporary changes is the Fourth Industrial Revolution. While similarly to previous industrial revolutions the Fourth Industrial Revolution radically altered technology, economy and society, the latter displays an exponential growth as compared to the linear development of the former. Consequently, cyber-physical systems emerge blurring the distinction between hardware and software, and take advantage of the options provided by networks and artificial intelligence. Furthermore, communication takes place not only between humans but machines as well (Schwab, 2015.). The Fourth Industrial Revolution results in a

cultural paradigm shift and dramatically changes how society functions including learning and information acquisition (Szűts, 2022). Since the library has a complex role as an information system and as a culture and value transmitting institution it is extremely sensitive to these developments. Therefore in order to preserve their competitive edge, libraries must continuously and adaptively respond to the given changes. .

The magnitude and significance of the problem is indicated by the fact that while numerous research efforts focus on the future of libraries and the impact of digitalization (Koen, 2018, Logan & McLuhan, 2016), system level changes in the library information systems and the resulting digital ecosystem have not yet been given the same level of researcher attention.

In our essay we explore the impact of the respective paradigm shift-generating features on libraries and identify external factors influencing library ecosystems and the related expectations. We will perform a trend analysis of the strategic documents of several international library associations (IFLA 2013-2024, ALA 2017-2022). The results of a software-supported content analysis will help in defining the concept of the library digital ecosystem.

2. Theoretical framework

2.1. *The digital transformation phenomenon*

In the past decades a digital technology-focused perspective has permeated all spheres including the industrial sector. The process is best described by the term “digital transformation” implying a multifaceted development effort aimed at the maximization of the potential functions of public libraries in the context of digital ecosystem criteria via the comprehensive development of digital competences, the application of human performance support systems through the propagation and integration of the technologies of the information society (ICT devices). In addition to infrastructure the process is based on management, professional development of human resources, and the channels and services of the respective collections.

Similarly to the chronological division of the web reflecting changes in the digital world (web 1.0, web 2.0, web 3.0) the phenomenon can be represented in various developmental stages. The respective phases, however, are not arranged in a linear fashion as they tend to appear simultaneously or in a parallel manner and frequently display cyclical features. Consequently, during the adaptation of a technological innovation into the instruction process we re-enter the first stage to advance gradually forward to the second and third stage.

In the first stage of digital transformation the emphasis was on the search and testing of the infrastructural (currently digital) conditions, the human resource competences, and new methodological approaches. While the main concern was the actual launching of the process, a frequent contemporary misconception considered the mere existence of an appropriate infrastructure necessary and sufficient condition for its successful pedagogical adaptation. This perspective, however, has become more refined as it was revealed that digital transformation requires the development of the other pillars of the process as well, in other words it is a multifaceted approach.

The second stage entailed the evaluation of the schedule and extent of the respective development, the identification of options for assessing digital maturity, outlining further developmental steps along with the search for methodological solutions. (Lengyel, Szűts and Racsko, 2021). The improvement of infrastructure did not guarantee success by itself (OECD, 2018), as a modified attitude to information and the related new methodology became necessary (Kiszl, Rado and Hubay, 2018). The third stage is likely to include the actual integration following a stabilization along the lines of a paradigm shift (concepts, methodologies). The respective changes will result in the rearrangement of scholarly paradigms as the previous theories are not capable of providing answers to newly emerging questions eventually leading to a scientific crisis. Thus the digital transformation is a long process since the conversion of new perspectives to paradigms, during which one approach can gain dominance among its counterparts is slow and time consuming.

2.2. *The digital ecosystem*

Due to its inherent features the process of digital transformation is part of a larger system, which can be defined as the digital ecosystem. “A digital ecosystem is an interactive system established between a set of active agents and an environment within which they engage in common activities. “Agents” include (but might not be limited to) providers of software services, information sources, and human agents. The environment is a combination of a socio-economic context and a digital infrastructure.” (Krause, Razavi, Moschoyiannis & Marinos, 2009)

The digital ecosystem operates or functions similarly to its natural counterpart emphasizing cooperation among organisms in a competitive context. The concept is applicable to several areas including the computer industry, entertainment sphere and special profession-related policy formation. The digital ecosystem can be also be considered a specific technological

solution. The main representative of this school is Gerald Briscoe, a researcher of the technologies of the future, asserting that the digital ecosystem is a technology designed for the realization of specific human objectives and is capable of development in order to solve dynamic problems in a simultaneous and efficient way (2009). According to Briscoe the main difference between biological and digital ecosystems is that while the former develops via a hereditary or evolutionary process, the latter facilitates the realization of objectives set by humans and its “evolutionary” impact is implied by the dynamic solutions of the respective problems.

In 2022, a team of researchers conducted a literature review to identify the key features and main challenges of digital ecosystem research by reviewing 94 publications. The result was a service-centric definition: “A digital ecosystem consists of one or more digital ecosystem services that fulfill the criteria DS1 and ES1–ES6. Additionally, the digital ecosystem contains all service assets, the digital platform, the ecosystem roles service asset broker, service asset providers, service asset consumers, and potential support providers.

Digital Service Criterion:

DS1. The digital platform enables the digital core service activity.

Ecosystem Service Criteria:

ES1. There is a service asset broker who brokers service assets between service asset providers and service asset consumers.

ES2. The service asset broker is responsible for arranging the onboarding of service asset providers and service asset consumers.

ES3. Service asset providers are responsible for the placement of service assets.

ES4. The service asset broker is responsible for service asset matching.

ES5. The service asset broker is responsible for enabling physical or digital fulfillment.

ES6. The service asset broker must be neither the only service asset provider nor the only service asset consumer.” (Koch et al, 2022.)

2.3. *The library ecosystem*

Any definition of the ecosystem of libraries has to consider the social norms and the general culture determining library-related attitudes, and indicators of one’s social position (one’s

socio-economic background, qualifications) impacting expectations along with material aspects and the legal, regulatory and financial systems providing the given operational framework. While the preservation or survival of libraries is a crucial issue in the 21st century, the specific components of interaction have to be determined along the lines of cultural expectations, social requirements, the expectations of maintaining organizations, and the given professional and legal context (Lengyel, 2022).

Research concerning the future of libraries envisions a complete role or function change as in 50 years libraries due to their capability of providing access to data banks are expected to become universal sites for learning, the consumption, sharing, and creation of knowledge along with experience acquisition (Pescovitz, 2016). Such developments, however, are not solely applicable to the distant future, as they partially imply current changes too. An analysis of library strategies revealed a full harmony between the American and European perspectives in the 2013-2018 period. Consequently, libraries can provide space for or facilitate:

- learning in order to improve digital competences and to provide preparation for meeting challenges posed by the technological development,
- preparation and familiarization of the public with the relevant legal framework, copyright law, digital law, and the protection of the private sphere,
- access to the global information economy entailing credible and authentic information, new technologies, blockchains.,
- access to community services (internet services, social infrastructure, network-connected or network-based society).

Therefore the main functions of digital ecosystems of libraries include:

- Information providing –online information provision
- Preservation, retention – web archiving, creation and maintenance of digital collections
- Improvement of life quality, organizing digital workshops (Makerspace movement)
- Assuring equality of opportunity –Providing info-communicational accessibility
- Innovation – development of new methodological solutions
- Employment support – Competence development
- Informal education– The creation of an authentic learning environment, the training of digital citizens, online and ICT methodology supported instruction.

The digital ecosystem of libraries implies the goal-oriented application and provision of digital devices, methods, and platforms in order to strengthen the competitiveness and develop the

modernization capability of the cultural, social, and material dimensions of library ecosystems to facilitate the improvement of life quality and promote the social utility of libraries (Lengyel, 2022).

3. Method

In analysing international library strategies we relied on a qualitative non-reactive (intervention-free, non-consequential) approach (Hennink-Baily, 2020.) We performed indirect observations and drew consequences, provided explanations and descriptions related to situations and documents (Bortz and Döhring, 2003) We used a qualitative method during the content analysis of the given text. Text-based content analysis can be performed both in a qualitative and quantitative manner. The former implies a frequency assessment of categories established by researchers, the latter is an interpretative, meaning construing analysis highlighting the thoughts and messages related to the subject of the respective research (Mayring, 2002).

In our research we relied on a hybrid solution.

During the sample taking process we applied the typical/intensive strategy of qualitative selection strategies (Koivu - Hinze, 2017), facilitating a multidimensional consideration of the procedure (Mayring, 2002). Thus chronologically we emphasized the period lasting from 2010 until today, while from a spatial or geographic point of view we explored international strategies issued by supranational organizations among them the ALA and IFLA, primarily related to the United States and Europe. Regarding the organizational dimension, we consider the public collections, especially libraries as the basis of our analysis.

Besides the descriptive approach the actual research apparatus prioritises content analysis. Our exploration utilizes the MaxQda text analysis software relying on a knowledge-based programming language. (Mayring, 2002)

The inquiry results in conceptual maps and graphs visually describing the code systems and the respective connections revealed by an in-depth analysis.

4. Results

Libraries as an information transmitting system maintain a continuous and adaptive connection with all subsystems of society. We explored the role of the respective system components in

the international library strategies providing guidelines and strategic foundations for the total library sphere.

The 2017 strategy of the American Library Association states:

”The library is a hub of community engagement and continual learning: a place to form the critical thinking skills fundamental to learning in a technologically evolving world, to access information, and to create and share new knowledge.” (American Library Association, 2017.)

The IFLA (International Federation of Library Associations and Institutions) establishes primary guidelines for libraries as the leading organisation dedicated to library and information science. The IFLA publishes an annual overview of information society-related developments impacting libraries.

The first trend report issued in 2013 was updated annually until 2019.

In 2013 the IFLA summarised the primary changes impacting libraries in 5 crucial points:

1. the new technologies increase, yet at the same time limit access to information by narrowing the circle of those entitled to obtain the respective knowledge,
2. online instruction democratizes education globally while effecting radical changes in the learning process,
3. the borders of the private sphere and the scope of data protection have to be redefined,
4. new opinions and groups gain prevalence in network-based societies,
5. the new technologies transform the global information economy. (IFLA, 2017)

The qualitative analysis of the first Update issued by IFLA in 2016 reveals that libraries prioritise three out of the five abovementioned concerns:

1. The impact of new technologies.
2. Global learning emphasizing skills while online instruction is enhanced with blended learning, MOOC courses, and informal instruction schemes.
3. Data protection and copyright issues.

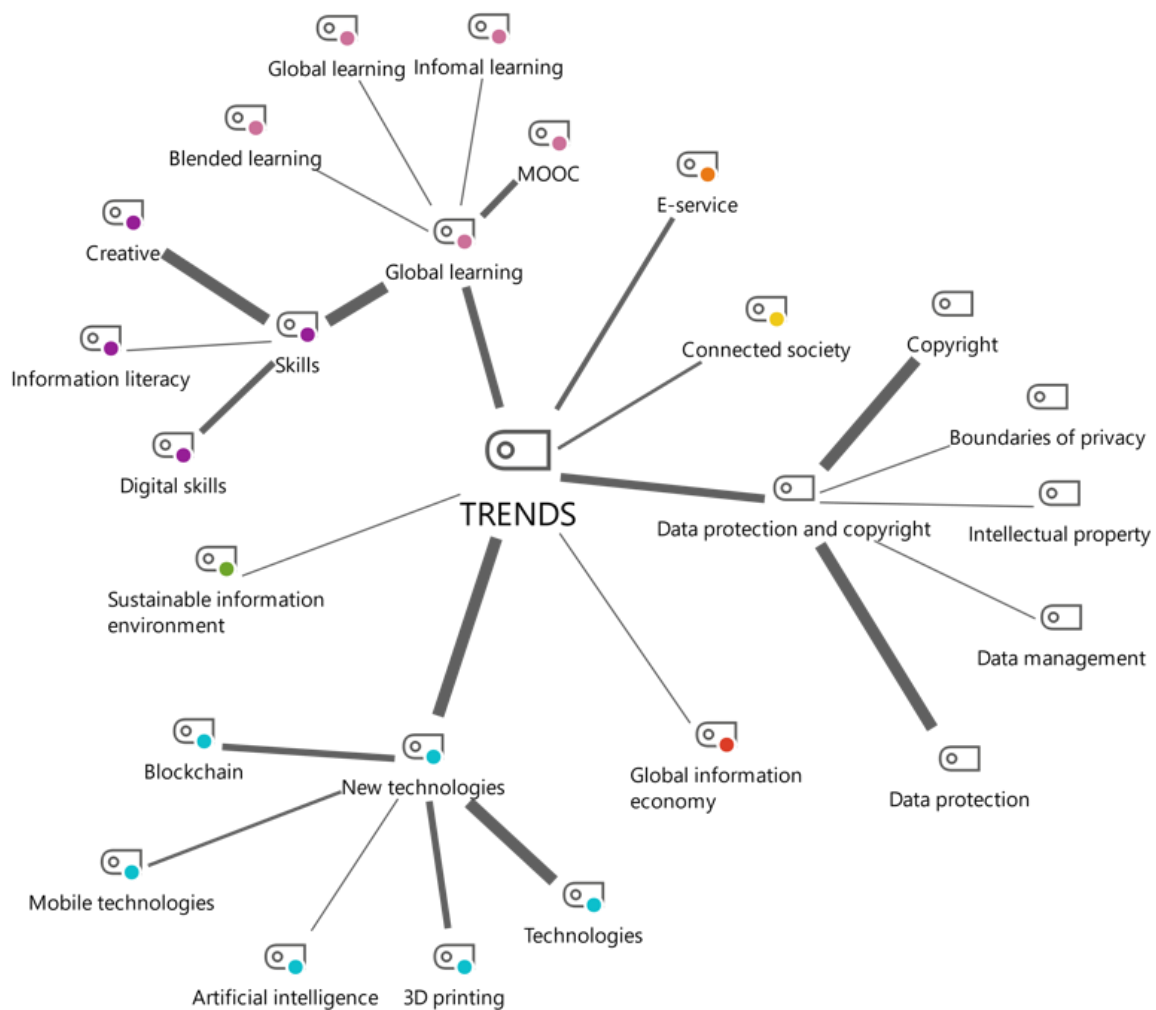


Figure 1. IFLA Trend Report 2016, Updated code map

As of next year, the newer trend reports reflected a different structure. The factors impacting libraries are not listed according to continents, but as the 2017 trend report indicates (IFLA, 2017) a futurist, a consultant, and a leader of a Makerspace lab wrote a chapter respectively. The most important issues include providing access to reliable information while highlighting the advantages implied by local features. As far as later strategies are concerned, the emphasis will shift to international connection and cooperation within the library sphere.

The content analysis of the 2018 Update Report (IFLA, 2018) singles out maximising the Internet provided options followed by such topics as community networks, environment and cooperation.

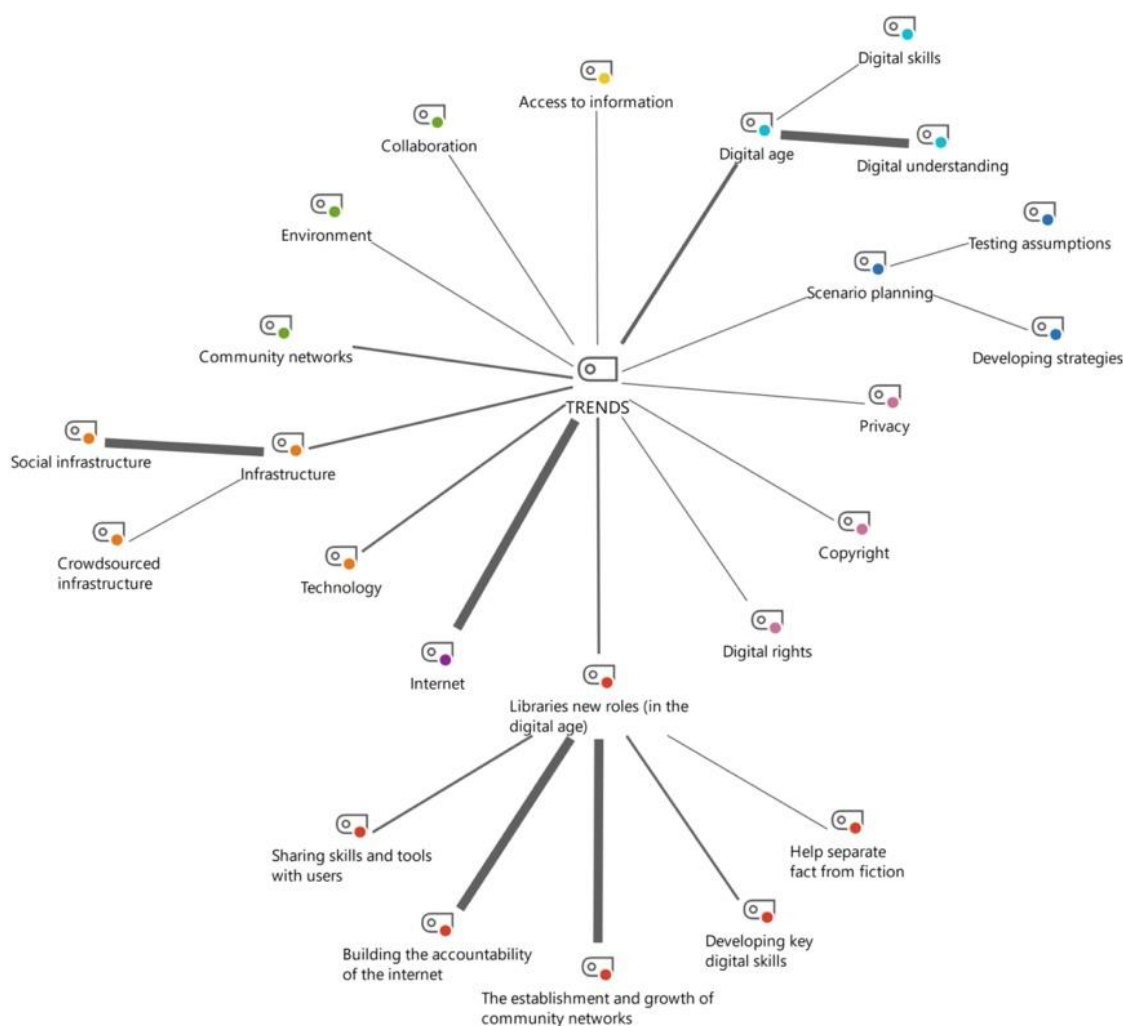


Figure 2. 2018 IFLA Trend Report

A similar emphasis is placed on the future importance of legal protection, the protection of the private sphere, digital law, copyright issues and the significance of the challenges posed by the digital age including the promotion of digital comprehension, and the improvement of digital skills. The concepts of technology and infrastructure are assigned special importance with attention to social infrastructure and the infrastructure for provision of services on a mass scale.

The 2019 Update Report follows a different structure introducing the action plans proposed by leaders of international library organizations. The most determinative aspect is the impact analysis of governmental measures and the respective political trends emphasizing the importance of advocacy efforts while especially persistent functioning and “the smart state” of libraries are identified as a key to long term survival . The Report reveals a widespread unfamiliarity with general rights and underlines the potential crucial role of libraries promoting access to information both for citizens and policy makers alike.

The code map of the 2019 Trend Report Update reveals the prevalent role of the political sphere and of governments. In addition, information, online work, transformation, uncertainty and the online form of education are emphasised, and a new element is the holistic approach and global thinking.

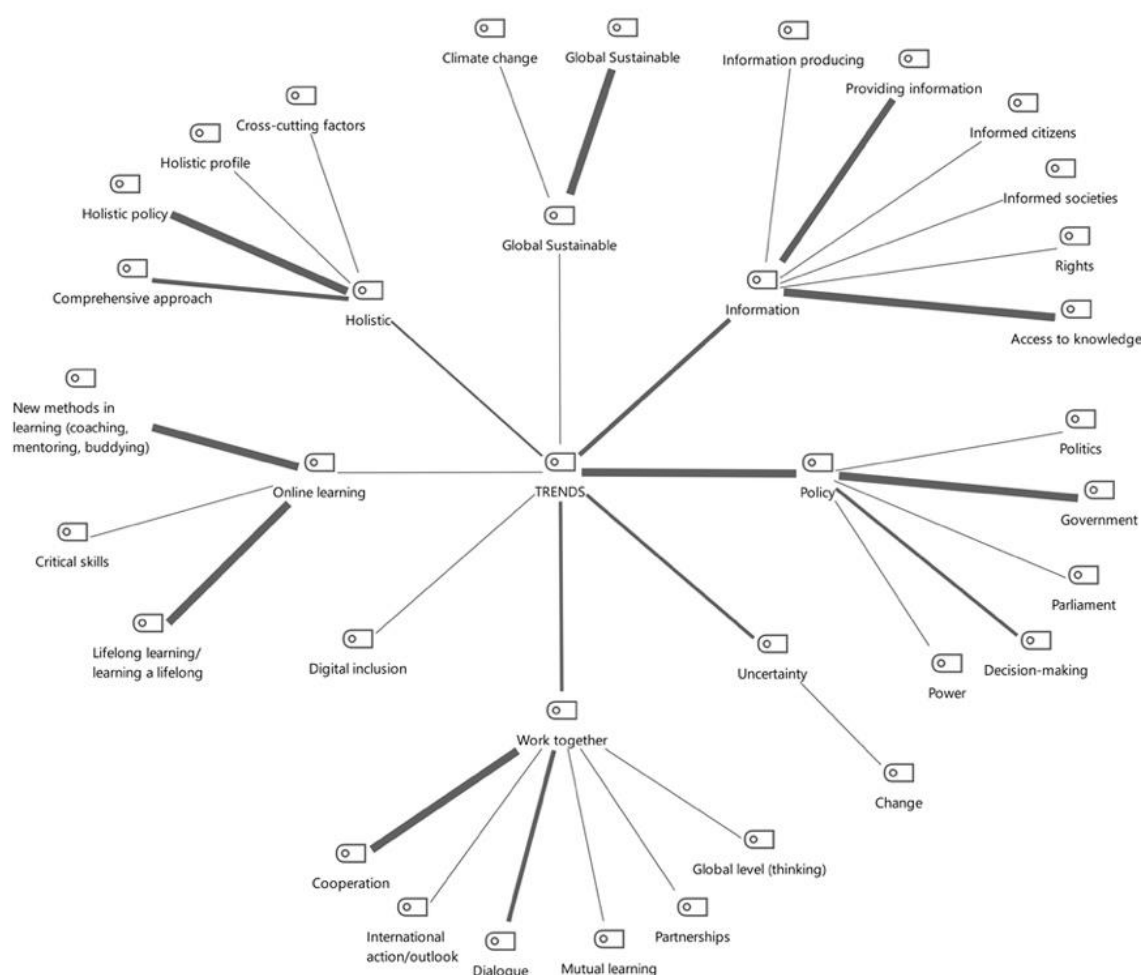


Figure 3. The 2019 IFLA Trend Report

Instead of issuing an updated report in 2020 a comprehensive strategic document spanning over a greater period was published. The IFLA Strategy 2019-2024 identifies 4 major guidelines: (IFLA, 2019).

1. Strengthen the global voice of libraries
2. Inspire and enhance professional practice
3. Connect and empower the field
4. Optimise our organisation

These points differing from previous practice promote the internal strengthening and reinforcement of the library profession,

The content analysis of the strategy for 2019-2024, a short document in itself, and the resulting code map provides a more refined picture.

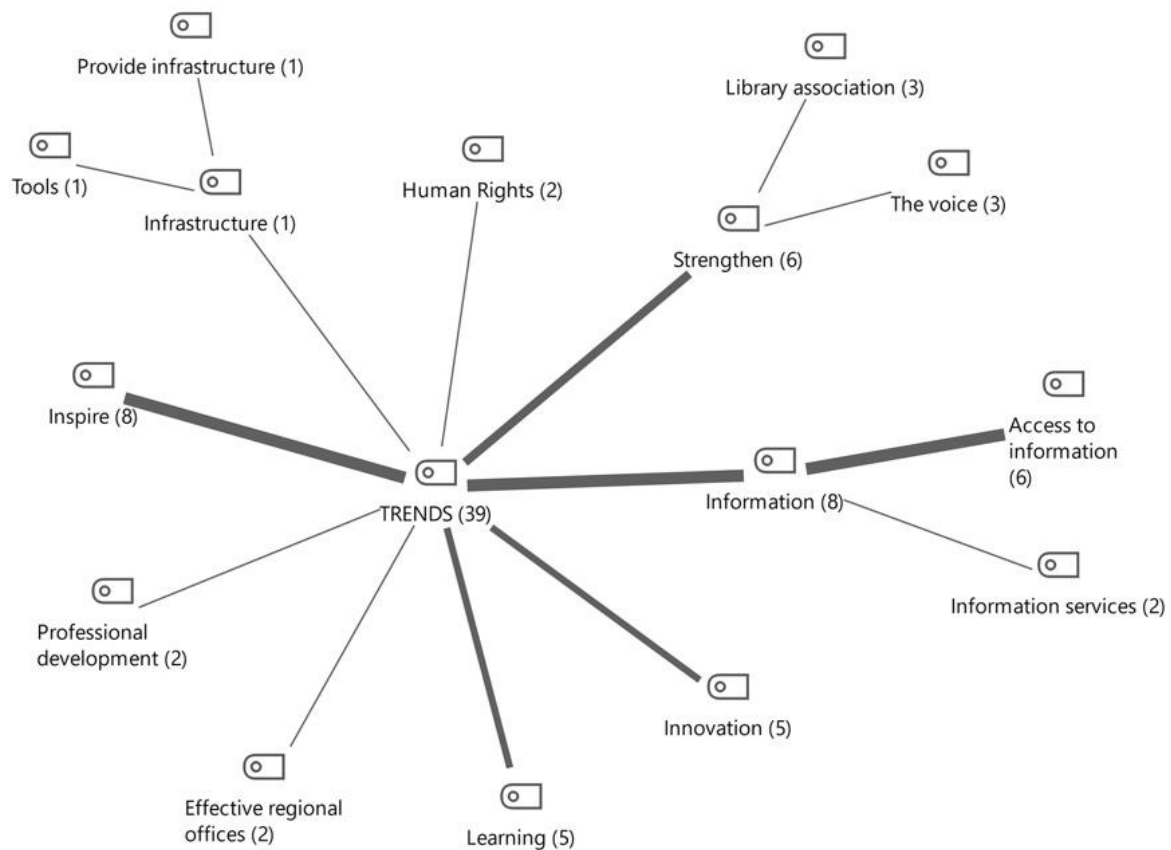


Figure 4. IFLA Strategy 2019-24 code map

The most important component or factor is inspiration, providing access to information and following the given guidelines, the respective strengths are highlighted. Learning is a crucial concept and the context-based analysis shows the emphasis is on the training processes of librarians and library managers. While the education of the public is also a genuine concern, the improvement of digital competence levels, online instruction and the preparation of the public to meet the challenges of the cyber-physical society are not included in the document.

5. Conclusions and future works

The exploration of major factors influencing the library sphere resulted in the identification of features, which not only have significant impact on society, but on the library profession as well. One of the most important issues is the Fourth Industrial Revolution radically changing

the labour market. The technological development will result in heretofore non-existent professions while several trades and professions are expected to disappear and the production of robots or the phenomenon of robotics will fundamentally modify the functioning of factories by forming automated systems free from human intervention. As a result of such processes the task-related competences have experienced continual change in order to meet the requirements of high technology oriented future work environments. The radical changes will not only impact the labour market and the work place as they will extend to transportation, the operation of households, everyday communication, and information acquisition. There is an unquestionable need for a facility where the public can prepare to meet these challenges by becoming familiar with the operation of the given digital infrastructure. Libraries can provide an excellent solution to this problem!

The realization of this goal, however, is far from simple as libraries have to cope with a variety of demands. These institutions have to determine the guidelines, which reflect the expectations of the public, and they are required to develop the competences of their own colleagues to enable them to meet these new demands and finally they have to implement the digital transformation process in the library sphere.

As the researchers of MIT declared: “To succeed digitally, big old companies need to embrace new organizational structures and processes that empower their people to collaboratively experiment with technologies and deliver integrated products and services to their customers.” (Sebastian et al. 2017. 199.)

Consequently, not only the public, but the library sphere needs help. While library strategies determine specific trends, there is a continuous change in this area. Factors that played a determinative role in 2013, including technology, data protection, and the emphasis on a global information strategy have become superseded by the impact of governments and the need for advocacy. Such developments resulted in significant changes in the library perspectives. Consequently, the assessment of the current state of digital ecosystem entails the global information economy, digital public collections, digital services, digital competence and infrastructure.

Regarding competence development constructive pedagogy is a promising approach to libraries as it includes the learner in an active knowledge acquisition process or creative effort utilizing previous knowledge. In this case the crucial aspect of knowledge is its usability and adaptability (Alemu, Stevens, and Ross, 2012). In constructive pedagogy the environment plays a vital role

especially the digital learning environment and the application of relevant e-learning methodologies (Antal and Czeglédi, 2022).

According to the “Social constructivism is a theory of knowledge in sociology and communication theory that examines the knowledge and understandings of the world that are developed jointly by individuals. This theory assumes that understanding, significance, and meaning are developed in coordination with other human beings. The most important elements in this theory are (a) the assumption that human beings rationalize their experience by creating a model of the social world and the way that it functions and, (b) the belief in language as the most essential system through which humans construct reality” (Leeds-Hurwitz, 2009 qtd. by Amineh and Asl 2015. 13). The library can be an excellent support for socio-constructivist learning, as different groups in society can use the community to implement learning and knowledge acquisition, shared meaning creation, and cultural transmission.

Effective learning (Heick, 2018) requires informal, authentic learning environments provided by the libraries. Functioning as an alternative instruction facility, libraries can contribute to training for 21st century global citizenship through the given organization’s management (perspective, vision) modern infrastructure, highly qualified associates and appropriate methodological background (OECD, 2021) (Kővári, 2022).

One question emerges in light of the new European trends. What kind of influence will advocacy, governments, and the international movements have on the ecosystem? The answers to this question will fundamentally determine the future of libraries. The reason is: libraries have to keep up with changes in human skills and must provide solutions and support for meeting the challenges of the current paradigm shift!

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