Information Literacy and Libraries in the Knowledge Society

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Foreword

Today, before reading this, you probably already checked your e-mail, your Instagram or your WhatsApp messages. Our smartphones, computers, and the World Wide Web have become natural parts of our daily lives, at home, at work or at school. While we slowly but readily accepted these changes to our lives, in the name of comfort, innovation, or efficiency, we do not yet know everything about how they influence us, our surroundings and our society as a whole. In information science, important research topics are located in these interactions between humans and computers.

To optimally deal with these interactions, humans need information literacy. In the recent years, information scientists have begun to research the role of information literacy in our society. This research is closely related to studies on libraries of the 21st century, which adapt and change their role from sole providers of information to educators of the knowledge society. But how are these two connected? To keep it simple: Libraries are, next to schools, important institutions for information literacy instruction. Therefore, it is conclusive to see a connection between them. Furthermore, all the efforts of the library are for naught if patrons do not have the necessary skills to utilize them. Together, the two research areas build the foundation of "Information Literacy and Libraries in the Knowledge Society," the work in front of you. It is part of a research program after Lakatos (1976) and its hard core is the assumption that information literacy is a meta-competence of the information and knowledge society. It was driven by two fundamental research questions:

1) What is the role of information literacy in our modern society?
2) What is the role of the library in our modern society?

The two fundamental research questions lead to further, more detailed, research questions, which build the positive heuristic and protective belt of the research program. Two of the main auxiliary theories are that libraries will share or even lead the role of information literacy educators and promoters and that they will only thrive if they transform according to the needs of the knowledge society. These, as well as related research questions, are explored in the 11 research papers (Chapters 2-12) presented hereafter. In Chapters 2-12, we will find out more

about the current state of information literacy research, education, assessment and comparison as well as how libraries promote information literacy. We will also take a closer look at the services modern libraries offer around the world and closely observe transformations of library systems in two case studies. Finally, we will talk about how libraries can innovate in a knowledge society and why they are, as information literacy is, of high importance for the construction and maintenance of information societies and knowledge societies.

Each research paper can be seen as a content-increasing step of the research program, aiding in "revising some false 'facts' or adding novel auxiliary hypotheses" (Lakatos, 1976, p. 49). Some of these have to be adjusted or even replaced in order for the research program to progress and, while not every step can immediately lead to new facts, every now and then we have to retrospectively corroborate observations (Lakatos, 1976). In the Conclusion (Chapter 13), the corroboration of observations will be explored further.

But let us start at the beginning: In the following chapter (Chapter 1), the two main topics will be introduced: Firstly, information literacy, by following a short timeline of information literacy definitions and discussing why information literacy is important for the knowledge society. Secondly, libraries of the 21st century, by referring to a contemporary definition and the library's relevance for information science research. This introduction is followed by an overview of all research chapters (Chapters 2-12). They are a collection of 11 peer-reviewed and published articles and represent the core of this work. After Chapters 2 to 12, a conclusion for all chapters will follow (Chapter 13).

I will now leave you to the perusal of "Information Literacy and Libraries in the Knowledge Society." I sincerely hope you enjoy reading this work and that it will lead to interesting discussions.

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Maria Henkel
Düsseldorf, Germany • May 2019

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Acknowledgements

1 Introduction to Information Literacy and Libraries

1.1 What is information literacy?

"In everyday life (Catts & Lau, 2008) and in professional life (Bruce, 1999), information science finds its expression in the skills of information literacy" (Stock & Stock, 2013, p. 3). But how is information literacy defined? Probably the most-cited definition of information literacy, is the following by the Association for College and Research Libraries ([ACRL]; American Library Association [ALA], 1989): „To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." But since 1989, a lot in how we interact daily with information, especially on and through the internet, has changed. Our former role of passive consumers who simply have to find and use information, has changed to the role of the "prosumer", actively participating and shaping the web (Toffler, 1980). The transformation of our daily lives due to the development of information and communication technologies has to affect how we define an information literate individual. Consequentially, information literacy definitions need to be updated and changed as we, our technology, and our society progress.

In 2014, Beutelspacher evaluated various information literacy standards, models and research literature and summarized them as 62 skills, divided into seven groups:

1. Identifying information need
2. Searching and finding information
3. Evaluating information
4. Using information
5. Organizing information
6. Communicating and publishing information
7. Responsible handling of information

Especially the sixth and seventh group were relatively new then. Now, that it becomes clearer and clearer how important they are for everyone in the knowledge society, more and more definitions include this "second thread" of information literacy, which comprises of skills such as the "creation of information, (...) indexing and storage in digital information services as well

as the ability to sufficiently heed any demands for privacy in one's own information and others'" (Stock & Stock, 2013, p. 79).

In 2016, ACRL's Information Literacy Competency Standards for Higher Education were rescinded and replaced by the Information Literacy Framework (American Library Association, 2016), consisting of six core concepts, so called "frames:"

- Authority Is Constructed and Contextual
- Information Creation as a Process
- Information Has Value
- Research as Inquiry
- Scholarship as Conversation
- Searching as Strategic Exploration

As these frames represent "a cluster of interconnected core concepts, with flexible options for implementation" and not a definite list of skills, they each include "a concept central to information literacy, a set of knowledge practices, and a set of dispositions" (ALA, 2016, Introduction, para. 2). The goal of this concept is to enable institutions to adapt these frames for their own specific circumstances, qualities and needs including student participation.

In 2018, the Information Literacy Group of the Chartered Institute of Library and Information Professionals (CILIP) defined information literacy as "the ability to think critically and make balanced judgements about any information we find and use. It empowers us as citizens to reach and express informed views and to engage fully with society" (Coonan et al., 2018, p. 3). They furthermore recognize that it includes skills as, for example, "how to discover, access, interpret, analyse, manage, create, communicate, store and share information" and that it "is associated and overlaps with other literacies, including specifically digital literacy, academic literacy and media literacy" (p. 3). They also emphasize that "Information literacy helps to understand the ethical and legal issues associated with the use of information, including privacy, data protection, freedom of information, open access/open data and intellectual property" (p. 3).

Before we finish this brief timeline of information literacy definitions, it should be noted that there are several other related concepts, such as digital literacy, media literacy, and computer literacy, some of them mentioned before, which are sometimes synonymous, and sometimes refer to different aspects or facets of basically the same idea. Some frameworks see information literacy as the central concept of all these literacies, some try to unify all these literacies under the term "Metaliteracy" (Mackey & Jacobson, 2011), others merge two or more of these terms. The United Nations Educational, Scientific and Cultural Organization (UNESCO), for example, promotes Media and Information Literacy (MIL) as composite concept (UNESCO, 2017).

It can be easy to get lost in semantic arguments. Coonan (2014) argues that these literacies are not entirely separable from each other. They ultimately all aim at the same goal: "to help (…) realise a critical and reflective relationship with the information that shapes, filters and mediates our lived experience" (Coonan, 2014, para. 7). Although defining information literacy seems to be a sometimes hard and never-ending task, it is nevertheless important to do it again and again, to help promote, develop and measure information skills. In the end, no matter what definition of information literacy, digital literacy or meta literacy you look at, it clearly is a core competence for both social and economic participation in the information age (Lloyd, 2003).

Further analysis of the information literacy concept and related definitions as well as the discussion of the skills it encompasses, can be found in Chapter 2.

1.2   Why is information literacy important?

Webber and Johnston (2000, p. 381) write that our increased attention to information literacy is "a theoretical and practical response to the cultural, social and economic developments associated with the information society." Bruce (2004, p. 1) even describes information literacy as "a natural extension of the concept of literacy in our information society" and information literacy education as "the catalyst required to transform the information society of today into the learning society of tomorrow." Why is so much importance attached to the concept of information literacy and what does it have to do with our society?

The availability and rapid development of information and communications technologies (ICTs) has laid the foundation for our transition into an information society. Information and knowledge have become fundamental parts of our economy, education systems, and culture, establishing a society where information work transcends manual work (Webster, 2005; Linde & Stock, 2011). In a society like this, knowledge is essential for progress and economic success (Khveshchanka, Mainka, & Peters, 2011). The information landscape and technology are ever changing, so we have to "learn to learn" to be able to adapt to our surroundings again and again. Since information influences every economic sector and affects every individual in all stages of life (Wolfgang G. Stock, 2000), there is no doubt that information literacy is needed to participate fully.

Here, I would like to note that the most important ability is not the use of ICT, but to understand, engage in and reflect information practices (Bruce, 2004). Information literacy is more than the adequate use of ICT. It is more than the ability to write a research paper or to find a book at the library.

Yes, we do have access to more information than ever, but this also means it is harder to find what we seek and to check if it is valuable or even true. If simply finding any information was the goal, information retrieval systems like the search engine *Google* would be sufficient. But we need to find and share relevant, high-quality information, we need to do it ethically and in compliance with the law, we need independent inquiry and critical engagement with the information around us. This kind of information literacy is not only needed to be successful in our private lives, but also in our professional lives: "Today's employers are looking for people who understand and can adapt to the characteristics of the Information Age. If a student has 'learned how to learn,' upon graduation, they are a much more attractive job candidate. An information literate individual – with their strong analytical, critical thinking and problem-solving skills – can be expected to be an adaptable, capable and valuable employee, with much to contribute" (Shane, 2011, para. 6).

It is also important to consider that no one is exempt from the need of information literacy. "Everyone uses information whether it be as citizens, workers, problem solvers, or lifelong learners" (Doyle, 1994, p. 1). As information literacy enables individuals to participate in

lifelong learning and make informed decisions, it is not only seen as an essential skill set for every individual living in an inclusive and participatory society, but also as a tool of empowerment and a catalyst for equality and democracy: „Information literacy empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals. It is a basic human right in a digital world and promotes social inclusion in all nations" (International Federation of Library Associations and Institutions, 2015, para. 2).

This being said, it is proposed to start information literacy education in kindergarten or primary school and extend it over the entire school career to university and finally, work (Bucher, 2000; Catts & Lau, 2008; Gust von Loh & Stock, 2013). The institution, however, which has been promoting information literacy for the longest time now, is the library (Stock & Stock, 2013).

1.3 Are libraries still relevant in the knowledge society?

Since decades information science has been dealing with libraries as a subject of research. The term "library," however, seems to create the same outdated image in a majority of people's minds: An old, rather dusty building full of smelly books and librarians who "shush" everyone into silence. Right now, we are in transition to a knowledge society. Digitalization advances more and more every year and paper books seem to have become almost obsolete. Search engines such as Google have already taken over the role as main providers of information. Surely, the halls of all libraries worldwide must be empty by now?

Libraries of the 21st century have a mission that goes far beyond the storage of books. Eberhart, for example, offers the following definition:

> "A library is a collection of resources in a variety of formats that is (1) organized by information professionals or other experts who (2) provide convenient physical, digital, bibliographic, or intellectual access and (3) offer targeted services and programs (4) with the mission of educating, informing, or entertaining a variety of audiences (5) and the goal of stimulating individual learning and advancing society as a whole" (2006, p. 2).

Surely a library by this definition can take a completely different form from what we pictured at the beginning. And indeed, many modern libraries follow their mission to educate, inform and entertain the citizens of the knowledge society. They offer innovative services and (physical and digital) spaces to their patrons.

Dokk1, a public library and cultural center in Aarhus, Denmark is a prime example for a modern library which stays in the center of the public. It is not only the largest library in Scandinavia (Zorthian, 2016) but also winner of the IFLA Systematic Public Library of the Year Award given to a library that "best combines open, functional architecture with creative IT solutions and also takes into account both digital developments and local culture" (International Federation of Library Associations and Institutions, 2019). With its "rooms for transformation" (The Agency for Culture and Palaces, 2016, para. 2) it offers social and cultural learning opportunities as well as outdoor playgrounds for children, makerspaces, workshops, interactive learning areas, and adaptable architecture.

Another example is the School 7 library in Den Helder, Netherlands which describes itself as the living room of the city. It focuses on the accessibility to all members of its community. One can book parts of School 7 as a wedding location or use the cafe for celebrations (International Federation of Library Associations and Institutions, 2018). School 7 offers workshops as well as comfortable reading areas. School 7 is an example for the adaptability of the modern library concept even in small cities.

The Joe and Rika Mansueto Library of the University of Chicago is an example for a modern academic library that puts the needs of their students first. Established in 2011, it features a unique design as well as an innovative approach to book storage and access. While the surface floor is a large reading and working area, millions of books are stored underground and automatically retrieved at request within minutes (The Joe and Rika Mansueto Library, n.d.).

The Internet Archive is a digital library worth mentioning as well. Its Wayback Machine is, among many other projects, a service to access otherwise inaccessible websites dating back to the very early days of the internet. Over 330 billion web pages are openly available as of April 2019 (The Internet Archive, n.d.). Their Open Library stores 20 million books, of which ten

percent are openly available to download and read, aims to have "[o]ne web page for every book ever published" (The Internet Archive, 2015). The Internet Archive welcomes user participation worldwide to build an archive of all things digital and analog (Streitfeld, 2014), including old recordings of radio broadcasts from as early as 1930 (The Internet Archive, 2019).

Today, an abundance of examples can be found of libraries that thrive, because they have transformed, by utilizing, for instance, open innovation (Henkel, Ilhan, Mainka, & Stock, 2018) to offer innovative services and spaces. The library has, in actuality, always been an ever changing and evolving institution (Patridge, Menzies, Lee, & Munro, 2010). Now that "information moves from the traditional print formats to digital platforms and new media formats, the expectation of the public towards libraries is continuously being reshaped" (Gill & Siew, 2018, p. 34), which means that libraries have to transform "to keep pace with the needs of a modern information society" (Islam, Agarwal, & Ikeda, 2015, p. 3). It also shows why libraries are still, maybe more than ever, interesting research subjects for information science research. In this regard, they are prime examples for other institutions' transformations in the transition to a knowledge society.

In this chapter only a few examples are mentioned to show that modern libraries can take a variety of forms and have many different purposes, they provide an important third place (next to home and work) in the knowledge society to meet and exchange knowledge. This exchange of knowledge is supported in many ways – in this work, however, one library activity receives particular attention: The promotion of information literacy.

Information literacy has become an important part of the library science discipline (Johnson, Detmering, & Sproles, 2013) and in turn, libraries play an important role in information literacy instruction (Homann, Reisser, Schleihagen, & Weisel, 2011; Henkel & Stock, 2016). While academic libraries had a historical "head start" when it comes to library instruction (Campbell, 2008) information literacy is important for all individuals – not just those who have the privilege of higher education. Today, both public and academic libraries all over the world contribute to promoting information literacy (Boyer Commission on Educating Undergraduates

in the Research University, 1998; Julien & Pecoskie, 2009) in different ways – ways presented and discussed in the later chapters of this work.

So, to answer our question from the beginning with the words of Janes: "While one still occasionally hears the old 'what do we need libraries for when everything's on Google' canard, libraries of all kinds have never been in more demand, the importance of what librarians do has never been greater" (2017, Foreword, para. 3).

1.4   Chapters 2-12 Overview

Part I: Information Literacy as a Basic Skill in the Knowledge Society

Vermittlung von Informationskompetenz, Medienkompetenz und Digitaler Kompetenz als Schulfach (Chapter 2) & Informationskompetenz – Forschung in Graz und Düsseldorf (Chapter 3)

We live in a time of transition, where digitalization is changing our society and economy, touching all areas of our lives. In this time, schools are faced with the task of getting the next generations ready for life and work in the knowledge society (Wiater, 2017). But how can schools achieve this ambitious goal? How and what exactly should be taught? Chapter 2 builds on (1) theory and practice of digital competence, media literacy, and information literacy as well as (2) an extensive review of relevant research results and the current draft of the German Standing Conference of the Ministers of Education and Cultural Affairs, to summarize the status quo and discuss different strategies based on the example of the German education system, from kindergarten to university. The theoretical foundation of this chapter is expanded by Chapter 3, which reviews information literacy research from the Department of Information Science at Heinrich Heine University in Düsseldorf, Germany and the Institute for Information Science and Business Informatics at Karl Franzens University in Graz, Austria, the two major research institutions in the German-speaking countries, when it comes to information literacy research. The two main foci in this chapter are (1) the assessment of information literacy levels of different target groups and (2) approaches to information literacy education. The result is a meta-analysis of published and unpublished work of recent years, comparing and discussing topics such as information literacy levels of pupils and students, their information behavior, motivation to learn information literacy and cultural differences. In this context, a special

consideration is given to the promising method of Massive Open Online Courses (MOOCs). Are they the future of information literacy education?

Comparing Information Literacy Levels of Canadian and German University Students (Chapter 4)

Although the importance of information literacy is widely recognized on an academic level, there is plenty of research showing that the majority of students are not information literate enough. The purpose of this study is not only to assess the status of information literacy among students, but also to attempt an international comparison. By the means of a multiple-choice questionnaire, the level of information literacy among university students of informational cities in Canada and Germany is being assessed, allowing a comparison between the two countries for the different competence areas of information literacy. To test information literacy skills, Beutelspacher's (2014) questionnaire version for high-school graduates and students was used. It consists of 41 different multiple-choice questions leading to positive and negative scores. It is, however, necessary to discuss what can be learned from this approach and whether such a comparison can be beneficial to improve information literacy education or if a comparison is even possible.

Exploring Media and Information Literacy in Early Childhood with a Digital App (Chapter 5)

Taking a closer look at one of the target groups we discussed earlier, this study focusses on children from 3 to 6 years who, in Germany, usually attend kindergarten. While researchers are just discovering children of this age group as research subjects for studies on media and information literacy, the digitalization of our society has already reached them. We can observe even the smallest children playing with their parents' mobile phones, using digital devices to play games, watch videos or take pictures. Given these developments, it might be too late to start with media and information literacy research and education in school. But are young children information literate? And is kindergarten the right place to work with digital media? What are digital media practices in families with young children? Those are research questions of the study described in this chapter. To get a holistic view of the status quo in German families and kindergartens, not just from parents and kindergarten teachers, but also and mainly the children themselves, an innovative research method was utilized: A self-developed

tablet computer application aided the researchers in their interviews with the children. Research was conducted in a playful way while collecting data through observation and in the background of the application.

Evaluating an Information Literacy Assessment Instrument – The Case of a Bachelor Course in Business Administration (Chapter 6)

Not only when working with very young children, can the assessment of information literacy skills pose a challenge. Multiple Choice Questionnaires are a popular method with the advantages of convenience, comparability and objectivity. In this chapter, the case study of a bachelor course in business administration is presented with the goal to evaluate the method of information literacy level assessment via a multiple-choice questionnaire. Not only the advantages but also disadvantages and challenges of this method are being thematized and discussed to explore the question "How can we create better questionnaires?".

Educators of the Information Society: Information Literacy Instruction in Public and Academic Libraries of Canada (Chapter 7) & "We have big plans." – Information Literacy Instruction in Academic and Public Libraries in the United States of America (Chapter 8)

Most articles in scientific literature focus on information literacy instruction in academic libraries. These libraries teach university students information literacy as part of their academic education. But if information literacy education is limited to academic libraries, we fail to reach all other target groups, apart from university students. Here, public libraries come into play. This chapter describes an empirical study on comprehensive information literacy instruction in academic and public libraries. In particular, the study focuses on libraries in prototypical cities of the knowledge society (Stock, 2015; Stock, 2011). It was conducted in Canada (Chapter 7) and in the United States of America (Chapter 8), as some of the top-rated libraries are located there (Mainka et al., 2013) and library information literacy instruction has a long history in both countries. Librarians in charge of library programs and information literacy instruction participated in interviews structured by a SERVQUAL-inspired questionnaire. This kind of method allowed a quantitative as well as a qualitative evaluation of the opinions and experiences librarians had in regard to the infrastructure of their libraries, information literacy education and related fields. Aim of this research was to assess the role of libraries in

promoting information literacy skills in the knowledge society. How is information literacy education implemented in academic and public libraries? What are current practices and challenges? And finally, what are differences between public and academic libraries in this regard?

Part II: Libraries as Parts of Public Knowledge Infrastructures

Qatar National Library as Part of a Countrywide Knowledge Infrastructure Chapter 9) & Singapore's Library System and Its Place in a Smart Nation (Chapter 10)

Chapters 9 and 10 are dedicated to two library systems, which are particularly interesting as case studies for libraries in the knowledge society. Qatar National Library ([QNL]; Chapter 9), combines a national library, a public library, and an academic library in one institution. It aims to become the knowledge hub of Qatar, a country where the "profession of librarianship (…) is currently in a phase of rapid growth, development and transition" (Johnston & Williams, 2015, p. 86). As a third place and an important driving force of Qatar's knowledge-based economy with a variety of spaces and services, QNL might be able to establish a book and reading culture among the Qatari people. Aligning with the country's vision of transitioning to a knowledge society is also the education in information literacy. Librarians in Qatar take over the role as "knowledge navigators" (Küster, 2010, p. 10), they "support education and encourage information consumption and development" (Gremm, Barth, Fietkiewicz, & Stock, 2018, p. 204) to prepare Qatar for the era after the oil.

In contrast to QNL, Singapore's National Library Board (NLB) poses the case study of a well-established library system in a city-state with almost 40-year-old governmental masterplans to develop a knowledge society and knowledge-based economy (Chapter 10). Therefore, it is no surprise that Singapore's National Library and Archive System is considered one of the most modern worldwide (Bertelsmann Stiftung, 2004). It even attracts librarians from various countries, who visit and participate in so-called "library tourism" (Mittermaier, 2007). By conducting literature reviews, rapid ethnographic field research and semi-structured interviews, the integration of the two library systems in their country's knowledge infrastructure on the way towards the knowledge society are being discussed. The leading

research question of these chapters is: Which place do libraries have in the ongoing development of the knowledge society or smart nation?

How Public Libraries are Keeping Pace with the Times: Core Services of Libraries in Informational World Cities (Chapter 11)

The rise of the knowledge society has transformed the ways in which humans utilize technology to consume, transform and produce information and knowledge (Stock, 2011), which has also changed the way in which libraries are used today (Hyysalo et al., 2014). But how do libraries meet these new needs? Are there best practice examples of library services? In Chapter 11, the services of public libraries in informational world cities are analyzed and ranked to evaluate the adaptation of libraries to the changing culture of creation and education. The research method combines literature review with empirical data gathered through online information on websites, field studies and interviews. The range of physical and digital services was analyzed separately. Adding to the study conducted in 2012 (Mainka et al., 2013), maker spaces and information literacy instruction were added to the investigation.

Open Innovation in Libraries (Chapter 12)

Libraries serve as prime examples for institutions which benefit from open innovation. We already know that they are ever changing and evolving, "to keep pace with the needs of a modern information society" (Jantz, 2012, p. 3). They use knowledge management to improve services, performance and also relevance in the knowledge society. Open innovation gives them a chance to achieve those goals while steadily growing together with the environment, technology and their users. In this chapter, open innovation and its connection with libraries is explained and the following research questions are discussed: (1) If a library applies open innovation, what are its sources, means and tools of information inflow? (2) What concrete innovations do result from the open innovation process? (3) If a library successfully applied open innovation, what are the addressees of information outflows in order to reuse the innovation? Besides literature review and document analysis of libraries' websites, empirical data on open innovation projects in libraries was gathered by conducting a survey. Six libraries filled in our online questionnaire and therefore served as international case studies for open innovation on a scale from small to large.

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Part I: Information Literacy in the Knowledge Society

2 Vermittlung von Informationskompetenz, Medienkompetenz und Digitaler Kompetenz als Schulfach

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2.1 Einleitung

Wir leben in einer Zeit des Übergangs. Industrie und Dienstleistung sind in vielen Ländern nicht mehr die treibenden ökonomischen Entwicklungskräfte, sondern die Digitalisierung, die uns in die Wissensgesellschaft führen wird. Die Digitalisierung ändert die Wirtschaft und dringt in alle Lebensbereiche der Menschen ein. „Der Prozess betrifft nicht nur die sich zum Teil in hoher Dynamik verändernden beruflichen Anforderungen, sondern prägt in zunehmendem Maße auch den privaten Lebensbereich", stellt die Kultusministerkonferenz (KMK, 2016, S. 3) fest. Um in einer Wissensgesellschaft sowohl beruflich als auch privat zurechtzukommen, muss man die Digitalisierung beherrschen. Dies erreicht man durch digitale Kompetenz in Verbindung mit Medienkompetenz und Informationskompetenz. Schulen aller Formen haben seit jeher den Auftrag, Schüler adäquat auf das Leben in der Gesellschaft vorzubereiten. In der heutigen Zeit stehen die Schulen also vor der Aufgabe, ihre Schüler für das Leben und Arbeiten in der Wissensgesellschaft fit zu machen (Wiater, 2017). Am Ende jeglicher schulischen Ausbildung wird demnach ein Absolvent stehen, der umfassend medien- und informationskompetent ist und die digitalen Herausforderungen zuhause, in der Freizeit und am Arbeitsplatz meistert. Wie kann die Schule dieses ambitionierte Ziel erreichen?

Zunächst: Was bedeuten überhaupt „Informationskompetenz", „Medienkompetenz" und „digitale Kompetenz"? Wir verschaffen uns einen ersten Eindruck, in dem wir in die wissenschaftliche Literatur zu den drei Themen schauen (Abbildung 1). Alle Terme erfreuen sich Anfang des 21. Jahrhunderts großer und ansteigender Beliebtheit bei Wissenschaftlern. Der dominierende Begriff mit 2.869 Treffern in der allgemeinwissenschaftlichen Datenbank Scopus ist „Informationskompetenz", aber „digitale Kompetenz" ist seit etwa 2010 in einer rapiden Wachstumsphase und kommt im betrachteten Zeitraum auf immerhin schon 640

Dokumente. „Medienkompetenz" ist zwar auch 648mal in Scopus vertreten, hat aber gegenüber „digitale Kompetenz" nicht die starken Steigerungsraten in den letzten Jahren.

Wenn wir uns am vorherrschenden Sprachgebrauch der Wissenschaft orientieren, heißt unser Thema „Informationskompetenz", aber mit einer zunehmend starken Betonung der „digitalen Kompetenz". Da sehr viele Medien digital vorliegen und Informationen digital verarbeitet werden, steht genau genommen die „digital information literacy" (Bawden, 2001, S. 246) im Vordergrund – also die Verbindung von Medien- sowie Informationskompetenz und digitaler Kompetenz.

Die zugehörige Wissenschaftsdisziplin ist die Bibliotheks- und Informationswissenschaft; es spielen jedoch auch Aspekte aus Medienwissenschaft und Informatik hinein. Insbesondere in Kanada (Henkel, 2015) und in den Vereinigten Staaten (Henkel/Stock, 2016) fühlen sich die Bibliothekare für die Vermittlung von Informationskompetenz zuständig. In vergangenen Jahren haben sich Forscher wie Lehrer viel mit Medienkompetenz beschäftigt. Diese hatte jedoch – zumindest in historischer Perspektive – viel mit Massenmedien zu tun, also u. a. mit Fernsehen und Zeitungen. Darum geht es hier nicht primär. „In diesem Sinne wäre es präziser – statt über Medienkompetenz oder Medienbildung – über ‚Bildung in einer digital geprägten Welt' zu sprechen" (Heinen/Kerres, 2017, S. 131). Die Aspekte der Medienkompetenz fließen allerdings in die Informationskompetenz mit ein. Die UNESCO spricht daher offiziell nur noch von MIL – Media and Information Literacy – und hat ein umfassendes Curriculum für den Schulunterricht dieses Faches vorgelegt (Wilson et al., 2011).

„On the one hand, information literacy emphasizes the importance of access to information and the evaluation and ethical use of such information. On the other hand, media literacy emphasizes the ability to understand media functions, evaluate how those functions are performed and to rationally engage with media for self-expression. The MIL Curriculum and Competency Framework for Teachers incorporates both ideas" (Wilson et al., 2011, S. 18).

Mit Koltay (2011) sehen wir das neue Schulfach als Vereinigung der in der Literatur oftmals vereinzelt betrachteten Kompetenzen – Medienkompetenz, digitale Kompetenz, Informationskompetenz – als das angestrebte Lehr- und Lernziel. Wenn wir im Folgenden

vereinfachend nur von „Informationskompetenz" sprechen, meinen wir die Vereinigung aller drei Aspekte.
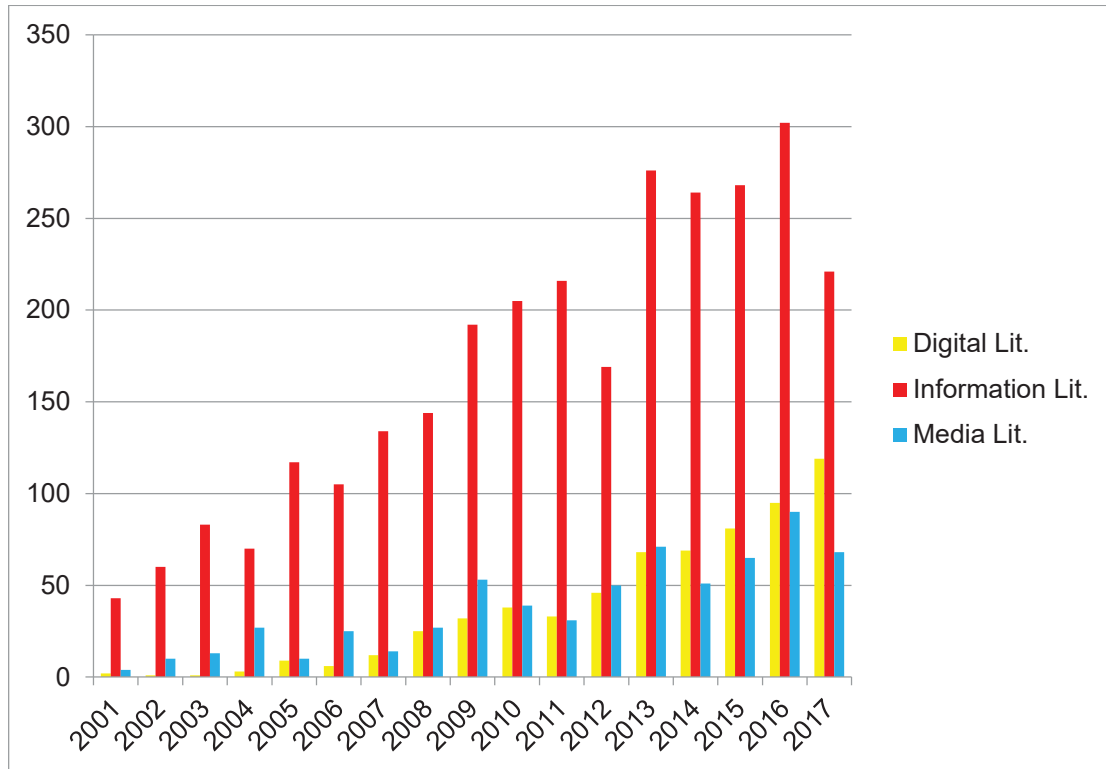
Abbildung 1: Informationskompetenz (rot), Medienkompetenz (blau) und digitale Kompetenz (gelb) in der wissenschaftlichen Literatur zwischen 2001 und 2017. Datenquelle: Scopus.Suchanfragen: („information literac*" or „information competenc*") im Titel; N = 2.869; („media literac*" or „media competenc*") im Titel; N = 648; („digital literac*" or „digital competenc*") im Titel; N = 640.

2.2 Spezifische Kompetenzen der Wissensgesellschaft

Die geforderten Kompetenzen stehen gemäß Catts und Lau (2008, S. 18) in einem Schichtenmodell geordnet übereinander. Basis ist nach wie vor die Kompetenz in Schreiben, Lesen und Rechnen (unterer Kasten in Abbildung 2). Wir wollen terminologisch zwischen „Informationsgesellschaft" und „Wissensgesellschaft" unterscheiden. In einer Informationsgesellschaft steht die Informations- und Kommunikationstechnik (IKT) im Vordergrund (Linde/Stock, 2011, S. 81 ff.). In einer Wissensgesellschaft hingegen wird die IKT eingesetzt, um Wissen zu kreieren, zu speichern und abzurufen (Linde/Stock, 2011, S. 84). Da sich das Wissen jederzeit ändern kann, muss es stets neu erarbeitet werden. Damit gehen lebenslanges Lernen und Informationskompetenz Hand in Hand. In einer

Informationsgesellschaft sind Fähigkeiten zum Umgang mit IKT, beispielsweise PC, Laptop und Smartphone (Luca, 2013) sowie die Medienkompetenz zur Einschätzung der jeweiligen Übertragungsmedien unumgänglich (Wilson et al., 2011). Jeder Schüler sollte mit Computer und Smartphone umgehen können, grundlegende Office-Software (Schreib-, Kalkulations-, Datenbank- und Präsentationsprogramme) beherrschen, das Internet und wichtige seiner Dienste (wie WWW, E-Mail oder Chat) kennen sowie die unterschiedlichen Medien (wie Printmedien, Hörfunk, Fernsehen, Internet) angemessen einsetzen. Auch müssen Schüler das Internet der Dinge (z.B. die Steuerung der Wohnungsheizung über das Smartphone) sowie Wearables (Endgeräte, die am Körper getragen werden wie beispielsweise Aktivitätstracker) benutzen, durchschauen und kritisch hinterfragen lernen (mittlerer Kasten in Abbildung 2).
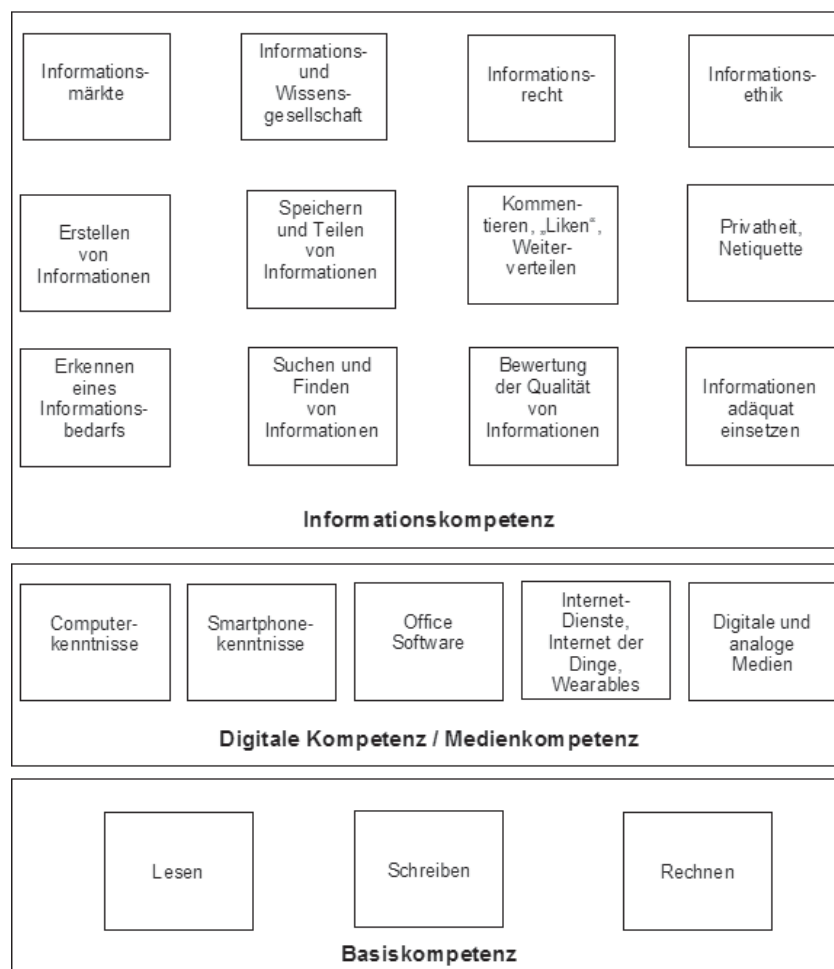
Abbildung 2: Geforderte Kompetenzen in der Wissensgesellschaft.
Quelle: Stock/Stock 2013, S. 79 (modifiziert)

Bei der Informationskompetenz i.e.S. (oberer Kasten in Abbildung 2) verfolgen wir drei Dimensionen: (1) Wissen aus digitalen wie analogen Quellen abrufen, (2) selbst kreiertes Wissen (vor allem: digital) verbreiten und (3) das Umfeld aus Gesellschaft, Wirtschaft, Recht, und Ethik gebührend beachten.

(1) Die erste Dimension umfasst praktische Kompetenzen für Information Retrieval (Sesay, 2013). Sie geht vom Erkennen eines Informationsbedarfs aus und führt über das Suchen und Finden von Informationen und der Evaluation gefundener Informationen (einschließlich der Beurteilung des Wahrheitsgehalts des Wissens) zur Anwendung der positiv bewerteten Informationen. Hier geht es auch um die Algorithmen der Suchmaschinen (wie den PageRank von Google) genauso wie um die Zugänge zu professionellen fachspezifischen Datenbanken. Insbesondere durch Herausforderungen wie Fake News oder alternativer Fakten ist die Evaluation und Anwendung gefundenen Wissens ein äußerst wichtiges Lernziel (Hauk/Soubusta, 2013). Dies ist die inzwischen klassische Auffassung von Informationskompetenz, die insbesondere im Bibliothekswesen propagiert wird. Eine viel zitierte Definition stammt von der Association for College and Research Libraries (ACRL) der American Library Association: „To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (Presidential Committee on Information Literacy, 1989). Für einige Autoren ist dies das gesamte Themenspektrum der Informationskompetenz. Dieser sehr eingeschränkten und nicht mehr zeitgemäßen Definition folgt beispielsweise immer noch der Deutsche Bibliotheksverband in seinem Referenzrahmen Informationskompetenz im Jahr 2016 (Klingenberg, 2016).

Die ACRL fügt im Jahr 2000 einen weiteren Baustein der Informationskompetenz hinzu (ACRL, 2000, S. 14): „The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally". Dieser letzte Aspekt ist bei uns in Dimension 3 verortet.

(2) Mit dem Aufkommen der Social Media haben die Nutzer die Möglichkeit, sich selbst digital zu artikulieren. Insbesondere junge Leute machen davon vielfältig und häufig Gebrauch. Der zweite Strang der Informationskompetenz fasst praktische Fähigkeiten der Erstellung von

Wissen und der Wissensrepräsentation zusammen (Hauk, 2013). Neben der Kreation von Informationen stehen deren Speicherung und bewusste Streuung („Teilen") sowie das Kommentieren, „Liken" und Weiterteilen fremder Inhalte in digitalen Informationsdiensten im Mittelpunkt, flankiert von der Kompetenz, bei eigenen wie fremden Informationen insbesondere die Privacy gebührend zu beachten (Gust von Loh/Stock, 2013).

(3) Information ist ein besonderes Wirtschaftsgut – und dies hat beachtliche Konsequenzen. Wenn ich ein physisches Produkt (etwa ein Auto) verkaufe, habe ich danach das Gut nicht mehr, denn das hat ja nunmehr der Käufer. Wenn ich eine digitale Information (etwa einen Datensatz aus einem Informationsdienst) verkaufe, habe ich danach das Gut immer noch, und der Käufer hat eine Kopie davon. Dies hat u. a. Auswirkungen auf die Zahlungsbereitschaft der Kunden, die teilweise gegen Null tendiert. Internetunternehmen (wie Google oder Facebook) agieren deshalb in vielen Fällen auf zweiseitigen Märkten: Die eine Marktseite sind die Nutzer, die den Dienst ohne Geld, aber mit ihren Daten oder ihrer Aufmerksamkeit bezahlen, die andere Marktseite ist die Werbebranche, die die Daten oder die Aufmerksamkeit – nunmehr gegen Geld – eintauscht (Linde/Stock, 2011). Natürlich gibt es weitaus mehr Aspekte des Umfeldes von digitalen Informationen; Menschen leben in zwei Welten (in der digitalen genauso wie in der analogen) mit massiven Auswirkungen auf ihr Verhalten, zusätzlich haben sie veränderte Vorstellungen von Recht (und ignorieren vielfach Urheberrecht und Persönlichkeitsrecht). Deshalb muss vertieft auf die Spezifika von Informations- und Wissensgesellschaften, auf Informationsrecht und Informationsethik eingegangen werden (Beutelspacher, 2013).

Für die Lehre in der Schule haben „digitale Revolution" und Informationskompetenz zwei Auswirkungen:

- Informationskompetenz als Schulfach: Vermittlung des Stoffes der digitalen Kompetenz, der Medienkompetenz und der Informationskompetenz i.e.S. in allen Schulformen,
- Informationskompetenz in der Fachdidaktik: Neue Optionen der Gestaltung von Lehr- und Lernprozessen in allen Fächern durch digitale Lernumgebungen (KMK, 2016, S. 7).

Durch die Nutzung digitaler Medien stehen den Lehrkräften Werkzeuge zur Verfügung, virtuelle Lernräume (z.B. durch die Kommunikation mit Schülern über Social Media) zu schaffen, Materialen zu organisieren (etwa durch Lernmanagementsysteme) oder fachspezifische Softwareprodukte zu nutzen (wie MATHLAB im Mathematikunterricht oder Simulationen via PHET in den Naturwissenschaften). Hierzu müssen Lehrkräfte mit solchen Optionen der Fachdidaktik vertraut gemacht werden, „diese Medien im Sinne einer Öffnung virtueller Lernräume als didaktische Bereicherung einzusetzen" (Schulze-Vorberg et al., 2018, S. 232). Wir werden die Rolle der Informationskompetenz in der Fachdidaktik an dieser Stelle nicht weiter verfolgen, sondern uns ausschließlich auf die Informationskompetenz als eigenes Schulfach konzentrieren.

2.3 Wie informationskompetent sind Schüler?

Können wir eigentlich „Digital Natives" (Prensky, 2001) in digitalen Kompetenzen unterrichten? Eigentlich müssten die bereits in die digitale Welt hineingeborenen Schüler fit für die Wissensgesellschaft sein. Zunächst gilt es festzustellen, dass es *die* Digital Natives gar nicht gibt, vielmehr unterscheiden sich diejenigen, die ab etwa 1980 geboren sind, untereinander durch unterschiedliche Zugangsoptionen zum Digitalen und durch teilweise völlig unterschiedliche Nutzungsintensität. Und selbst wenn Schüler mit Smartphone und Laptop groß geworden sind, heißt das noch lange nicht, dass sie die dort erworbenen Fähigkeiten auch für das Lernen einsetzen. Ng (2012, S. 1065) stellt fest: „(T)he use of technology by young people is different in education in that most lack the skills and strategies to use them (the digital technologies, MH&WGS) for learning".

Tatsächlich zeigen internationale Studien, dass solche Schüler nicht gleich informationskompetent sind (Šorgo et al., 2017). Bartlett und Miller, zum Beispiel, beschreiben das Informationsverhalten von diesen jungen Menschen als unausgereift, unreflektiert und unvorsichtig:

> "Our research shows, however, that many young people are not careful, discerning users of the internet. They are unable to find the information they are looking for or trust the first thing they do. They do not apply fact checks to the information they find.

They are unable to recognise bias and propaganda and will not go to a varied number of sources" (Bartlett/Miller, 2011, S. 3).

Bei Informationskompetenz-Studien in Deutschland erreichen die meisten Schüler und Studenten nur mittelmäßige Ergebnisse (Dreisiebner/Beutelspacher/Henkel, 2017; Henkel/ Grafmüller/Gros, 2018). Es ist also ein Trugschluss, den selbstbewussten und selbstverständlichen Umgang mit neuen Medien auch mit Informationskompetenz gleichzusetzen. Zudem fehlt oft das Bewusstsein für Privatsphäre, Datenschutz und Urheberrecht (Orszullok, 2013) sowie für die eigenen Fähigkeiten – denn „Digital Natives" überschätzen oftmals ihre Informationskompetenz (Mahmood, 2016).

Viele junge Menschen können mit den heute etablierten Geräten und Medien scheinbar gut umgehen, aber es fehlen die Kompetenzen für das Suchen und Finden von hochwertigen, breitgefächerten Informationsquellen und vor allem die kritische Auseinandersetzung mit diesen und dem eigenen Verhalten. Solche Kompetenzen werden nicht durch das alleinige Vorhandensein von digitalen Geräten erlernt und müssen vermittelt werden – zum Beispiel im Schulfach Informationskompetenz.

In einer der wenigen Studien, bei denen Schüler (hier: der Sekundarstufe II) nach dem Sinn eines neuen Schulfachs Informationskompetenz gefragt worden sind, ergab sich eine breite Mehrheit (ca. 2/3) der Befragten für ein solches Fach. „Die meisten Schüler halten es für sinnvoll, Informationskompetenz als Schulfach anzubieten" (Förster, 2013, S. 140).

2.4 Die grundlegende Wissenschaftsdisziplin

Angehende Lehrer studieren grundsätzlich zwei Dinge: einmal Pädagogik, zum andern ihre Fächer. Das gilt natürlich auch für den Unterricht in Informationskompetenz. Die zugehörige Wissenschaftsdisziplin ist die Informationswissenschaft, die sich seit Jahrzehnten mit digitalen Informationen befasst (Webber/Johnston, 2000, S. 386). Webber und Johnston haben sich auch mit der Einbindung des Stoffes der Informationskompetenz in andere Fächer befasst. Zunächst stellt sich die einfache Frage: in welches Fachstudium denn? Wenn die KMK vorschlägt, Informationskompetenz als integrativen Teil „der Fachcurricula aller Fächer" (KMK, 2016, S. 7) anzusehen, müssten alle angehenden Lehrer Informationswissenschaft studieren.

Oder soll hier – entgegen jeder pädagogischen Tradition – auf ein Fachstudium verzichtet werden? Der Weg über andere Fächer scheint nicht gangbar zu sein. „It is contented here that, from a pedagogic perspective, information literacy needs attention in its own right and should not always be subordinated to another discipline. While integrating information literacy into other parts of the curriculum may have an attraction, [there is] the danger that students learn in snatches and do not develop a coherent conception of what information literacy means to them" (Webber/Johnston, 2000, S. 392). Diese Aussage aus dem Jahr 2000 gilt heute noch mehr, denn der Stoff hat sich im Vergleich zur Jahrtausendwende mit der weiterschreitenden Digitalisierung noch enorm ausgeweitet.

Natürlich gibt es fachspezifische Aspekte der Informationskompetenz (beispielsweise der Unterricht zu Fachinformationsdiensten in Physik und Chemie), aber es dominieren die generischen, von den anderen Fächern unabhängigen Inhalte, die es dringend nahelegen, (auch gegen den Vorschlag der KMK) Informationskompetenz als gesondertes Fach einzurichten und Lehramtsstudierende in Informationswissenschaft adäquat auszubilden.

Ein Curriculum der Informationskompetenz als Schulfach sollte – folgen wir der entsprechenden Fachliteratur – den in Tabelle 1 dargestellten generischen Stoff enthalten. Wenn wir diesen aus der Wissenschaft abgeleiteten Stoff mit den Vorschlägen der KMK vergleichen, so finden wir alle KMK-Inhalte in unserer Stoffpalette, aber wir legen zusätzlich Wert auf die Vermittlung grundlegender IT-Kenntnisse, der (ohnehin standardisierten) Retrievalkenntnisse und auf eine weitaus tiefere Behandlung der ökonomischen Besonderheiten der Informationsmärkte und der Informations- und Wissensgesellschaft.

2.5 Einführung des Fachs in die Schulen

Pettersen (2017) diskutiert vier Problembereiche, die für eine erfolgreiche Einführung von Informationskompetenz als Schulfach wesentlich sind: der politische Wille, die Infrastrukturen in den Schulen, das strategische Vorgehen der Schulen und letztlich die Rolle der Lehrer, ihre Ausbildung und Weiterbildung.

Kompetenzen der Wissensgesellschaft	KMK Vorschläge
Computerkenntnisse	3.1 Entwickeln und Produzieren 3.2 Weiterverarbeiten und Integrieren 5. Problemlösen und Handeln
Smartphonekenntnisse	---
Office Software	---
Internet, Internet der Dinge, Wearables	---
Medienkompetenz	2.5 Teilhabe an der Gesellschaft 6.1 Medien analysieren und bewerten
Erkennen eines Informationsbedarfs*	---
Suchen und Finden*	1.1 Suchen und Filtern
Bewertung der Informationsqualität*	1.2 Auswerten und Bewerten
Informationen adäquat einsetzen*	1.3 Speichern und Abrufen 2.3 Zusammenarbeiten
Erstellen von Informationen	2.1 Interagieren
Speichern und Teilen	2.2 Teilen
Kommentieren, „Liken", Weiterteilen	--- (ggf. unter 2.1 und 2.2)
Privatheit	4. Schützen und sicher Agieren
Informationsrecht und -ethik*	2.4 Umgangsregeln kennen und einhalten 3.3 Rechtliche Vorgaben beachten
Informationsmärkte*	6.2 Medien in der digitalen Welt verstehen

* Offizielle Standards der Retrievalkompetenz (ACRL)

2.5.1 Politischer Wille

Zentrale Voraussetzung jeglicher Einführung von Informationskompetenz in die Schulen ist der politische Wille. Die Schulministerien der Länder müssen von diesem Vorgehen überzeugt sein, genügend Finanzmittel bereitstellen und den Übergangsprozess betreuen. Da wir wissen,

dass es bei der Aus- und Weiterbildung von Informationskompetenz-Lehrern große Lücken gibt, müssen diese durch eine adäquate Anzahl von Lehrstühlen für Informationskompetenz und ihrer Didaktik sowie dem Angebot von Curricula in den Hochschulen geschlossen werden.

2.5.2 Infrastrukturen

Bei den Infrastrukturen in den Schulen gilt es insbesondere für das Leben in einer Wissensgesellschaft, dass die Inhalte und nicht die technischen Geräte oder die Medien primär sind. Viele Schulen verfügen jetzt schon über Computerräume, falls nicht, sollten solche in der Tat eingerichtet und mit entsprechender Hardware (PCs, Internetanschluss, Bildschirm, zentrale Drucker) ausgestattet werden. Die Schüler verfügen zudem heutzutage mehrheitlich über ihre eigenen Geräte, so dass BYOD (Bring your own device) sicherlich schon einmal weiterhilft. Dies stellt allerdings die Informationskompetenz-Lehrkräfte vor die Aufgabe, bei unterschiedlichen Geräten jeweils passende Hilfestellungen geben zu können (Scheiter, 2016, S. 91). Wichtig ist: Die Schüler können dort abgeholt werden, wo sie zuhause sind – nämlich auf ihren Smartphones.

Da nahezu alle Apps auf dem Smartphone und auch alle web-basierten Programme Internetzugang zwingend benötigen, ist auf einen schnellen und kapazitätsstarken Internetzugang zu achten. Man sollte bei der Planung davon ausgehen, dass alle Schüler der Schule gleichzeitig ins Internet gehen können.

Zugänge zu kommerziellen Informationsdiensten wie zum Beispiel Web of Science, Scopus und die fachspezifischen Informationsdienste, die dringend zur Unterrichtung in Retrievalkompetenz benötigt werden, sind nicht kostengünstig. Hier bieten sich Kooperationen mit Öffentlichen wie Wissenschaftlichen Bibliotheken an, die solche Datenbanken meist ohnehin in ihrem Angebot haben.

In vielen Ländern Südostasiens gibt es nicht nur (im Gegensatz zu Deutschland) flächendeckend Schulbibliotheken, sondern auch „Teacher Librarians", also Absolventen von LIS-Studiengängen (Library and Information Science), die den Status von Lehrern haben. Wenn wir solch einen Weg in Deutschland einschlagen wollen, benötigt jede Schule ein Informationszentrum (als Ansprechstelle für Literatur, digitale Informationsdienste, Software

und IT-Geräte) – quasi die zentrale Infrastruktureinrichtung sowohl für das Fach Informationskompetenz als auch für den Einsatz digitaler Medien in allen anderen Schulfächern.

2.5.3 Strategien: Vom Kindergarten bis zu den Sekundarstufen

Mit welchen Strategien sollte Informationskompetenz in die unterschiedlichen Schulformen eingeführt werden? Die ersten Schritte in Richtung Informationskompetenz werden im Kindergarten gegangen. Auch wenn viele Eltern nicht „an Tablets oder Laptops in den Händen von Klein- und Vorschuldkindern denken" möchten (Bostelmann/Fink, 2014, S. 6), so sieht die Realität doch anders aus. Fakt ist: Die neuen Medien und ihre Inhalte werden von Kindern ganz genau beobachtet. Gerade Kinder im vorschulischen Alter „wollen verstehen, was um sie herum passiert, wollen selbst ausprobieren, was Erwachsene tun und die Dinge, mit denen Erwachsene hantieren, selbst in die Hand nehmen und erproben (...). Dazu gehören auch technische Geräte wie Smartphone und Tablet-PC" (Bostelmann, 2018, S. 179). Es ist wichtig, gemeinsam mit den Kindern Themen wie die neuen Medien und ihre Inhalte im Kindergarten aufzugreifen. Auch Vorschulkindern kann man schon rudimentäre Kompetenzen wie den (durchaus auch kritischen) Umgang mit Inhalten aus Internet, Radio und Fernsehen sowie die Funktionsweisen technischer Geräte (besonders des Smartphones) nahebringen. Auch gestatten Bilderbuch-Apps einen ersten Einstieg in die digitale Welt (Knopf, 2018). Ziel ist es hier nicht, extensive Mediennutzung im Kindergartenalter zu fördern, sondern präventiv zu arbeiten und das Informationsverhalten der Kinder von Anfang an positiv zu beeinflussen (Gust von Loh/Henkel, 2014). Dies kann in Kindergärten allerdings nur passieren, wenn Kindergärtner und Kindergärtnerinnen selbst in Medien- und Informationskompetenz sowie deren Vermittlung geschult werden.

In der *Grundschule* wird Informationskompetenz integraler Bestandteil der Fächer (und kein eigenständiges Fach). Informationskompetenz wird ergänzend zu Lesen, Schreiben und Rechnen als Kulturkompetenz der Wissensgesellschaft gelehrt (Irion/Ruber/Schneider, 2018, S. 42). Es geht nicht nur um „reine Hantierungsfähigkeiten" in digitalen Umgebungen, sondern zusätzlich um „bildungsrelevante Elemente" (Irion/Ruber/Schneider, 2018, S. 49). „Angesichts der hohen Dynamik digitaler Informations- und Kommunikationssysteme sind dabei

insbesondere Fragen der Entwicklung von Transfer- und Selbstlernkompetenzen zu beantworten. Die Grundschule steht insbesondere vor der Aufgabe, diese Prozesse grundzulegen" (Irion/Ruber/Schneider, 2018, S. 55). Aus Erfahrungen an Grundschulen in Hongkong wissen wir (Soubusta/Chu, 2013), dass Kinder der 4. Klasse erfolgreich in Boolescher Logik, in einer Nachrichtendatenbank im Web sowie in Klassifikationssystemen unterrichtet worden sind, so dass sich die Schüler in digitalen Bibliothekskatalogen und bei Web-Newsseiten zurechtfinden konnten.

In den *Sekundarstufen* gehört Informationskompetenz als Fach in das mathematisch-naturwissenschaftlich-technische Arbeitsfeld (Ader/Orszullok/Stock, 2013, S. 264 ff.). In der *Sekundarstufe I* ist das Erlernen und Beherrschen grundlegender Funktionalitäten von Internet und Smartphone Voraussetzung für alle weiteren Aktivitäten und sollte deshalb zu Beginn der Lehr- und Lernblöcke der Informationskompetenz stehen. Hier gibt es bereits Erfahrungen, insofern einige Schulen das Fach ITG (Informationstechnologische Grundbildung) in das Schulcurriculum eingebunden haben. Der Gedanke, Smartphones im Unterricht einzusetzen, könnte möglicherweise bei der Lehrerschaft auf Widerstand stoßen. Generell ist das Verhältnis zwischen Schule und Handy eher problematisch, da es derzeit nicht für schulische Zwecke genutzt wird, sondern als Störfaktor gilt. Die Schüleraktivitäten am Smartphone lassen sich schlechter kontrollieren als die PC-Benutzung im Computerraum. Hier muss bei der Lehrerschaft ein Umdenken einsetzen, das vom aktiven – und sinnvollen – Gebrauch von Smartphones ausgeht und dieses in das didaktische Konzept einbezieht. Ebenso erscheint es unerlässlich, schon in dieser Phase auf die Möglichkeiten und Risiken digitaler Medien sowie insbesondere auf Gefahren im Internet aufmerksam zu machen. In der *Sekundarstufe II* wird dieser Stoff vertieft und auf die Informationsmärkte, die Medienlandschaft, Datenschutz, Urheberrecht und Jugendmedienschutz ausgeweitet. Im Zentrum des Informationskompetenzunterrichts stehen in der Sekundarstufe II fortgeschrittene Recherche- und Repräsentationskompetenzen. Im Information Retrieval lernen die Schüler professionelle Informationsquellen kennen, erlernen Techniken und Strategien, darin zu suchen, und wissen, die gefundenen Dokumente zu bewerten und in der eigenen Arbeit anzuwenden. Diese

Recherchekompetenz wird den Schülern sowohl beim Anfertigen ihrer Facharbeit helfen als auch die Studierfähigkeit der Schüler erhöhen.

Bei der Didaktik der Informationskompetenz können diverse, aktuelle Formen der Didaktik eingesetzt werden. Ader, Orszullok und Stock (2013, S. 262 ff.) nennen dokumentbasiertes Lernen, Projektarbeit und Teamarbeit. Da Schüler im 21. Jahrhundert in aller Regel Erfahrungen mit digitalen Spielen haben, erscheint es für Knautz (2013) sinnvoll, solch ein „spielendes Lernen" in der Form eines gamifizierten Informationskompetenz-Unterrichts durchzuführen. „Grundlegend dabei ist, Schüler für Richtiges zu belohnen und immer einen Überblick über den Status ihrer Fähigkeiten und Kenntnisse zu bieten. Rückkopplungsmechanismen in Form von Punkten, Level, Achievements etc. geben Feedback über das Geleistete und sprechen menschliche Bedürfnisse nach beispielsweise Wettbewerb oder Status an. Auf diese Weise ist es Schülern möglich, ihren Lernfortschritt selbst zu kontrollieren" (Knautz, 2013, S. 257).

2.5.4 Lehrer für Informationskompetenz

Zu Recht betont Bergner (2017, S. 123): „Nicht Medien verbessern das (schulische) Lernen, sondern die Lehrkräfte, die diese Medien zielführend einsetzen". Wir halten es für dringend erforderlich, das Studium der Informationskompetenz als Lehramt an deutschen Hochschulen einzuführen. Wenn wirklich „alle Lehrkräfte", wie die KMK (2016, S. 19) fordert, Informationskompetenz unterrichten sollen, ist dieses Fach an allen Universitäten bzw. Fachhochschulen einzuführen, insofern an den Standorten Lehrer ausgebildet werden. Die geforderten Kompetenzen der Lehrer (KMK, 2016, S. 20-22) kommen sicherlich nicht von allein oder können von anderen Studienfächern geliefert werden, sondern müssen in einem eigenen Fach angeboten und studiert werden. Es ist schon etwas überraschend, dass dieser doch nicht unwichtige Aspekt der professionellen Lehrerausbildung von der KMK übersehen worden ist.

2.6 Zusammenfassung und Ausblick

Die Vereinigung von Medienkompetenz, digitaler Kompetenz und Informationskompetenz (in diesem Artikel unter dem wissenschaftlichen Leitbegriff „Informationskompetenz"

zusammengefasst) ist das angestrebte Lehr- und Lernziel einer Schulbildung in der digital geprägten Welt der Wissensgesellschaften im 21. Jahrhundert. Informationskompetenz spielt sowohl eine Rolle in den Didaktiken der einzelnen Fächer als auch – entgegen der Vorschläge der KMK – ab den Sekundarstufen als eigenes Fach. Informationskompetenz umfasst als Stoff grundlegende IT-Kenntnisse (Computer, Smartphone, Internetdienste, Internet der Dinge, Wearables), ebenso grundlegende Kenntnisse in Softwareprodukten (vor allem Office-Software), vertiefte Einsichten in analoge wie digitale Medien, die (inzwischen normierten) Bausteine der Retrievalkompetenz (vom Erkennen von Informationsbedarfen über Suchen und Finden, der Bewertung der Qualität der gefundenen Informationen bis zum adäquaten Einsatz des als zuverlässig eingeschätzten Wissens), die Bausteine des Erstellen und (Ver-)Teilens sowie der Wissensrepräsentation und letztlich ein vertieftes Verstehen der Charakteristika der Informations- und Wissensgesellschaft, der Informationsmärkte sowie von Informationsethik und -recht. All dies sind generische Inhalte, die nicht irgendeinem (bereits bestehendem) Schulfach „untergeschoben" werden können. Sie begründen unser Plädoyer für ein eigenes Fach, das in den Sekundarstufen unterrichtet wird.

Wie kann ein solches Fach in den Schulunterricht integriert werden? Eines ist sicher: Schnell wird das nicht gehen. Derzeit gibt es nämlich kaum adäquat ausgebildete Lehrer für Informationskompetenz, keine entsprechende Lehrerbildung an den Hochschulen, ja nicht einmal die hierzu nötigen Lehrstühle für Informationskompetenz. Zentral wichtig für die Umsetzung ist der entschlossene politische Wille, solch eine Transformation anzustoßen und auch finanziell auszustatten. Die geforderten Infrastrukturen in den Schulen sind weniger von den Endgeräten abhängig (es gibt bereits Computerräume, und die Schüler besitzen Smartphones) als vom Internetzugang (für alle Schüler gleichzeitig) und dem Zugang zu wichtigen Fachdatenbanken. Optimal wäre die Einrichtung eines Informationszentrums, das für Hardware, Software und Hilfestellungen zuständig ist. Die Strategien der Umsetzung beginnen im Kindergarten mit dem ersten Nachdenken über digitale Medien. In der Grundschule werden bereits grundlegende Kompetenzen angeeignet; in den Sekundarstufen wird der gesamte Stoff derart vermittelt, dass er auch nach Verlassen der Schule jederzeit abrufbar ist. Die Lehrer für Informationskompetenz sehen das Smartphone der Schüler aus

einem völlig neuen Blickwinkel: Es ist nunmehr kein Störfaktor mehr, sondern ein aktives Werkzeug im Unterricht. Die Didaktik der Informationskompetenz kennt eine große Palette von Methoden, die von dokumentbasiertem Lernen über Teamarbeit und Projektarbeit bis zu einem gamifizierten Unterricht reichen.

Was passiert, wenn Informationskompetenz nicht in voller Breite in den Schulen ankommt? Die Schüler und Absolventen werden dann große Probleme haben, sich in der Wissensgesellschaft zurechtzufinden, im Privaten natürlich Smartphone und Internet nutzen – aber vor allem für Spiele und für private Kommunikationen, und im Berufsleben sind sie überhaupt nicht für die Anforderungen der digitalen Wirtschaft vorbereitet. Bundesländer, die ihre Schüler nicht umfassend in Informationskompetenz ausbilden, verorten ihre Bürger auf die „falsche" Seite der digitalen Kluft. Und – diese Prognose ist derzeit nicht allzu gewagt – diese Länder werden auch massive Probleme haben, den Strukturwandel der Wirtschaft und der Gesellschaft hin in die Wissensgesellschaft zu meistern.

Zum Schluss sollten wir noch einmal die Schüler zu Wort kommen lassen: Nach empirischen Ergebnissen (aus Deutschland) finden zwei Drittel der Befragten einen Unterricht in Informationskompetenz sinnvoll (Förster, 2013, S. 140). Den Schülern – allesamt Digital Natives – ist offenbar klar, was sie alles nicht wissen, aber wissen sollten oder wollen und was sie derzeit in der Schule nicht vermittelt bekommen.

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3 Informationskompetenz – Forschung in Graz und Düsseldorf

3.1 Informationskompetenz: Fähigkeiten in der Wissensgesellschaft

Informationskompetenz bezeichnet die Fähigkeit einer Person, zu identifizieren, wann und in welchem Umfang Informationen benötigt werden, wie diese Informationen gefunden, evaluiert und effektiv eingesetzt werden können, als auch das Wissen, wie Informationen kreiert und formal und inhaltlich repräsentiert werden können. Der sinnvolle und verantwortungsbewusste Umgang mit Informations- und Medientechnologien ist eine Voraussetzung für eine funktionierende Wissensgesellschaft (Gust von Loh & Stock, 2013).

Durch die wachsende Bedeutung der Informationskompetenz im Schul- und Hochschulbereich entstanden in den letzten Jahren sowohl nationale als auch internationale Standards. Diese wandeln Definitionen und Modelle in konkrete Indikatoren um, durch die sowohl die Vermittlung von Informationskompetenzen standardisiert als auch der Stand der Informationskompetenz festgestellt werden kann. Im Bereich der Universitäten haben sich international vor allem die amerikanischen *Information Literacy Competency Standards for Higher Education* (American Library Association, 2000) und die australischen *Information Literacy Standards* (Council of Australian University Librarians, 2001) durchsetzen können. In Grund- und Sekundarstufen dominieren die *Nine Information Literacy Standards for Student Learning* (American Association of School Librarians, 1998).

Sonja Gust von Loh und Wolfgang G. Stock vom Institut für Sprache und Information der Heinrich-Heine-Universität Düsseldorf gaben 2013 einen umfangreichen Sammelband zum Thema Informationskompetenz in der Schule heraus. Dieser beleuchtet informationswissenschaftlich, verschiedene Bereiche der Erfassung und Vermittlung von Informationskompetenz (Gust von Loh & Stock, 2013). Zudem wurde in Düsseldorf eine Indikatorenliste entwickelt, bei der vor allem Überschneidungen der einzelnen Informationskompetenz-Modelle und Standards berücksichtigt, aber auch weniger häufig diskutierte Fähigkeiten aus dem Bereich der Informationskompetenz, wie zum Beispiel die

Beachtung der Privatsphäre und die selbständige Erstellung von Informationen, aufgenommen wurden (Beutelspacher, 2014). Die 62 Indikatoren sind in sieben Kompetenzbereiche mit jeweils zwei bis vier Unterkategorien unterteilt, die jeweils andere Fertigkeiten fordern:

1. Informationsbedarf erkennen
2. Informationen suchen und finden
3. Informationen beurteilen
4. Informationen nutzen
5. Informationen organisieren
6. Informationen kommunizieren und publizieren
7. Verantwortungsbewusster Umgang mit Informationen

Die Indikatoren können bei Schülern ab der 7. Klasse, Abiturienten und Studierenden aber auch bei Lehrern und Wissenschaftlern Anwendung finden. Je nach Zielgruppe müssen die Definitionen der Indikatoren jedoch angepasst werden. Anhand der vorliegenden Indikatoren wurden zielgruppenspezifische Fragebogen entworfen, um die jeweiligen Fähigkeiten zu testen.

3.2 Erfassung und Messung von Informationskompetenz

Aus der Literatur lassen sich im Bereich der Erhebung von Informations- und Medienkompetenz zwei verschiedene Schwerpunkte erkennen. Zahlreiche Studien fokussieren sich auf die Untersuchung von Informations- und Mediennutzung von Kindern, Jugendlichen, Studierenden oder Erwachsenen durch mündliche und schriftliche Befragungen mit Hilfe von Fragebogen oder Interviews. Bei diesen Befragungen wird nicht zwischen richtigen und falschen Antworten unterschieden, sondern es werden lediglich die Meinungen, Einstellungen oder Verhaltensweisen der Probanden dokumentiert (Bortz & Döring, 2006). Vorteil der Interviewmethode ist der enge Kontakt zu den Probanden. Es kann auf Fragen und auf durch das Gespräch auftauchende Themen je nach Bedarf eingegangen werden. Ein Nachteil der mündlichen Befragung ist die Gefahr der Beeinflussung der Befragten durch die Interviewer. Dies trifft vor allem auf gering standardisierte Interviews zu. Der Grad der Standardisierung sollte also dem Einsatzzweck sowie der Zielgruppe angepasst werden. Die schriftliche

Befragung hat den Vorteil, dass innerhalb einer recht kurzen Zeit deutlich mehr Probanden befragt werden können als in einem Interview. Dadurch erhöht sich auch die Objektivität des Tests, da weniger äußere Bedingungen, wie zum Beispiel das Verhalten des Testleiters, auf das Ergebnis einwirken.

Der zweite Schwerpunkt liegt auf der konkreten Überprüfung der Informationskompetenz durch Wissens- und Leistungstests. Hier wird in der Regel zwischen richtigen und falschen Antworten bzw. Handlungen unterschieden. Häufig werden zu dieser konkreten Überprüfung Fragebögen eingesetzt, da diese eine hohe Objektivität besitzen, also unabhängig vom Auswerter zu gleichen Ergebnissen führen (Scharf, 2007). Allerdings ist es mit dieser Methode meist nur möglich, das faktische Wissen abzufragen. Im Gegensatz dazu können zum Beispiel mit Hilfe von Real-World Szenarien die aktiven Fähigkeiten der Probanden getestet werden. Hier werden konkrete Aufgaben gestellt, die größtenteils in einer vorgegebenen Zeitspanne erledigt werden müssen. Die Methoden der Wissens- und Leistungstests können zur konkreten Lernstandsüberprüfung und somit zur Bewertung der Effektivität von Vermittlungsprogrammen eingesetzt werden.

Die Abteilung für Informationswissenschaft in Düsseldorf entwickelte anhand der bereits erwähnten Indikatoren verschiedene zielgruppenspezifische Multiple-Choice-Fragebogen zur Erfassung von Informationskompetenz (siehe Beutelspacher, 2014). Diese Fragebogen richten sich an Schüler (siebte und zehnte Klasse), Abiturienten und Studierende sowie an Lehrer und Wissenschaftler. Seit Entwicklung wurden mit Hilfe dieser Testinstrumente verschiedene Untersuchungen durchgeführt, deren Ergebnisse im Diskussionsteil dieses Artikels zu finden sind. So wurde der Fragebogen auch bei Studierenden der Karl-Franzens-Universität Graz eingesetzt (Beutelspacher, Henkel & Schlögl, 2015). Hier wurde deutlich, dass sich das Testinstrument sehr gut als Wissenstest eignet und, wie in diesem Fall, sogar als Klausurersatz dienen kann. Durch die Multiple-Choice Struktur ist es aber schwierig, tatsächliche Aktivitäten, wie das Durchführen einer Recherche, zu testen.

Bei manchen Zielgruppen, zum Beispiel Kleinkindern, sind konservative Methoden wie Interviews und Fragebögen kaum möglich. Oft wird hier die spielerische Interaktion in Verbindung mit genauer Beobachtung angewandt. Gust von Loh und Henkel (2015) zum

Beispiel nutzten eine eigens für diesen Zweck entwickelte Tablet-App, um mehr über den Status der Medien- und Informationskompetenz in Düsseldorfer Kindergärten zu erfahren.

3.3 Vermittlung von Informationskompetenz

Die Vermittlung von Informationskompetenz sollte nach Catts und Lau (2008) bereits im Kindergarten beginnen und sich über die gesamte Schullaufbahn bis hin zur Universität und dem Arbeitsplatz erstrecken. Auch Gust von Loh und Stock (2013) sehen es kritisch, erst in der universitären Ausbildung mit der Förderung von Informationskompetenz zu beginnen und fordern deshalb die Einführung von Informationskompetenz als Schulfach. Lehrer verfügen aber in vielen Fällen nicht über eine adäquate Ausbildung im Bereich Informationskompetenz. Adler, Orszullok und Stock (2013) halten deshalb die Ausbildung von Fachlehrern für Informationskompetenz unter Einbindung von Schulbibliothekaren, wie es bereits in den USA, Großbritannien und Australien in Form einer Weiterbildung zu zertifizierten teacher-librarians üblich ist, für sinnvoll.

Dem Hochschulbereich fällt im Bereich der Vermittlung von Informationskompetenz eine sehr hohe Verantwortung zu (Diaconescu, 2009). Betrachtet man die bestehende Literatur, lässt sich auch erkennen, dass diesem Bereich ein hohes Maß an Aufmerksamkeit zukommt. In Ländern wie Kanada und den Vereinigten Staaten von Amerika werden Hochschulen tatkräftig von den Fachkräften in den akademischen Bibliotheken unterstützt. Auch die öffentlichen Bibliotheken dort konzentrieren sich immer mehr auf das Ziel, Informationskompetenz zu vermitteln und zu fördern. Das 2015 entwickelte *Framework for Information Literacy for Higher Education* (Association of College & Research Libraries, 2015) gibt eine Art Leitfaden vor, an dem sich Institutionen wie Bibliotheken, vor allem aber Universitäten, bei der Entwicklung ihrer Curricula im Bereich Informationskompetenz richten können.

Mit der „Legende von Zyren" wurde an der Universität Düsseldorf ein innovativer Ansatz zur Vermittlung von Informationskompetenz getestet (Knautz, 2013). Die Studierenden werden in eine Fantasy-Welt entführt, in der sie Rätsel lösen und Aufgaben erfüllen müssen. Diesem vielversprechenden Ansatz liegt ein spielerisches Konzept (Gamification) zugrunde, das in den

letzten Jahren immer mehr in den Fokus der wissenschaftlichen Forschung wie auch der Praxis rückte.

3.4 Ergebnisse aus Graz und Düsseldorf

Die Abteilung für Informationswissenschaft der Heinrich-Heine-Universität Düsseldorf und das Institut für Informationswissenschaft und Wirtschaftsinformatik an der Karl-Franzens-Universität Graz forschten zu unterschiedlichen Aspekten aus dem Bereich Informations- und Medienkompetenz. Im Zeitraum von 2011 bis 2016 entstanden 19 Forschungsarbeiten, welche die Grundlage folgender Metaanalyse darstellen. Diese Arbeiten widmeten sich neben der Erfassung des Stands der Informationskompetenz verschiedener Ziel- und Altersgruppen auch den Wegen der Vermittlung von Informationskompetenz.

3.4.1 Erfassung und Messung von Informationskompetenz

Redzinski (2013) führte bereits bei Grundschülern (n=77) einen Informationskompetenz-Test mit Hilfe eines Fragebogens durch. Hierbei wurden Schüler der zweiten Klasse einbezogen, indem der Fragebogen vorgelesen und mit Hilfe des Klassenlehrers beantwortet wurde. Redzinski berichtet jedoch, dass erst ab der dritten Klasse, wenn Lese- und Schreibkompetenz ausreichen sind, Informationskompetenz wirklich erkennbar sei und sich bis zur vierten Klasse bereits steigere. Sie betont, dass es Aufgabe der Schule sei, die Wissenskluft zwischen Schülern zu schließen, auch im Bereich der Informationskompetenz. Im deutschsprachigen Raum ist jedoch, gerade bei jüngeren Nutzern, der Begriff der Informationskompetenz häufig mit dem der Medienkompetenz verknüpft (Gust von Loh & Henkel, 2014). So auch in den Studien von Orszullok (2013) und Förster (2013), die Fragebögen an insgesamt 467 Jugendliche im Alter von 10 bis 17 Jahren in deutschen Gymnasien verteilten, um mehr über deren Nutzung von Medien sowie den Umgang mit Medieninhalten zu erfahren. Die Mehrheit der Teilnehmer besaßen und benutzten neue Medien, vor allem Social Media, regelmäßig. Viele junge Nutzer besaßen bereits einen eigenen Internetzugang und nutzten im Alltag sogar mehrere Medien gleichzeitig. Dies jedoch eher als Konsumenten und nicht als Produzenten von Medieninhalten. Auch sei das Bewusstsein für private Daten unter ihnen nicht ausgeprägt und fast die Hälfte der älteren Teilnehmergruppe gab an, auch illegale Quellen für Medieninhalte heranzuziehen.

Die Nutzung von Computern und die Diskussion von neuen Medien im Unterricht wurden hingegen nur selten wahrgenommen. Erkmen und Shanmugarajah (2013) befragten ebenfalls Schüler von weiterführenden Schulen (n=423), diesmal ganz klar mit dem Ziel, den Stand der Informationskompetenz mit Hilfe eines Fragebogens zu messen. Die Schüler erreichten im Schnitt nur die Hälfte aller Punkte und die Autorinnen resümierten (S. 140):

„Bei den Analysen kam heraus, dass deutsche Schüler weitgehend das Interesse und grundlegende Kenntnisse besitzen, die relevant beim Aneignen von Informationskompetenzen sind, jedoch nicht genug motiviert, belehrt und gefördert werden, damit diese Aneignung rechtzeitig und erfolgreich vonstattengehen kann. So wäre eine frühzeitige Belehrung der Kinder bezüglich der Informationskompetenzen wünschenswert."

Auch Förster (2013) und Orszullok (2013) sehen ganz klar Bedarf an Vermittlung von Informationskompetenz an weiterführenden Schulen.

Studenten an deutschen und österreichischen Universitäten erreichen oftmals nur mittelmäßige Punktzahlen in verschiedenen Tests zur Informationskompetenz (Maurer et al., 2016; März, 2016; Gerharter, 2015; Grafmüller & Gros, 2015). In einer Umfrage von Beckers (2015; n=272) erreichten die studentischen Teilnehmer nur das Anfänger-Level, was durch einzelne Experimente (n=27) bestätigt wurde. Masterstudenten schnitten oft etwas besser ab als Bachelorstudenten (Gerharter, 2015; Beckers, 2015). Zudem wurden auch Ergebnisse anderer Studien (Mahmood, 2016) bestätigt, wonach Studierende ihre eigene Informationskompetenz überschätzen (Maurer et al., 2016; Rust, 2016; Gerharter, 2015).

Gerharter (2015) berichtet, dass Teilnehmer bereits durch den Besuch einer Lehrveranstaltung zum Thema Informationskompetenz ein besseres Ergebnis im durchgeführten Test erzielten und fordert eine Anpassung der Studieninhalte, mehr Einbeziehung der akademischen Bibliotheken und das Schaffen eines erhöhten Bewusstseins für die Bedeutung von Informationskompetenz.

Auch internationale Vergleiche sind ein interessantes Forschungsgebiet: So vergleicht Rust (2016, n=80) die Informationskompetenz von koreanischen und österreichischen Masterstudenten, während Grafmüller und Gros (2015, n=892) einen

Vergleich zwischen Studenten aus deutschen und kanadischen sogenannten informationellen Städten[1] anstreben. Gerade bei Studien dieser Art müssen jedoch kulturelle Unterschiede, sprachliche Besonderheiten, Infrastruktur und Unterschiede im Schulsystem berücksichtigt werden. Diese und andere Faktoren können einen simplen Vergleich via Fragebogen zur Herausforderung machen. Es stellt sich die Frage, ob die zugrundeliegende aus dem angloamerikanischen Raum beeinflusste Definition von Informationskompetenz die gleiche ist wie in anderen Kulturen und ob ein einheitliches Konzept überhaupt möglich oder nötig ist.

3.4.2 Vermittlung von Informationskompetenz

Glinik (2015) untersuchte, in welchem Ausmaß Informationskompetenz in den betriebswirtschaftlichen Studiengängen der Karl-Franzens-Universität Graz vermittelt wird. Hierfür wurden Beschreibungen von 281 Lehrveranstaltungen evaluiert mit dem Ergebnis, dass 31 Prozent aller Master-Lehrveranstaltungen und 7,9 Prozent aller Bachelor-Lehrveranstaltungen Aspekte der ACRL-Definition für Informationskompetenz enthielten.

Stefan (2015) führte Interviews mit wissenschaftlichen Mitarbeitern der Sozial- und Wirtschaftswissenschaftlichen Fakultät der Karl-Franzens-Universität Graz durch. In dieser explorativen Studie kam heraus, dass der Begriff der Informationskompetenz „bei Betriebswirten kaum bekannt" (S. 46) sei, aber als wichtig für Studenten angesehen wurde. Sie schlägt vor, einen Grundkurs in Informationskompetenz für alle Studenten anzubieten.

Aber nicht nur an Schulen und Universitäten wird Informationskompetenz vermittelt. Öffentliche und akademische Bibliotheken haben uns schon immer beim Suchen und Finden von Informationen unterstützt. In zwei Studien zu informationellen Städten wurden Bibliothekare in Amerika und Kanada interviewt, um mehr über die dortige Vermittlung von Informationskompetenz zu erfahren (Henkel, 2015; Henkel & Stock, 2016). Dort sahen Bibliothekare in akademischen Bibliotheken dies als eine sehr wichtige Aufgabe an und waren zu diesem Zweck oft sogar in die Hochschullehre eingebunden. Auch öffentliche Bibliotheken berichteten, sich zunehmend um Informationskompetenz-Vermittlung für die Öffentlichkeit zu bemühen, klagten aber häufig über fehlende Ressourcen.

Eines haben alle diese Studien gemeinsam: Sie decken Lücken in der Lehre und Anwendung von Informationskompetenz auf und fordern, diese zu schließen.

3.5 MOOC – Eine mögliche Lösung zur Steigerung der Informationskompetenz?

Die in allen der analysierten Studien belegten Defizite in der Informationskompetenz zeigen einen Bedarf für verstärkte Informationskompetenz-Schulungen. Ein flächendeckender Ausbau über alle Bildungsniveaus hinweg würde jedoch beträchtliche Ressourcen beanspruchen. Online-Angebote erscheinen vor dem Hintergrund dieser Herausforderung aufgrund ihrer leichten Verbreitbarkeit als ideale Lösung. Es existieren bereits eine beträchtliche Zahl an derartigen Online-Ressourcen im Kontext der Informationskompetenz-Entwicklung im weitesten Sinne. So gibt es beispielsweise Anleitungen zur Benutzerschulung auf Bibliotheks-Websites. Websites aus dem bibliothekarischen Umfeld zu der Thematik Informationskompetenz[2] und zahlreiche Lehrende stellen auf ihren Websites Informationen zu wissenschaftlichem Arbeiten zu Verfügung. All diese verstreuten Online-Ressourcen haben jedoch den Nachteil, dass sie keinen Kurscharakter aufweisen. Es benötigt bereits ein gewisses Problembewusstsein, um gezielt nach derartigen Hilfestellungen zu suchen.

Als bestens geeigneter Ansatz zur Bereitstellung solcher Kurse im Online-Format erscheinen daher MOOC (Massive Open Online Courses). Das Konzept eines MOOC entwickelte sich aus der Open Educational Resources-Bewegung und wurde im Jahr 2008 geprägt (Gabel, 2013). MOOC weisen keine formalen Zugangsbeschränkungen auf und können von einer unbeschränkten Anzahl an Teilnehmerinnen und Teilnehmern absolviert werden. Sämtliche Lehrmaterialien werden über das Internet zu Verfügung gestellt und sind vergleichbar mit klassischen Präsenzkursen strukturiert. Gängige Bestandteile der Kurse sind Kurzvorlesungen, die als Videos veröffentlicht werden, Foren zur Kommunikation der Teilnehmerinnen und Teilnehmer, Quiz zur (Selbst-)Überprüfung von Wissen und teilweise auch die Vergabe von Zertifikaten (Schulmeister, 2013).

Ein Vorteil derartiger Angebote ist, dass diese eine große Anzahl Interessierter erreichen und auf vielfältige Weise eingesetzt werden können. MOOC können sowohl selbstständig wie ein Kurs absolviert werden, gleichzeitig aber auch als Informationsquelle für spezifische

Fragestellungen dienen. Verbunden mit rechtlichen und administrativen Hürden ist für die Absolvierung von MOOC an Hochschulen sogar die Vergabe von ECTS-Punkten möglich. Beispielsweise besteht an der Karl-Franzens-Universität Graz für Studierende die Möglichkeit, einen rein als MOOC auf der hauseigenen Plattform iMooX angebotenen Kurs im Rahmen der freien Wahlfächer zu absolvieren und hierfür nach einer elektronischen Präsenzprüfung ECTS-Anrechnungspunkte zu erhalten.[3] Zusätzlich können MOOC auch teilweise oder vollständig in bestehende Lehrangebote integriert werden, beispielsweise nach dem Flipped-Classroom-Ansatz (Milman, 2012).

Nachdem der Einsatz von MOOC zur Vermittlung von Informationskompetenz bereits mehrfach in der Literatur angeregt wurde (Creed-Dikeogu & Clark, 2013; Gore, 2014; Georgy, 2015), gibt es mittlerweile weltweit eine wachsende Zahl an MOOC, die sich direkt oder indirekt der Thematik der Informationskompetenz widmen. Erste Beispiele gibt es auch bereits im deutschen Sprachraum.[4] Eine Analyse bisheriger MOOC-Angebote konnte jedoch Defizite bei der Berücksichtigung fach- und landesspezifischer Aspekte sowie ein Fehlen umfangreicher Selbstevaluierungsmöglichkeiten für Teilnehmer aufzeigen (Dreisiebner & Mandl, 2017).

Ein aktuelles Projekt, das sich der Entwicklung eines Informationskompetenz-MOOC widmet, lautet *Information Literacy Online – Developing Multilingual Open Educational Resources Reflecting Multicultural Aspects (ILO)*.[5] Das Projekt mit einer Laufzeit von knapp drei Jahren wurde im November 2016 gestartet und wird im Rahmen der Erasmus+-Programmschiene Strategische Partnerschaften von der Europäischen Union gefördert. Neben der Karl-Franzens-Universität Graz, welche die koordinierende Funktion übernimmt, sind auch die City University of London (UK), Universität Barcelona (ESP), Universität Zadar (CRO), Universität Ljubljana (SLO) sowie die Universität Hildesheim (DE) und das Deutsche Institut für Internationale Pädagogische Forschung (DE) beteiligt. Ziel des Projekts ist die Entwicklung eines MOOC in den Sprachen aller beteiligten Partnerländer zur Vermittlung grundlegender Informationskompetenz auf Hochschul-Niveau. Auch wenn der Fokus hierbei auf Studierende liegt, soll das Angebot ebenso das Life-Long-Learning der breiten Bevölkerung unterstützen. Durch die Entwicklung in Englisch, Deutsch, Spanisch, Katalanisch, Slowenisch und Kroatisch finden auch länderspezifische Besonderheiten Berücksichtigung. Der entwickelte MOOC soll

um fachspezifische Erweiterungen ergänzt werden können, wofür zwei exemplarische Vertiefungen für die Disziplinen der Wirtschaftswissenschaften und Psychologie entwickelt werden. Ebenso soll eine elektronische Assessment-Komponente integriert werden, deren Aufgabenstellungen sowohl als wissensbasierte Multiple-Choice-Fragen als auch problembasierte Praxisbeispiele aufbereitet werden, die teilweise auch in simulierten Benutzeroberflächen gelöst werden müssen. Beabsichtigung ist, dass sämtliche Materialien unter einer offenen Lizenz veröffentlicht werden, um diese möglichst niederschwellig auch für andere interessierte Lehrende verwendbar und adaptierbar zu machen (Dreisiebner & Mandl, 2017).

Dieses Projekt und andere bestehende MOOC-Angebote zur Vermittlung von Informationskompetenz zeigen die zunehmende Verfügbarkeit niederschwellig zugänglicher Lehrangebote, die dabei helfen können, auf die bisher schlechten Evaluierungsergebnisse quer durch alle untersuchten Gruppen zu reagieren. Hierzu benötigt es jedoch auch ein steigendes Problembewusstsein innerhalb der Bildungsinstitutionen und der breiten Bevölkerung. Dazu bedarf es zukünftig weitere Anstrengungen, die auch über das informationswissenschaftliche Spektrum hinausgehen. In welchem Ausmaß MOOC-Angebote zu besseren Ergebnissen bei Informationskompetenz-Testungen führen, ist aktuell noch nicht erforscht.

3.6 Zusammenfassung und Ausblick

Wie die vorherigen Abschnitte gezeigt haben, gibt es eine Vielzahl von Forschungsschwerpunkten und Projekten hinsichtlich der Informationskompetenz an der Abteilung für Informationswissenschaft der Heinrich-Heine-Universität Düsseldorf und dem Institut für Informationswissenschaft und Wirtschaftsinformatik der Karl-Franzens-Universität Graz.

Im Bereich der theoretischen Grundlagen ist vor allem das umfangreiche Werk von Gust von Loh und Stock (2013) zu nennen. Die Düsseldorfer Autoren gehen hier unter anderem auf die verschiedenen Inhalte ein, die Schülern im Bereich der Medien- und Informationskompetenz vermittelt werden sollten. Auch Beutelspacher (2014) beschreibt in ihrer Indikatorenliste unterschiedlichste Fähigkeiten, die für die Teilhabe an der Wissensgesellschaft von Nöten sind.

Der Erfassung von Informationskompetenz wurden von den beiden Standorten zahlreiche Forschungsprojekte gewidmet. Zielgruppen waren hier vor allem Schüler verschiedener Klassenstufen sowie Studierende deutschsprachiger, aber auch internationaler Universitäten. Allen Ergebnissen gemein ist, dass sich der Grad der Informations- und Medienkompetenz auf einem ausbaufähigen Level bewegt, sodass von den Forschern Nachholbedarf in der Vermittlung dieser Kompetenzen gesehen werden.

Diese Vermittlung von Informationskompetenz ist auch Gegenstand der österreichischen und deutschen Forschung. In diesem Bereich ist, neben dem gamifizierten Ansatz der Universität Düsseldorf, vor allem das Projekt Information Literacy Online der Grazer Informationswissenschaft zu nennen. Die Entwicklung eines Massive Open Online Courses scheint viele Vorteile für die Vermittlung, wie zum Beispiel den freien und einfachen Zugriff oder die vielfältige Anwendbarkeit, mit sich zu bringen. Inwieweit derartige MOOC auch die Ergebnisse im Rahmen der Erfassung von Informationskompetenz positiv beeinflussen, ist Gegenstand geplanter zukünftiger Forschungen.

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4 Evaluating an Information Literacy Assessment Instrument – The Case of a Bachelor Course in Business Administration

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4.1 Introduction to information literacy

For some years, information literacy is seen more and more as an essential competence for the 21st century. Skills like searching, using, evaluating and creating information are required not only for university students or library users but for each participant in the knowledge society. To unitize these skills of information literacy, numerous models and standards have been developed over the last decades. Probably the best-known standards are the "Information Literacy Competency Standards for Higher Education" (American Library Association [ALA] 2000). They describe the specific skills an information literate university student should have. This includes the identification of needed information, the effective and efficient access to information and information systems, the evaluation and use of information as well as the understanding of economic, legal and social issues regarding information. These skills can be identified in a lot of models and standards. But due to the fast development of information and media technology, new skills need to be taken into consideration. For example, the role of users in the Internet has changed a lot. Whereas previously the user participated passively, he now steps out of that role and becomes an active participant of the web, a so-called "prosumer" (Toffler 1980). This kind of information creation and dissemination requires new skills relating to generating and indexing information, but also knowledge about legal aspects and ethics, like ensuring privacy or data security (Gust von Loh & Stock 2013). As a consequence, information literacy requirements are not static but need an adaption from time to time.

4.2 Assessing information literacy

When choosing a suitable method for assessing information literacy, the implementing institutions should be aware of the exact target, the subsequent use of the data and the target

group of the survey. As can be read in the literature, the use of Multiple Choice (MC) tests is a very popular method for assessing information or media literacy. A well-known example for such a test is the "Information Literacy Test" developed at James Madison University (Cameron, Wise & Lottridge 2007). Here constant answers are suggested, from which the subject has to select one or more. A clear advantage of this test method is the objectivity. Each respondent gets the same questions and answers. For each question there are clearly right and clearly wrong answers, regardless of the test administrators. Moreover, the results can be compared very well among institutions or individuals. But especially in the area of information usage or similar issues, the disadvantage of this method becomes clear: "Yet such tests may not well-suited to the task of evaluating higher-order skills, such as a student's ability to integrate new information" (Scharf et al. 2007: 462). We can therefore only assess the knowledge of the test subjects but no actual performance. In addition, there is always the risk of falsification due to random checking the right answers by the subjects (Bühner 2010). Some institutions try to minimize the disadvantages mentioned by using rubrics instead of multiple-choice tests (Oakleaf 2009). Rubrics provide teachers or test users with the ability to assess results based on specific criteria. They describe the performance of a specific task, a product or a service and evaluate them. Using rubrics for information literacy assessment brings some benefits for teachers and test users as well. Since the evaluation is not only done by grades but through performance descriptions, learners can understand where they might have problems. The disadvantages of rubrics are also obvious: The results of the tasks are rated subjectively, in spite of predetermined evaluation criteria. The analysis is thus not completely objective, and the comparison between test results may suffer. This manual rating, however, brings another problem with it. The analysis is very time consuming and cannot be automatized. Also, the construction of such a rubric is very time-consuming and costly. Another form of performance tests are the real-world scenarios. Here the subject is shown a scenario (for example a research task), which they need to solve in a given time. In most cases, the test is automatically rated based on clicked links, keywords used or selected literature. A good example for this assessment method is the ETS iSkills (Katz 2007). An advantage of this method is especially the realistic setting. Due to the scenario-based tasks, areas such as critical thinking or the development of problem-solving strategies can be tested. A disadvantage is the high effort in

creating the different tasks: The scenarios and algorithms for rating need to be implemented and the performance of the tests need to be ensured.

4.3 Indicators and information literacy questionnaire

The information literacy assessment instrument which was developed at the University of Düsseldorf (Beutelspacher 2014a) was partly adapted for its use at the Faculty of Social Sciences and Economics at the University of Graz. Most of the questions were taken from the initial questionnaire, a few questions were transformed to the business administration context, and several questions were omitted. Finally, the resulting information literacy questionnaire consisted of 25 questions. The adopted questionnaire can be downloaded from the Website of the Institute of Information Science and Information Systems (INWI, 2015). The initial questionnaire was developed by referring to different skills of information literacy, which were selected from various standards, models and research literature (Beutelspacher 2014b). The resulting 62 indicators were divided into seven areas:

1. Identifying information need
2. Searching and finding information
3. Evaluating information
4. Using information
5. Organizing information
6. Communicating and publishing information
7. Responsible handling of information.

To make sure that the initial questionnaire covers all aspects of information literacy, the questions were assigned to the areas and indicators. However, we are aware that it is not possible to assess all indicators with such a multiple-choice test since only the knowledge and not the performance can be tested (Beutelspacher 2014c).

4.4 Case Study

There is only one elective course (called "Information Science") in the bachelor program on business administration at the University of Graz which is primarily devoted to information

literacy. The main objective of this course is to provide students with basics in information literacy with regards to

- an increased knowledge about important information sources;
- more efficient information seeking skills;
- information evaluation (UGO 2015).

For this purpose, an introduction to information literacy is given in the first part of the course which ends with a written exam. Usually, the students have to answer various questions and perform several small exercises (for instance, calculating the impact factor for a journal, formulating a Boolean search or constructing a small Thesaurus out of a few words). In the second part of the course, the students have to explore a search engine or a database on their own, write a manual (term paper) and present the search engine/database to the other students. This semester, the information literacy questionnaire was used instead of the usual written exam. However, the students did not know this before. In general, the students answered most questions successfully. Yet, the relatively small difference between the best (26 points) and the worst student (20 points) was not expected. The mean score amounted to 23.6 points, the median to 24 points. Another interesting result was that the best student missed the maximum score by 3 points. This means that three out of the 25 questions were answered wrongly. This might be due to the fact that there were a few single/multiple choice questions which left some room for interpretation.

4.5 Evaluation of information literacy questionnaire

After the students had completed the information literacy questionnaire, they received another questionnaire in which they were asked for their opinion on the information literacy test instrument. Contrary to the information literacy questionnaire, the second survey was anonymous. The questionnaire consisted of 2 closed-ended and 5 open-ended questions. The answers to the open-ended questions were categorized in a bottom-up approach, i.e. the statements to questions 2 to 4 are the result of categorizing the answers of the students to larger "units".

4.5.1 Appreciation and length of used questionnaire

Figure 1 shows the results for question 1, in which the students had to assess their appreciation of the information literacy questionnaire on a 5-point scale (1 = very reasonable, 5 = not at all reasonable). As can be seen, 18 out of 27 students judged the test instrument to be "reasonable".
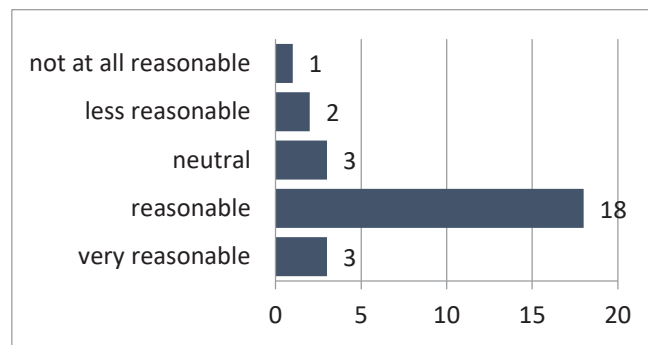
Figure 1: Acceptance/appreciation of information literacy questionnaire by students (n=27)

Most students completed the information literacy questionnaire in 20 minutes. More than 80% found the length of the questionnaire appropriate. However, the 25 questions appeared too little to assess the level of information literacy to 4 students (see fig. 2). This could be an indication that such a questionnaire could be slightly extended.
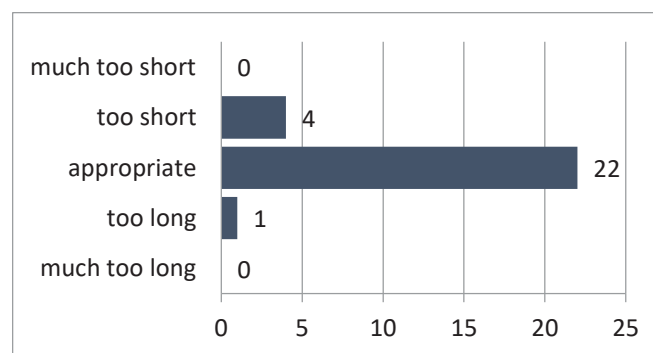
Figure 2: Length of information literacy questionnaire (n=27)

4.5.2 Advantages

In question 2, the students were asked for the advantages of such an information literacy questionnaire. 8 mentions referred to the case that such a questionnaire allows an "efficient assessment of information literacy". Also, in 8 statements the students indicated that such an

assessment instrument allows to give a "good overview about the level of information literacy". Accordingly, such a questionnaire can be used for "self-assessment" (3 mentions). It was not expected that as much as 7 students indicated the "comparability of the test results". Closely related are arguments like "assessment of big samples possible" (3 mentions), "objectivity" (1 mention) and "possibility to identify correlations with other variables" (1 mention). Since the questionnaire was one part of the final marking of the students, two arguments with two mentions each were given in this context: "more convenient exam situation" and "easier to pass exam". Two of the arguments given above (comparability and objectivity) were already mentioned before.

4.5.3 Problem areas

One of the two most frequently arguments seen by the students was that it is "not possible to assess information literacy more comprehensively" (10 mentions) – see also next subsection. This means that higher-order skills cannot be tested (Scharf 2007 et al.: 462). One reason for this is that probands can "only select between closed-ended questions" (3 mentions). Creating "questions the fixed response options of which are unambiguous to all respondents" received also 10 mentions. Since business administration students must pass several (electronic) multiple choice exams due to the great number of students, the participants in this survey have some kind of "expert status" in this regard. This was also confirmed through a few critical comments: "danger that questions are too specific" (2 mentions), "students must be familiar with technical terms (for instance, SWOT analysis) to be able to give correct answers" (2 mentions) and "fixed response options could possibly irritate students" (1 mention). Third most indications referred to the risk of distortion (Bühner 2010) because it is possible to "guess the right answer" (6 mentions) which would not be possible for open-ended questions. This could partly explain the positive feedback of the students with regards to the exam (see sub-section Advantages) and, finally, why all students received at Evaluating an Information Literacy Assessment Instrument 489 least two thirds of the total score attainable. Finally, one student indicated that it is generally "difficult to measure information literacy".

4.5.4 Areas which cannot be assessed

Question 4 followed up the previous question and asked for areas which cannot be assessed by such an information literacy survey. In the previous subsection it was already revealed that certain aspects of information literacy cannot be tested. This concerns in particular "situations in which information literacy must be applied to real-word problems". This aspect was mentioned by 22 students out of which 8 indicated that performing a good search, for instance, for a bachelor thesis, cannot be evaluated by an information literacy questionnaire. Another student wrote that an ethical use of information can only be evaluated in reality. 2 students noted, also in line with the results to question 3, that it is "not possible to assess information literacy on a more detailed level".

4.5.5 Irritating and needless questions

In question 5 the students were asked if there were any information literacy questions unclear to them. For 12 students all questions were clear. However, not less than 10 students criticized the question where they had to select one search term in order to find literature on SWOT (strength – weaknesses – opportunities – threats) analysis. This question was wrongly indicated as a single choice question though four correct closed-ended questions were listed. Four students noticed that for one question it was necessary to know the term "acquisition" to be able to give the right answer. For 18 students all questions were appropriate for assessing information literacy (question 6). 4 students indicated that professional terms (SWOT, change management) should not be included in such a questionnaire because they are not directly related to information literacy and the relevant questions cannot possibly be answered without knowing them. 3 respondents noticed that personal data (smartphone use, use of search engines, etc.) is not directly related to information literacy and, therefore, should be omitted. For one student the question where the respondents had to estimate their own level of information literacy on a five-point scale did not make sense.

4.6   Conclusions

This case study aimed at investigating the value of a multiple-choice questionnaire to determine the level of information literacy. It turned out that 18 out of 27 students found the information

literacy questionnaire reasonable for such a purpose. However, it was also elaborated that it is not possible to assess information literacy more comprehensively with such a questionnaire. This concerns in particular situations in which information literacy must be applied to real-word problems like, for instance, the search of relevant and high-quality literature for a master thesis. While it is not possible to measure the performance of the information literate subject solely by the means of a multiple-choice questionnaire, the test instrument was considered to be an efficient and convenient knowledge assessment tool and – furthermore, yielding results with high comparability – even for big samples. The risk of falsification due to subjects randomly guessing the answers to self-contained questions was discussed as well as the difficulties of questions which leave room for interpretation or which are too specific.

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Appendix

Questions used for evaluating the information literacy questionnaire:

1. How do you evaluate the used questionnaire for the purpose of assessing information literacy: o very reasonable o reasonable o neutral o not reasonable o not at all reasonable

2. Which advantages does such an information literacy questionnaire have in your opinion?

3. Which problem areas are related to such a questionnaire?

4. Which areas of information literacy cannot be evaluated with it in your opinion?

5. Were there any unclear questions? Which ones?

6. Were there any needless questions? Which ones?

7. How appropriate was the length of the information literacy questionnaire?

much too long

too long

appropriate

too short

much too short

5 Exploring Media and Information Literacy in Early Childhood with a Digital App

5.1 Introduction

Today, digital technologies are an integral part of our society. The rapid development and transformation of information and communication technology (ICT) has not only been transforming how we work, but also interspersed with our private lives in almost every aspect and action of the day (Stock, 2013). It has changed our economy, how we communicate, learn and play. In everyday life, while shopping or in a restaurant, we can already observe even the smallest children playing with their parents' mobile phones, swiping pictures back and forth on digital cameras or using a tablet computer to play games. Digitalisation has already reached even the youngest of us.

This digitalisation of our work and private activities has brought many opportunities for the improvement of our lives but also a demand for certain competences to be able to fully participate. These skills are often summarised under the term media literacy, information literacy, or digital literacy, also conflated to digital information literacy (Bawden, 2001) or media and information literacy (UNESCO, 2017). Information literacy, for example, is not only defined as an essential skill set for every individual living in the information society, but also as a tool of empowerment and a catalyst for equality (IFLA, 2014). Among scholars it is widely accepted that digital competence combined with media and information literacy is needed and necessary for lifelong learning and participation. Therefore, it is necessary for and also a right of every person, regardless of origin, circumstances or age. But when and where should we start to instruct children?

In most countries, media and information literacy education, if at all, starts somewhere in school. But children are influenced by media content and digital technologies earlier than that, so it might be appropriate to start before school, in kindergarten. In early childhood, digital information literacy is not primarily needed for participation in our society in the same contexts as with older generations. But media and technology are already omnipresent in the everyday

lives of young children, voluntarily or involuntarily. It is important to observe, improve and evaluate how media content and technology use influence the lives, wellbeing and development of our children.

In 2017, over 93% of all German children three to five years of age went to kindergarten or publicly funded day care (Destatis, 2017). Implementing educational programs in kindergarten therefore means providing media and information literacy education to the majority of children. Even though many parents do not like the idea of their children playing with tablets or at the computer, in reality it has already become part of their lives. Media contents and technology use of peers and adults are closely monitored by children. Especially in early childhood it is only natural to want to try out what parents and other family members are doing with their gadgets and be part of these kinds of activities (Bostelmann, 2018, p. 179). This is why it is important to address topics such as new media and their contents in kindergarten together with the children. Even pre-school children can already be taught rudimentary skills such as handling and evaluating content from the internet, radio and television and the basic usage of technology. The aim here is not to promote extensive media use in early childhood, but to work preventively and to positively influence the children's information behaviour from the beginning.

Before any recommendations can be made on media and information literacy education in kindergarten, we need to learn about the current status of digital media in kindergarten. What does the infrastructure in kindergartens look like? Are kindergarten teachers already working with tablets and computers, and did they receive any formal media literacy education? To get a better idea of the whole picture, the situation at home is also important: How do parents handle their own and their children's digital media use? What opinions, practices and challenges do families with young children have concerning new media devices and contents?

To assess the current role of digital media in early childhood and to learn more about digital information literacy of young children, we designed and conducted an extensive survey with children from three to six years, their parents and their kindergarten teachers. After visiting 12 kindergartens in North Rhine-Westphalia, Germany, in this work, we will describe our methods and summarize first results of the survey. We will describe how our participants interacted

with the interview app and how their media use is described by them and their parents. Furthermore, we will talk about the infrastructure in kindergartens and about the parent's opinion concerning media education in kindergarten.

5.2 Methods

As the main goal of this study was to get a holistic view of digital media practices of and with young children, it was important for us to interview not just parents and kindergarten teachers, but also and mainly the children themselves. The children's parents and their nursery nurses are important as well, but we know that there is often a different perception between child and adult – about what was understood and meant by the child and what adults think and understand (Scott, 1997). Young children already have a life of their own, which perhaps remains unnoticed by the parents (Lipski, 1998). Furthermore, when working with very young children, scientific methods have to be selected accordingly. One the one hand, linguistic expression, motor skills, etc. are not yet fully developed and children might have difficulty with time and quantity information. On the other hand, we want to protect our young interviewees from frustration or anxiety due to self-consciousness around the researchers or other factors. Of course, as with grown-up subjects, there is also the possibility of social desirability bias (Weise, 2008). To minimize difficulties and get the most out of our time with the children, we decided to develop a tablet computer application to interview the children in a playful way while collecting data through observation and in the background of the application. We expected that not all children who took part in the study were familiar with this type of medium, but we cherished the opportunity to also learn how quickly children get used to handling unknown digital devices and media.

5.2.1 Description of the Interview-Application

The application was developed to make use of the convenience and benefit of technology to combine the research interest from our side with a fun factor for the children. It consists of six different games, each available in two difficulty levels: one for children aged three to four and a more difficult one for children aged five to six and preschool children. Young children undergo enormous physical and mental development (Hille, Evanschitzky, & Bauer, 2013)

which is why we decided to incorporate two different difficulty levels so that younger participants would not be overwhelmed and at the same time older children would not get bored because of mental underload.

The six games were developed with existing information literacy models, for grown-ups and for children, in mind. For example, Beutelspacher (2014) divides information literacy skills into seven competency areas. On the basis of the information literacy skills Beutelspacher describes, we carved out which aspects were to be estimated interesting and realistic for young children. Many abilities that are considered to be important for adults, had to be dismissed since they require reading and writing skills. In earlier publications we go into detail on media and information literacy for young children (Gust von Loh & Henkel, 2015; Gust von Loh & Henkel, 2016). From our point of view, the three and four-year-old children should be able to recognize an information need. Here we have to distinguish between their own (subjective) information need and an (objective) information need. It is being assumed that for small children their own information need is the most important. The second aspect for this group of children is searching for information. They are able to look for specific information, e.g. in relation to a given topic, but also for information regarding their own interest or to satisfy their subjective /objective information need. The youngest ones already have own ideas about their favourite things, as for example certain animals, cars, figures and so on.

The third area for our younger children is the use of information. This area is defined very broadly. Almost all actions – executed both by children and adults – can be interpreted as information use.

For the five and six-year-old children we add two more aspects to these mentioned above. Older children and preschool pupils should be able to evaluate information. They need not analyse and judge information the way adults do, so their evaluation can be different than how adults might expect, because adults do not have the same point of view. This has to be considered when estimating the child's evaluation. The fifth aspect is the communication of information. The three and four-year-olds can communicate information as well but the communication of the five- and six-year-old is much more target-oriented and differentiated. For this reason, we chose this competency area only for the older children. With these different areas of

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information literacy in mind, we developed the application especially for young children and for this study. In the following, each game will be described.

Figure 14: The Hungry Squirrel.

The Hungry Squirrel (1)

In the first game the screen shows a sad squirrel sitting on the grass (Fig. 1). The child has to recognize the need for information at this point because we want to know why the squirrel is sad. By touching the squirrel, we learn: The squirrel is hungry and asks for food. Three items (four for the five- and six-year olds) are being shown. The task is now to choose the correct food and feed (drag) it to the squirrel. If the selection is incorrect, the squirrel will ask to try again. If the selection is correct (nut), the squirrel will eat it.

Figure 15: Helping the Beaver.

Helping the Beaver (2)

In this game, a beaver asks for help with building a dam (Fig. 2). It explains that to build the dam, the logs have to be placed along the red line. In the higher difficulty version, the logs have to be placed in a certain order. Here, the child uses the information provided by the beaver to successfully complete the task.

Finding a Place to Sleep (3)

At the beginning of this game an owl appears in the forest. When the owl is touched by the child, it starts talking and explains to the child where different animals are sleeping. If the child assigns an animal to the wrong sleeping place, the owl reminds the child to consider again what she has previously communicated to the child (Fig. 3). If an animal is allocated the correct sleeping place, the information was used successfully. In the advanced version, there are more animals and sleeping places.

Figure 16: Finding a Place to Sleep.

Figure 17: Water for the Fish.
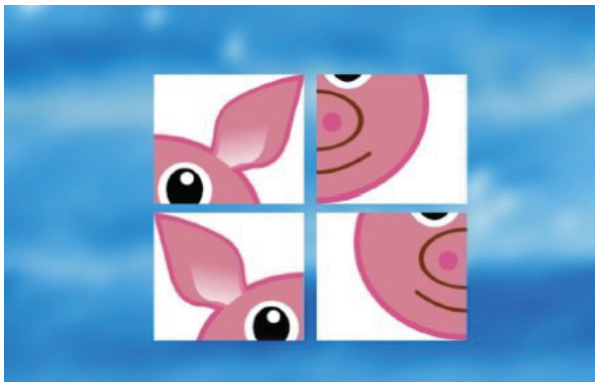
Figure 18: Puzzle.

Figure 19: Animal Song.

Water for the Fish (4)

At the beginning of this game, a river full of fish is displayed. The middle part of the river disappears, and the child is supposed to rebuild it. Different parts of the route (river parts, parts of the meadow, road parts, etc.) are displayed alternately (Fig. 4). The child now has to judge which parts are the right ones. Only when the child taps a correct river part does the river rebuild itself. If a wrong choice is made, the fish will alert the child. The difficulty level is differentiated by the number of parts needed to rebuild the river.

Puzzle (5)

A fox appears and tells the child that everything is mixed up and asks for help. The task in this game is to put the parts of an image or story in the right position. The shifting of the parts is not possible by a dragging or swiping movement this time. Instead, the parts should be swapped must be tapped. Here, it will be interesting how quickly our interviewees can adapt to the different mechanism. When all parts have been placed in the right place, the child has

solved the game correctly. For three- to four-year-olds this is a four-part image puzzle that reveals the face of a piglet (Fig. 5). For the five- and six-year-olds the puzzle is a picture story of the departure and landing of an aircraft.

Animal Song (6)

In the last game, named "Animal Song", the child will see a video player, similar to online videos on the web. The interviewer will ask questions regarding the video at this point (e.g., "Do you know what this is?", "Do you know how to start the video?", "Can you pause the video?"). Hereby we try to find out about the child's experiences. The video itself is a song that shows different animals in turn, which make their respective sounds. After the video, a play button is shown, which plays an animal sound known from the video when touched. The task is to assign the right animal to the sound from a selection of animals (Fig. 6). The three- and four-year-olds get so select from significantly different animals, while the five- and six-year-olds see animals that are more similar, for example, a chicken, a turkey and a duck. By correctly assigning the animals, the child shows that it has used the information previously obtained.

Table 4: What can we learn during the app interviews?

Development	Information Behaviour	Other Factors	Saved Data
Linguistic Expression	Information experience	Interest	Age
Motor Skills	Information understanding	Attention	Gender
Understanding	Information gathering	Self-Consciousness	Institution
	Information handling		Favourite medium
	Information reflection		Game duration
	Information communication		Attempts

In Table 1 is shown what aspects we can observe and gather during the interviews. Working with the app will demonstrate how the children are able to work with the tablet as a medium and also their information behaviour. We want to know how many children already have

experience with or how quickly they adapt to the use of modern digital technology. Maybe there will be cases where children cannot work with the medium at all. Also, how will they solve the tasks in the game? By inquiry or trial and error? At the same time, the app saves the time stamps and number of wrong attempts for every game, which allows us to evaluate the data, additionally to information gained by observation and interview.

5.2.2 Study Procedure

In 2015, we distributed letters to 190 kindergartens, located in a major city in North Rhine-Westphalia, Germany, inviting them to participate in our study. After receiving responses with expressions of interest from several kindergartens, we met with them personally to discuss our research interests, study structure and process as well as answering questions and receiving feedback from the kindergarten teachers. Overall, we conducted the study in 12 institutions. In each institution, we asked the teachers to select a maximum of 20 children of different age and from different social backgrounds to participate. Parents received materials provided by us including information regarding our study, a detailed description of the app and a consent form. We received consent forms from a total of 150 children (8-20 from each institution). In some kindergartens we planned an informal visit prior to the interviews, so that we could introduce ourselves and get acquainted with the children by joining playing activities.

The actual interviews were conducted from June 2015 to February 2016 and in a well-known environment for the children – their kindergarten. In some cases, a kindergarten teacher was present as well. Before playing the app, every child was involved in a dialogue regarding their interests, experiences and preferences with media and technology to lead into the topic. Then the child would play the 6 games, described earlier, together with a researcher as pictured in Figure 7. After playing the games, we reviewed the process together with the child. We wanted the children to feel safe and be comfortable at all times during the process so there was no pressure to participate or finish the games entirely nor a score where they could feel as if they would be competing with other children. At least one more researcher observed the interviews and took notes. Sessions took from 15 to 45 minutes and a total of 129 children completed the interviews.

Figure 20: A researcher is playing the app with a child. (Image Credit: Sonja Gust von Loh)

After the interviews, every child received a letter with a thank you note and a little book. The letter also included a questionnaire for the parents asking about the children's media behaviour. We received 60 of those questionnaires for evaluation. Instead of filling in the questionnaire, parents were also invited to participate in personal interviews. The basis was still the questionnaire, but here, parents had the opportunity to ask questions and explain in more detail. We conducted 14 parent interviews which took from 15 to 120 minutes in duration.

While working with the kindergarten teachers, unstructured interviews and a further questionnaire helped to assess the current situation and infrastructure in their respective institutions. Of the 12 questionnaires we distributed in the kindergartens, 11 were filled in. The survey ended in May 2016.

5.3 Results

We collected 129 datasets of children, 70 boys and 59 girls, who played the app with us. The boys were 4.5 years old and the girls 4.25 years old on average. 29 children were three years

old, 46 were four years old, 44 children were five years old and ten children were six years old (Fig. 8). In the following, we will present some of the first results of the survey: We will describe how our participants interacted with the interview app and how their media use is described by them and their parents. Furthermore, we will talk about the infrastructure and practice in kindergarten and about the parent's opinion concerning media education in kindergarten.
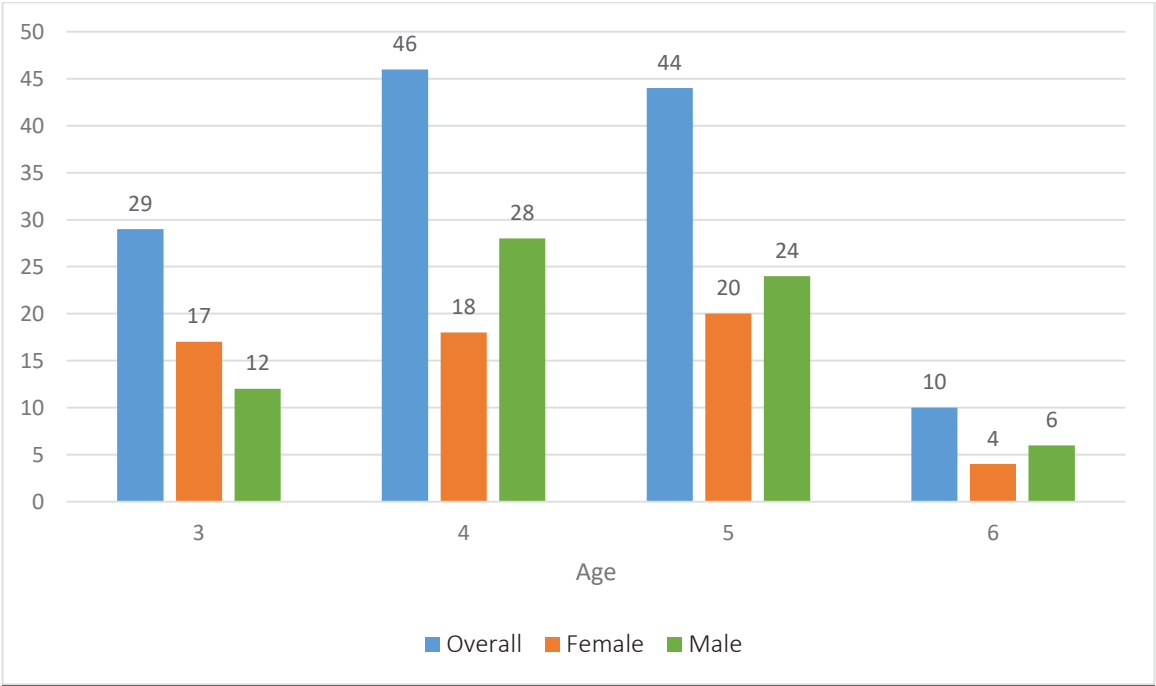
Figure 21: Age (in years) and gender of participating children (N=129).

5.3.1 How Children Interacted with the App

During the app-supported interviews we not only collected qualitative data regarding the children's media preferences, which will be discussed in the next chapter, but also quantitative data measured by the app in the background. Additionally, a researcher would observe and take notes during the whole session. These session protocols were digitalized, structured and analysed thematically. Table 2 shows observed behaviours sorted by frequency of occurrences.

Observation	F
talks to the animals or nods ins response	21
does not listen (until the end)	18
needs a lot of help	16
hesitant/shy (at first)	12
taps randomly	9
trial and error	9
unfocused/impatient	6
uses whole hand or fist	5
presses harder if nothing happens	2

As previously mentioned, all children participated in the interview on a voluntary basis and were able to abort at any time. Many children took to the animal theme very quickly and recited knowledge they had about the animals shows. Often, they responded to them verbally ("What can I do for you?") or nodded when an animal asked for help. There were also children, however, who did not seem to listen to what was said at the beginning of games. They often completed tasks by trial and error, or we had to explain to them what was asked. While some children seemed to be very concentrated and careful in their interaction with the games, some preferred trying things out, playing around with the game's elements and just "touching" things. One participant did not care so much for the tasks presented and used their own fantasy to create a story with the animals in the game.

Especially younger children needed a lot of assistance during the beginning or during games that were different/harder than others. This was not a problem, since the idea was that children would play the app together with a grown-up and accompanied by the dialogue about the game's contents and about media in general. It could be observed that many did not have any prior experience with a touch-screen device and tried to use their whole hand or fist to interact

with the game. Some children tried to "pick up" elements from the screen (for example the strawberry, to give it to the squirrel). Some children were so hesitant to touch the screen for the first time that they eventually did it together with their teacher or with one of the researchers. Indeed, many were a little shy at the beginning, but once they started to play the app, they quickly got used to it up to finishing the last games with only little or no assistance.

Children who already used a tablet before did the typical swipe and tipping movements more easily but did not necessarily perform better with the tasks. Apart from that, many recognized the typical video player in the last game ("Animal Song") and were able to start, pause or maximize the video. After playing the games, we took a few minutes to reflect on the games together. Many children wanted to play a certain game again or told us about their favourite animals. Out of 131 children who participated in the study, two did not finish their interview. These datasets were not included in the evaluation. Sessions took from 15 to 45 minutes.
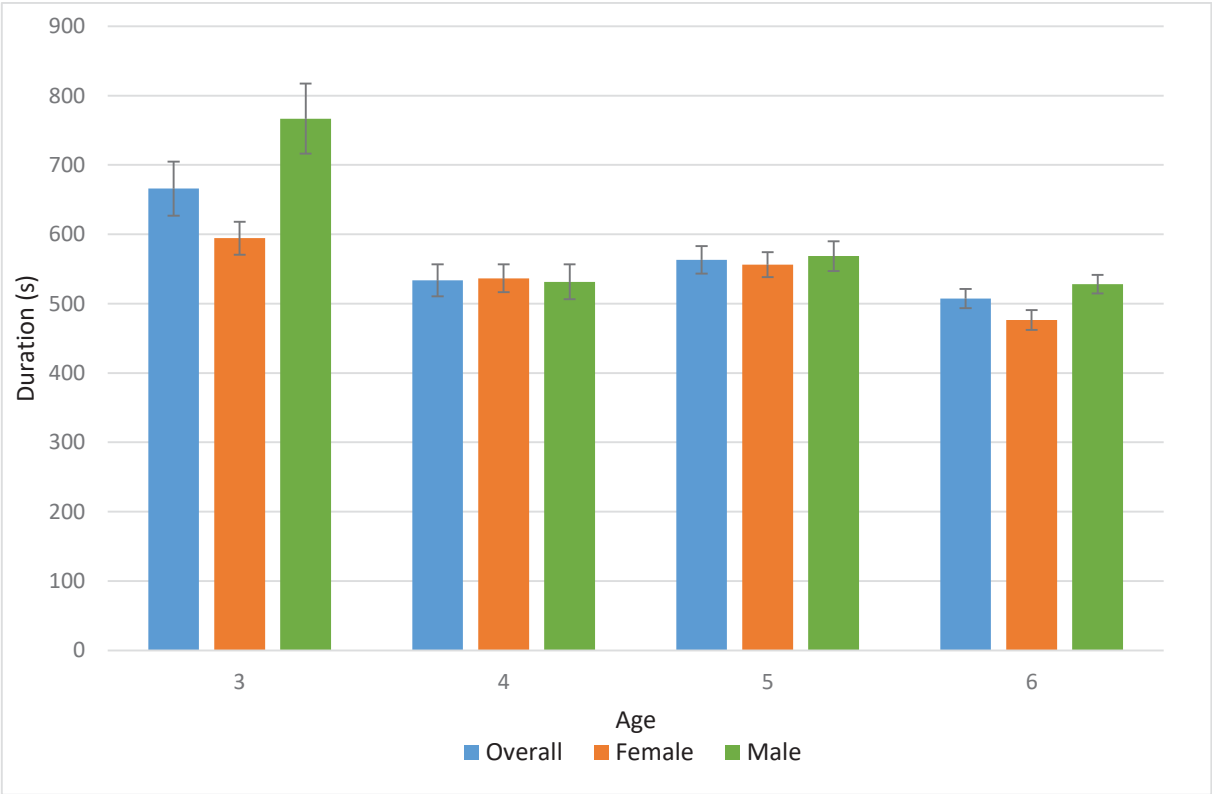
Figure 22: Duration (in seconds) needed to solve the 6 tasks from the interview-application (arithmetic mean, standard deviation).

Figure 9 shows the time (arithmetic mean, standard deviation) children needed to complete the games 1-6 and Figure 10 shows how many attempts they needed for the tasks, sorted by age and gender. A can be seen, 3-year-old boys needed longer to finish the games than 3-year-old girls. In the other age groups, boys and girls finished the game at relatively similar speed. When comparing the number of attempts though, girls needed less than boys, therefore seemed to be more careful before selecting the right animal, for instance. It also looks like there is a tendency for older children to make fewer mistakes, it should be noted though that the sample for the 6-year-olds is very small.
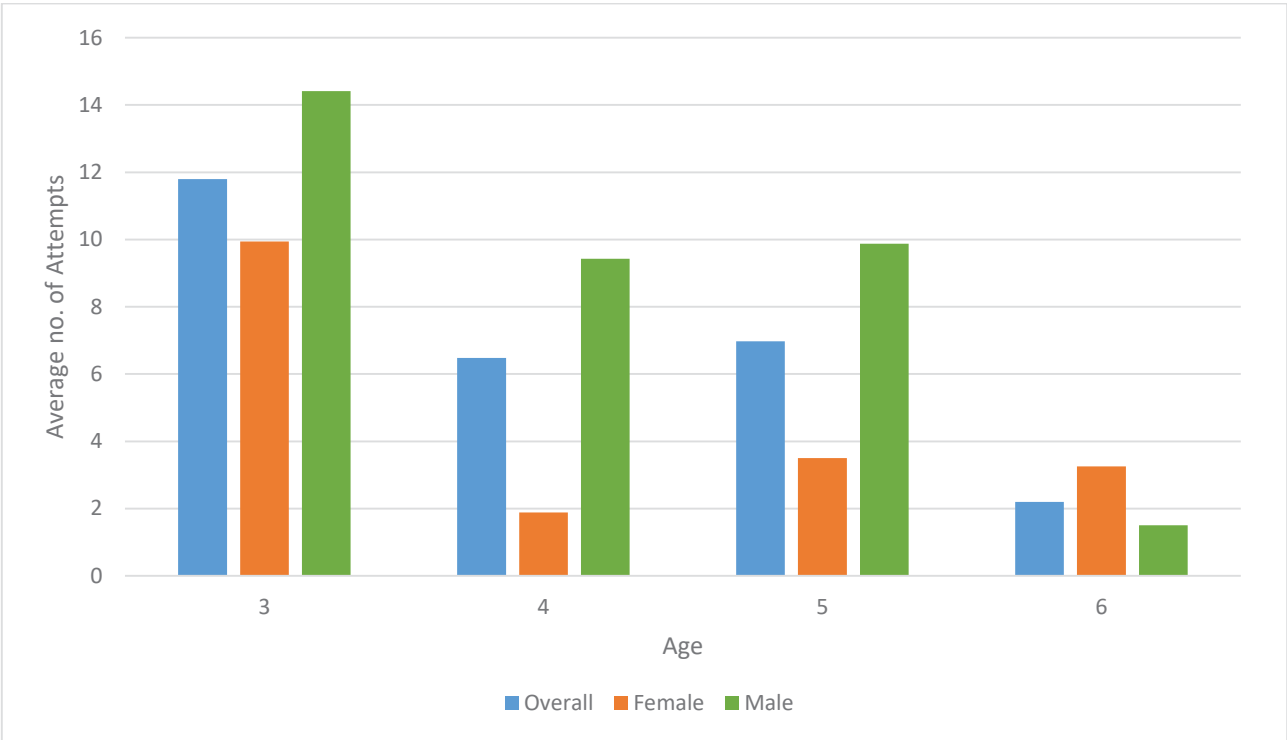
Figure 23: Attempts needed to solve the tasks, sorted by age and gender (arithmetic mean).

5.3.2 Media Usage in General

During the app interviews, we asked each child which medium they like to use the most. Children were asked to select one from an illustrated list of media shown in Figure 11. As we can see, most children picked the educational toy (e.g., "tiptoi" by Ravensburger, an audio-digital education toy system for children of 3 years and older) which was said to be very popular among children at the time of the survey. Over 20 children picked watching television

as their favourite activity and after that magazines and audio content were the most picked media. The computer or laptop were the least chosen as the children's favourite medium.
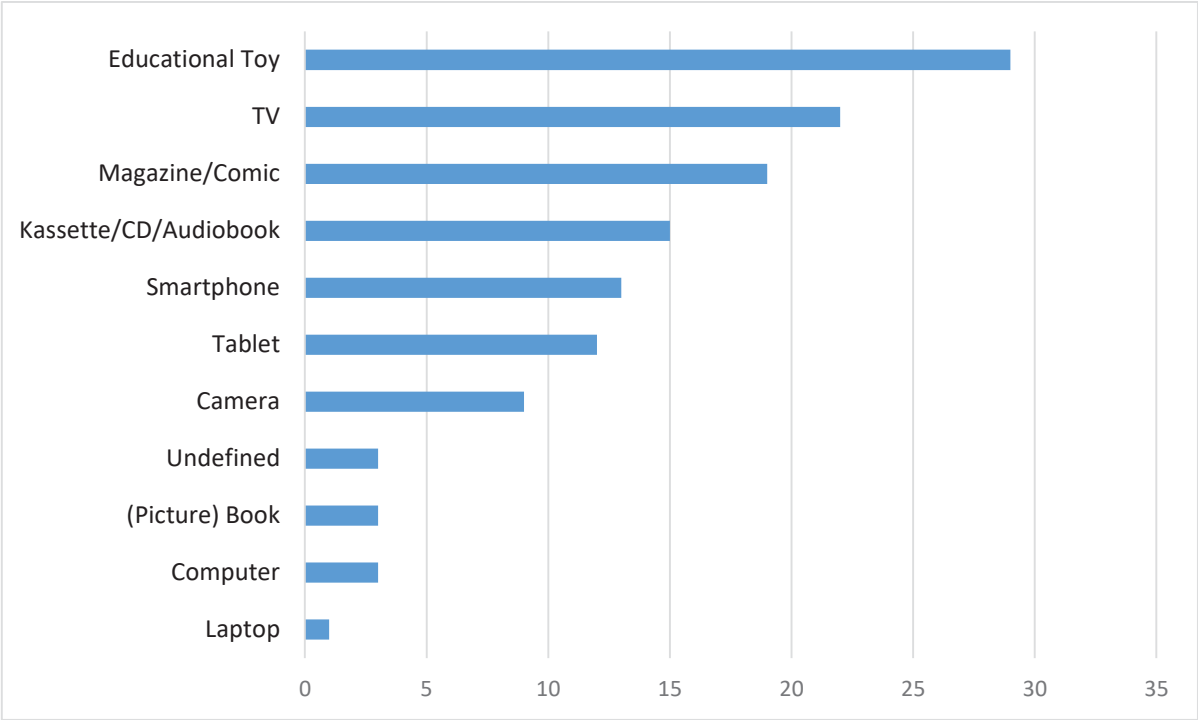
Figure 24: Children's favourite media (N=129).

A total of 43 parent questionnaires contain full details of the children's three most used media. Overall, books, audio content (CD, cassette or audio book) and television were the most frequently mentioned, followed by the tablet. According to the parents, their children spend the most time reading magazines or comics and television, followed closely by books and audio content. Different media activities were described during the interviews: watching television or DVDs together, playing smartphone apps or tablet games, but also looking at photos or listening to music. The internet was especially often described to be used to clarify questions the children might have.

Most parents restrict the time their children are able to watch television, videos or play games. Some restrict media use to a certain time frame; some children are only allowed to watch a certain television show or video. The children themselves often know these rules well. In the children interviews they often told us what and when they were (not) allowed to do, for

example "I am not allowed to play with my mom's iPad." or "I can play with my dad's smartphone sometimes. But only for ten minutes!" or "I watch Barbie in the mornings.". On average, parents reported a media usage of 40 to 45 minutes a day for their children. This may not include time that is not known by the parents, as many children also told us about media use outside of their parent's reach, for example, at a friend's house, with grandparents or at home without asking their parents.

On another note, there were often certain rituals connected to the described media use, such as watching a movie on the weekends or following a certain show together. Children told us about this, too (e.g., "My mom reads to me every day, when I go to sleep."). It was also often reported that media usage is strongly influenced by siblings. In many cases, if there was an older sister or brother, children picked up media behaviour much earlier. The children also reported to play games with their siblings or to use devices of their older sister or brother. Some told us they had their own mobile phone which was an old device discarded by another family member.

In general, media was seen as useful by the parents "if used right". One parent, for example, explained that watching a video can be a good distraction when treating illnesses, so that the child would sit still. Picture books and magazines took a special role as a very positive and educational medium. Reading time is often not restricted and readings is an activity that is "allowed" anytime. Many parents described reading with and to their children as a very important activity.

5.3.3 New and Old Media in Kindergarten

In the kindergartens we visited, traditional media were still the most popular. Almost all facilities had photo cameras, CD players and a children's library. Only one kindergarten teacher reported to have a tablet computer at work. Of course, all facilities owned a personal computer or laptop, but for office work rather than for working with the children. One of the teachers explained that sometimes children would follow her into the office, so that they could print some images or colouring sheets.

Figure 25: Responses to statements a-e from 1 (not true) to 7 (absolutely true).

All, except for one, estimated their own digital media skills to be sufficient. Some had already taken part in or heard of further education seminars that promote media literacy. Only two kindergarten teachers reported that media education was part of their basic education as educators. Among other questions, we asked them to rate from 1 (not true) to 7 (absolutely true) the following statements:

a. To promote child development, traditional media (books, CDs, radio, television) are more suitable than digital media (computer, tablet, Internet).

b. Using the internet is more of a hazard to children than a benefit.

c. Media and information literacy education should start in primary school; as other aspects of child development should be given priority in kindergarten.

d. I feel that I am able to adequately communicate information and media literacy to children.

e. Adequate use of digital media (computer, tablet, Internet) in the everyday life of the kindergarten is not realistic due to various factors (lack of space, financial shortcomings, lack of staff).

The answers to these statements can be seen in Figure 12. Our participants tended to attribute equal value to media old and new or to prefer traditional media like books, audio content and

television (a). Only a few respondents thought that the internet is more hazardous than beneficial for young children (b). Opinions regarding the beginning of media and information literacy education were mixed (c). It should be noted that no participant was entirely confident in their ability to adequately promote media and information literacy to their protégés (d). Many kindergarten teachers agreed with the last statement (e) as they felt there is not enough staff, time, space or money for the adequate use of digital media in kindergarten.

5.3.4 Media and Information Literacy in Kindergarten

During the parent-interviews we thoroughly discussed the role of media education in kindergarten. The most common answer was that children are already sufficiently exposed to new media content and technology at home. Parents often stated that while their children spend their time with watching television or playing digital games at home, time in kindergarten should be spent in a different way. The development of social skills while playing with other children was seen as most important. Often mentioned was also the time spent while playing outside on the playground. Parents were of the opinion that in kindergarten, traditional games and toys should be the main focus. Activities that promote creativity, like singing, crafting and drawing were also mentioned. So, to our question whether the use of new media devices and contents should be increased in kindergarten, 85% (n=45) responded with "no" and 15% (n=8) responded with "yes". Furthermore, we asked who should be responsible of media and information literacy education in early childhood. Here, most parents thought that is was more their own responsibility than that of the kindergarten teachers. In comparison, many kindergarten teachers answered that it was equally their and the parents' responsibility. During the interviews, some parents felt that our society is already full of digital media and therefore in kindergarten it should be secondary. Some parents feared that children in today's society would forget how to play "traditionally" and that using new media too much would isolate them. When we mentioned how media education in kindergarten could also be an instrument for prevention, however, it was regarded very positively.

5.4   Discussion

To assess the current role of digital media in kindergarten and in the family lives of young children, we designed and conducted an extensive survey with children from three to six years, their parents and their kindergarten teachers. After visiting 12 kindergartens in a major city of North Rhine-Westphalia, Germany, we were able to conduct 129 children interviews, supported by a self-developed tablet app. Furthermore, we conducted 14 parent interviews and distributed questionnaires. We collected 11 questionnaires from the kindergartens and 60 questionnaires from the children's parents. In this work, we summarized first results of this survey.

5.4.1 What role do digital technologies and Media and Information Literacy play in Early Childhood?

The interviews with the children clearly show that even the youngest children are in contact with digital technology in form of smartphones, tablets and other devices already.

Although digital media, just like television, generally have a bad reputation when it comes to their influence on children, and even if parents actively try to keep their young ones away from these, children naturally want to do what their families and friends are doing and therefore their interest in digital media is high. There is the common opinion that digital media and its diverse contents do not apply to children of a very young age, as they are not able to read and their motoric skills may not be fully developed. But, our study shows that even our youngest participants (3 years old) were able to productively interact with the app used in the interviews. Of course, this happened under supervision and combined with an active exchange, as it is recommended. Many children had already gained some experience in using apps or watching videos online at home or with friends. Some children even reported to own a tablet or smartphone. The statistics from our survey show that portable touch devices play a much bigger role in childhood than personal computers or laptops.

Here, it should again be clarified that our intent is not to promote digital media use in early childhood, but rather to observe what is already happening. Having observed that digital media is already part of young children's life, inferentially we propose that media and information

literacy education should be as well. Parents often were of the impression that digital media is so widespread in our society already that children should be actively kept away from it in kindergarten. Often there are time constraints around media consumption in early childhood. Media use is seen as something that is just done and there is generally no idea of how it can be actively shaped. It does not seem to be the primary concern of the parents to think about how media use can and should be learned actively, for example for the sake of prevention. If this was mentioned, however, it was received very positively. Children already have a strong opinion of what they want to do, they know their favourite shows, games and characters or themes. Rules and rituals around media consumption are very common, but also behaviour that is not mentioned or known by the parents. Even more so it should be our task to shape children's contact with digital media in a way that is save and has a positive influence on their present and future media behaviour.

5.4.2 Are Kindergartens ready to provide Media and Information Literacy Education?

In the facilities we visited, children spent their day with free play, drawing and reading, playing outside and similar traditional activities, as it is to be expected. Through the kindergarten survey we learned that traditional media was still preferred over new media by the kindergarten teachers. Opinions regarding the beginning of media and information literacy education were mixed and most of our participants did not receive any formal education that would support them in actively promoting media and information literacy skills among their protégés. It is no wonder that most kindergarten teachers agreed that there are not enough resources for the adequate use of digital media in kindergarten at the time of the survey. Of course, media and information literacy education does not equal, for instance, time spent with a tablet. There is a big difference between media use and media education, although many do not seem to differentiate between the two. In our opinion, a save, and productive use of media can be promoted without any equipment. The most important element is the education of staff.

In 2016, the Ministry of Family, Children, Youth, Culture and Sports and the Ministry of Education and Training of North Rhine-Westphalia published education principles for children from 0 to 10 (Ministerium für Familie, Kinder, Jugend, Kultur und Sport des Landes Nordrhein-Westfalen, 2016). These guidelines for elementary and primary pedagogical and teaching staff

also include the chapter "Media" as one of ten teaching areas and are also meant to support kindergarten teachers in promoting media literacy not only among the children, but also among parents. This can be seen as a good start in establishing media and information literacy education in kindergartens, but it does not ensure that staff is willing or ready enough to put these ideas and guidelines into practice.

Furthermore, we learned during the parent-interviews that parents do not wish for more or any media education in kindergarten. Although or especially because digital media is omnipresent in our and our children's everyday lives, some parents are unsure if, especially young children, should be in contact, use or consume digital media contents and tools. While some parents try to keep their children as far away from the new media as possible, there are also families who embrace them and where computers, tablets and consoles are parts of the nursery. In both cases, media and information literacy should be a topic. It has to become part of the dialogue between children, parents, kindergarten teachers, and policy makers for the sake of prevention if not also for facilitation of other educational activities.

5.4.4 Limitations and Outlook

This study was one of the first to explore media use and behavior of young children, their families and their teachers in kindergarten. As of now, there are no existing standards for measuring media information literacy in early childhood, and often media use in early childhood is overseen, because the "users", who are only a few years old, are underestimated. We learned, however, that children seem to intuitively learn to operate touch media even at an early age. Our explorative survey utilized a self-developed tablet application to show the status quo in German kindergartens and families. It has to be mentioned that our results cannot be seen as representative for all German children or kindergarten facilities. With limited time and resources, we could not gather representative sample of North Rhine-Westphalian or German children, especially since a German citizenship was not required to participate. Considering the explorative nature of this work, we rather welcomed any child, parent or kindergarten who was willing to work with us. We should also mention that the majority of families who participated in the study, came from a middle-class background. It is advisable to conduct further studies that will run for a longer period of time, investigate a larger and more representative group of

children and, if possible, look beyond the borders of North Rhine-Westphalia. Knowledge gathered through our study will surely help in designing and conducting further studies in this direction. We can definitively recommend working closely with kindergarten teachers and parents, and especially the children themselves.

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6 Comparing Information Literacy Levels of Canadian and German University Students

6.1 Introduction

Today, modern information and communication technology (ICT) is omnipresent and increasingly affects our daily lives. Due to its wide distribution, many people have constant access to the great stock of information available on the internet and elsewhere. But to be able to really take advantage of information as a resource, one needs information literacy. By investigating different definitions and models of information literacy, Stock and Stock [1] identify two threads: The first focuses on skills for information retrieval. "It starts with the recognition of an information need, proceeds via the search, retrieval and evaluation of information, and leads finally to the application of information deemed positive." The second puts emphasis on skills for knowledge representation. It includes the "creation of information", "representation and storage of information" and issues of information ethics, law and privacy. No matter what definition of information literacy you look at, it becomes obvious that information literacy is a core competence for both social and economic participation in the information age. This becomes especially clear at urban level in so-called informational world cities. These "prototypical cities of the knowledge society" [2] are characterised by their "space of flows (flows of money, power, and information) [that]tend to override space of places" [2]. Compared to traditional industries, especially the creative industries and the knowledge economy take on greater significance in informational cities, which leads to a so-called job polarisation: Routine tasks that used to be done by employees are now executed by computers with increased regularity, leading to the loss of jobs in the middle class. This results not only in "a gap between rich and poor" but also between "educated and uneducated people" [3] – the digital divide. To manage the flows that define informational cities, companies and public authorities, citizens must be able use technologies appropriately to search for, produce and use needed information. Here, information literacy plays a major role and enables people to participate socially and professionally, giving them an advantage at school, at work and in their

everyday lives [4]. It must be said, however, that most people today never had any information literacy education. And although the importance of information literacy is widely recognised on an academic level, there is plenty of research showing "evidence that many students are information illiterate when they enter institutions of higher education." [5] Furthermore, "despite clear evidence that sophisticated information literacy skills are beneficial to academic success, students are generally unsophisticated information seekers in academic contexts." [6]. The purpose of this study is not only to assess the status of information literacy among students, but also to attempt an international comparison. By the means of a multiple-choice questionnaire, we assess the level of information literacy among university students of informational cities in Canada and Germany, allowing a comparison between the two countries for the different competence areas of information literacy. After presenting our results, it is necessary to discuss what can be learned from this approach and whether such a comparison can be beneficial to improve information literacy education or if a comparison is even possible.

Different tools to assess the state of information literacy, especially among students, already exist. The Information Literacy Test (ILT), developed at James Madison University, is one of them [7]. It is based on and covers four of the five aspects presented in the ALA standards [8]. The actual use of information is excluded, as it cannot be covered in a multiple-choice test. Regarding the total score, the student is classified as "below proficient" (< 65%), "proficient" (_65%) or "advanced" (_90%). Smith et al. used the ILT at high schools in Canada and revealed that 80 out of 103 students of the12th grade were classified as "below proficient" [9]. Another method is the Standardized Assessment of Information Literacy Skills (SAILS) [10]. SAILS utilises eight skill sets, based on the ALA standards. Beutelspacher [11] developed another assessment tool, a multiple-choice questionnaire available for the following target groups: "7th grade", "10th grade", "high-school graduates and students", "teachers" and "scientists". It is based on 62 indicators for information literacy, divided into seven spheres of competence:

I.	to identify an information need
II.	to search for and find information
III.	to evaluate information
IV.	to use information
V.	to organise information
VI.	to communicate and publish information
VII.	responsible handling of information

These indicators which represent a "generic list of skills which should be mastered in order to persist in a knowledge society" [11] were collected by evaluating contemporary definitions, models and standards of information literacy. It is important to note that Beutelspacher's questionnaire tests skills in information retrieval, similar to the ILT and SAILS, but also includes skills in knowledge representation. This second thread of information literacy has become more and more important and should not be missing in any assessment tool. It is the main reason this tool was chosen for our study.

6.2 Methods

To test information literacy skills, Beutelspacher's questionnaire version for high-school graduates and students was used. It consists of 41 different multiple-choice questions leading to positive and negative scores. As an example, question 10 of the test is shown below. A complete list of all questions and possible answers can be found in the appendix.

Question 10: If a search engine retrieves too many web pages, what should you do?

Use advanced search.

Only use one search engine.

Only look at the first ten search results.

Use the "help"-function.

Add further search terms.

Delete some search terms.

Checking the answer "I don't know" leads to 0 points. The maximum score is 69 points. Participants are classified as "not information literate" if the total score is below 50% (34.5 points). With a total score of at least 50% they count as a "beginner". The "advanced" level starts at a total score of at least 75% (51.75 points). Our target groups were students attending universities located in informational world cities [2]. We further limited the first round of our survey to two countries: Canada and Germany. In each of those two countries, there are currently 3 cities identified as informational world cities by Mainka [12]: Montreal, Toronto, Vancouver and Berlin, Munich, Frankfurt. There are 14 universities located in those cities. An online survey (English and German) was set up and the link to the questionnaire was distributed among Facebook groups associated with those universities. Literature shows that many students are using Social Networking Sites (SNSs) on a regular basis. Facebook is one of the most popular SNSs [13], especially for students [14, 15]. We identified Facebook groups for this study by searching groups containing the university's name in its group title. Beforehand, the administrators of the groups were asked for permission. The survey link was posted in 128 different Facebook groups. The distribution started in February 2014 and ended in October 2014. Due to the long processing time of the voluntary questionnaire, a low participation rate was expected [16]. A raffle (gift cards) was added to the survey as incentive to raise the participation rate and to finish the questionnaire. To test Beutelspacher's questionnaire in terms of internal consistency, Cronbach's Alpha (a) was calculated [17]. In addition to that, a t-test shows whether differences between the total score of Canadian and German students are significant.

6.3 Results

In total, 892 students participated in the survey. 291 Canadian (109 male; 175 female; 7 preferred not to say; average age: 21.3 years) and 601 German students (203 male; 398female; average age: 23.3 years). 154 of the 291 Canadian students were based in Montreal (52.92%), 74 in Vancouver (25.43%), 63 in Toronto (21.65%). 395 of the German participants were studying in Berlin (65.72%), 151 in Frankfurt (25.12%), 55 in Munich (9.15%). Since Berlin and Montreal offer more universities than the other cities, their strong participation was predictable. Most of the participants were aiming for a bachelor degree or

state examination (Canada: 83.85%; Germany 75.04%).16.15% of the Canadian and 24.96% of the German students were in a master or PhD program at the time of the survey. Over 40 different major subjects were represented. On average, German students scored 48.62 (70.46%) and Canadian students scored44.63 (64.68%) out of 69 points (maximum score). A significant difference between the two groups was verified ($p < 0.001$). 13.06% of the Canadian and 4.83% of the German students were judged to be "not information literate", while the greatest share of both groups (Canada: 65.64%; Germany: 56.24%) reached the "beginner"-level. Only 21.31% of Canadian and 38.94% of German participants were classified as "advanced". Table 1 in the Appendix lists all items as well as the arithmetic mean of point scores for both countries and the significance value (p) of the t-test. A significant difference ($p < 0.05$) between the results was found in 25 cases. It should be noted that an equal variance is given in items 2, 9, 10, 13, 15, 17, 19, 23, 26, 30, 33c, 37 and 38 only. All other p-values were calculated with the total score of the students. According to the six spheres of competence tested, it is observed that German participants scored higher in every sphere (Fig. 1).
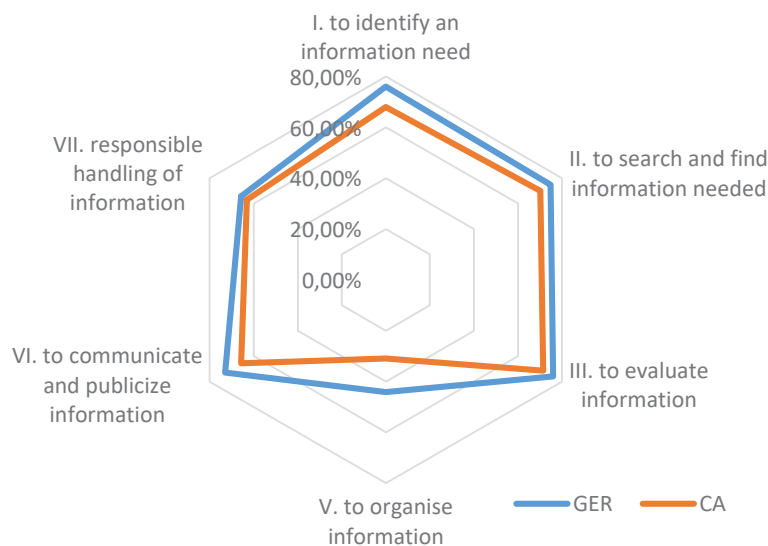
Figure 1. Average results for each sphere of competence (Canada vs. Germany)

Compared to the other spheres, the results of both groups in sphere V ("to organise information") are noticeably low. The distribution of information literacy skill level by gender showed that in both countries, male participants had more members in both the "advanced" and the "not information literate" category. On average, however, female participants scored

slightly better. When comparing students by desired degree, it stands out that "Bachelor of Science" and "Master of Arts" students had the best results, also, no master student from Canada was classified as "not information literate". This improvement cannot be observed for German students. Here, the best results were achieved by "Master of Arts" and "Bachelor of Arts" students. Comparing Canadian and German students who aim for the same degree, significant differences could be found within the groups "Bachelor of Arts" (p =0.001), "Master of Arts" (p =0.001) and "Master of Science" (p = 0.033). An equal variance is given in each of these groups. For all test items Cronbach's Alpha (a) was 0.814, which is an indicator for a "good" internal consistency and a "reasonable goal" [18].

6.4 Discussion

By means of a multiple-choice questionnaire, we are able to take a glimpse at the current status of information literacy among young citizens of informational cities in Canada and Germany. Overall, the results are in conformity with other studies assessing student's information literacy [5, 19], which means that measured information literacy levels were relatively low. The fact that students in a master program achieved noticeably better results than their colleagues aiming for a bachelor degree, indicates that students at least improve their information literacy skills during their academic career. The results of the comparison indicate that there are noticeable differences in the information literacy skills of German and Canadian students. On average, German students obtained a more favourable result in all of the six measured spheres of information literacy competence. For the most part, this proportion can also be seen in the numbers according to city, gender and target degree. It is necessary to investigate why the number of advanced students in Germany is that much higher than in Canada. By taking a closer look at the results of PISA [20], a study measuring, among others, the competences of 15-year-old students on an international scale, Canada's students scored very well when it came to digital skills, while students from Germany showed an average performance. But would a similar study in the field of information literacy show the same results? Furthermore, academic and public libraries in informational cities are supporting schools and universities in promoting information literacy among citizens and students [21] while this is not as common in Germany, where the term "information literacy" is known to few. The question arises, what results a

different method of assessment would have yielded. The use of a questionnaire has the advantage that less time and resources are needed, compared to an interview. Also, no influence by an interviewer's behaviour is possible. Additionally, participants experience written surveys more anonymously [22]. A questionnaire yields objective, reliable and comparable results. Every test person is given the same questions and answer options, which are explicitly right or wrong. Moreover, the results of this survey can be compared with future surveys of the same kind [11]. While a multiple-choice questionnaire has advantages, it is also limiting the assessment of competences, workflows and other aspects. Especially now, that the definition of information literacy is shifting from a catalogue of standards to a framework of "core ideas" [23], it might not be as easy to create questionnaires, which are able to asses this "new" definition of information literacy. In general, it is difficult to measure information literacy skills in a holistic way, since these are higher-order skills much more complex than assessible by a short questionnaire [24]. Since students were not monitored while filling in the questionnaire it is possible that participants were looking for answers with help of a search engine. Most students filled in the survey in the presumed time which leads us to believe that students were usually not using any help. However, the possibility that a student is guessing or picking any answer randomly is still given. Although almost 900 students participated in our survey, it is not possible to draw general conclusions yet. A greater number of students — from different major subjects and faculties, and with different degrees — is needed, to get results that are more representative. Also, an equal distribution of participants from each city or university is needed, to draw a more detailed analysis. Up to now, none of these assessment tools have been used on a national range. Luckily, we may soon be able to see results of the International Computer and Information Literacy Study (ICILS), a computer-based international assessment and comparison of eighth-grade students' computer and information literacy [25]. These results could provide valuable information, for example on when and how to promote information literacy skills among students. Different institutions could learn from each other. If a real difference existed, what could be reasons for those? Furthermore, results could be analysed regarding correlations with programs offered by universities and libraries to promote information literacy skills. Does the availability of such programs lead to better results?

While comparing results from different countries, this is by no means seen as a competition. It is rather an opportunity to learn about differences and to teach each other. But first, to find out more about the origin of the differences in results, further information is needed. For example, personal interviews at the participating universities, not only with students but also with teaching faculty, could help us to gain further insight. We chose Canada and Germany for this study, because we deemed them to be relatively similar. But when comparing different countries, cultural differences, linguistic peculiarities, distinctions in school systems and infrastructure have to be taken into account as well. These and other factors can turn a simple comparison into a challenge. And if this challenge were mastered, we still had to ask ourselves whether our definition of information literacy is the same of our neighbours. And does it have to be?

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Appendix

Table 1. Questionnaire items (1-41), average results (Canada, Germany) and p-value (t-test).

#	Question	Ø CAN	Ø GER	p
1	True or false? The first search result a search engine lists is always the best one. *("True", "False", "I don't know")* 1pt	0.928	0.958	0.077
2	True or false? All search engines give out the same results. *("True", "False", „I don't know")* 1pt	0.928	0.942	0.422
3	When researching a topic that you don't know anything about, what is the best place to start looking? *("In a journal", "In an encyclopaedia or dictionary", „In a library catalogue", „I don't know")* 1pt	0.680	0.760	0.014
4	Which statement is true? *("In an internet research you should check as many web pages as possible", "You should only use a single search engine", „You should compare different websites", „You should only look for information that supports your personal viewpoint", „I don't know")* 2pt	1.478	1.827	< 0.001
5	You have performed a search in a library catalogue and were not able to find any documents. What is the most likely reason for this? *(„The wrong search terms were used", „All documents on this topic are borrowed at the moment", „The system is defective", „I don't know")* 1pt	0.918	0.968	0.004
6	You must write a paper comparing schools in Germany to ones in Switzerland. Which words would you use in your web research? *(„Germany, Switzerland, Europe, Schools", „Europe, Germany, Switzerland", „Schools, Switzerland, Germany", „Schools, Europe", „I don't know")* 1pt	0.986	0.972	0.064
7	*You must discuss a certain topic in a paper. You have already found a book on this topic. Which section of the book will you consult if you wish to find further documents on the same topic? ("Glossary", „Table of contents", „Bibliography", „Index", „I don't know")* 1pt	0.777	0.684	0.003
8	You are looking for information on the social integration of foreigners, but you may not use the word "integration." Which word would you use instead? *(„Migration", „Immigration", „Assimilation", „Foreigner", „I don't know")* 1.5pt	1.015	1.273	< 0.001
9	Which two terms are synonymous? *(„Blue (colour) – „Blues (music)", „Tree – apple tree", „Eggplant – aubergine", „Dead – alive", „I don't know")* 1pt	0.869	0.887	0.451
10	Which query will retrieve more documents? *(„Dog AND cat", „Dog OR cat", „Both queries above will yield the same amount of results", „I don't know")* 1pt	0.601	0.576	0.465
11	You would like to research the following recipe using a search engine: Cookies, either with nuts or with almonds, but definitely without cinnamon. Which of the queries below (including operators) would you use to retrieve the recipe? *(„Cookies AND (nuts OR almonds) NOT cinnamon", „(Nuts OR almonds) (AND cookies NOT cinnamon)", „NOT cinnamon AND cookies (nuts OR almonds)", „Cookies AND almonds AND nuts NOT cinnamon", „I don't know")* 2pt	1.505	1.344	0.012
12	Which words are retrieved when you search for Science* in a scientific search engine or in a library catalogue with truncation? *(„Science", „Scientific", „Sciences", „Scientist", „Science project", „Conscience", „I don't know")* 3pt	1.399	1.474	0.396
13	If you search for "Shores in Germany" using a search engine, which results will you get? *(„All documents containing the word ‚shore'", „All documents containing the word ‚Germany'", „All documents whose full text contains the phrase ‚shores in Germany'", „No documents", „I don't know")* 2pt	1.574	1.544	0.617
14	If a search engine retrieves too many web pages, what should you do? *(„Use advanced search", „Only use one search engine", „Only look at the first ten search results", „Use the „help" function", „Add further search terms", „Delete some search terms", „I don't know")* 3pt	1.395	1.118	< 0.001
15	If your library does not have a certain book, how can you borrow it anyway? *(„Via inter-library loan", „By going to another library", „It's impossible", „I don't know")* 1.5pt	1.246	1.191	0.092
16	Choose a broader term, a narrower term, and a related term (in that order) for the word "tree". *(„Spruce, apple, trunk", „Trunk, plant, flower", „Plant, trunk, spruce", „Spruce, flower, spruce", „Plant, spruce, flower", „I don't know")* 1pt	0.426	0.719	< 0.001
17	*Which pages are in the Deep Web? („Pages that can only be found by one search engine", „Government pages", „Pages in special databases", „All pages that can be found by Google", „I don't know")* 1pt	0.519	0.463	0.115
18	What is a meta search engine? *(„A search engine that searches for other search engines", „A search engine that searches in social networks", „A search engine that searches through data from search engines", „I don't know")* 2pt	1.155	1.481	< 0.001

19	To find the most up to date information, you should check: *„A printed encyclopaedia", „A book", „A newspaper", „The internet", „I don't know")* 2pt	1.543	1.484	0.112
20	Current scientific studies are first published in*: „Books", „Encyclopaedia entries", „Articles in scientific journals", „Conference papers", „I don't know")* 2pt	1.326	1.484	0.001
21	A book's signature in a library is used... *(„to contact the author", „to find the book in the library", „to find the book online", „I don't know")* 1pt	0.619	0.842	< 0.001
22	Which books are placed side by side in a library? *(„Books by the same publisher", „Books with similar content", „Books of the same size", „Books published in the same year", „I don't know")* 1pt	0.890	0.958	0.001
23	How can you tell whether a Wikipedia article is high quality? *("I check whether the article has bibliographical references", "I check the comments on the article's discussion pages", "I check whether the article has a lot of pictures", "I check how long the article is", "I don't know")* 2pt	1.251	1.448	< 0.001
24	If you want to use a database, which is the best way to find out what journals it contains? *("To perform a search and look at the results", "You don't need to know this, because all databases cover all journals", "To look on the 'help' page or in the user manual", "I don't know")* 1pt	0.567	0.612	0.190
25	You are looking for information about the effects of air pollution on human health. Which of the listed sources is likely to be the most objective? *("Automobile manufacturers", "Medical research institute", "Environment organization", "Energy supplier", "I don't know")* 2pt	1.498	1.787	< 0.001
26	A summary of a scientific article is found: *("In the abstract", "In the bibliography", "In the introduction", "I don't know")* 1pt	0.835	0.839	0.893
27	Which tags (keywords) would you use for the following image of the Brooklyn Bridge if you wanted to upload it to a photo sharing service for other users to find? *("Bridge", "Brooklyn", "Water", "Brooklyn Bridge", "My city", "East River", "House", "New York", "Photo", "Suspension bridge", "Day", "World")* 3pt	1.978	1.715	< 0.001
28	When quoting a short sentence by another author in a homework paper, how should you label this sentence? *("Via quotation marks """, "Via square brackets [ ]", "Via round brackets ( )", "The sentence doesn't have to be labelled", "I don't know")* 1pt	0.921	0.960	0.028
29	When must you identify another author's text in your own work? *("When using an entire sentence word by word", "When using an entire paragraph word by word", "When reproducing a paragraph in your own words", "When translating a sentence from another language", "I don't know")* 4pt	3.021	3.158	0.101
30	Why is there a need for citations? *("To prove your own statements", "To help you out when you can't think of anything", "To not pass off other people's ideas as your own", "I don't know")* 2pt	1.237	1.629	< 0.001
31	Which facts must you include when using a quote from a book? *("Author's last name", "Author's year of birth", "Author's place of birth", "Date of publication", "ISBN", "Title", "Total number of pages", "Illustrator's last name", "Name of publisher", "Publisher's location", "I don't know")* 5pt	3.244	4.258	< 0.001
32	The following is what type of publication? Knautz, K. (2012). Emotions felt and depicted. Consequences for multimedia retrieval. In D. R. Neal (Ed.), Indexing and Retrieval of Non-Text Information (pp. 343-375). Berlin, Boston, MA: De Gruyter Saur. *("Chapter in a collection", "Monograph", "Chapter in a specialized journal", "Chapter in conference proceeding", "I don't know")* 1pt	0.247	0.611	< 0.001
33	Take a look at the following bibliographical reference and then answer questions a-c. Stock, W.G. (2011). Informationelle Städte im 21. Jahrhundert. Information - Wissenschaft und Praxis, 62(2), 71-94.			
33 a	What is the title of the journal? *("Stock, W.G.", "Informationelle Städte im 21. Jahrhundert", "Information – Wissenschaft und Praxis", "I don't know")* 1pt	0.536	0.639	0.004
33 b	How many pages is the article? *("60 pages", "62 pages", "24 pages", "11 pages", "2 pages", "I don't know")* 1pt	0.643	0.755	0.001
33 c	What is the volume of the above-mentioned journal? *("2", "62", "2011", "71-94", "I don't know")* 1pt	0.478	0.463	0.672
34	How do you sort your search results when looking for articles that have attracted the most attention in the scientific community? *("By citation frequency", "By author", "By date of publication", "By the length of the articles", "I don't know")* 1pt	0.770	0.822	0.075
35	What does it mean when an article has passed peer review? *("The article has been checked and corrected by friends and colleagues of the author", "The article has been checked by experts and changes have been suggested", "The article has been edited by the publisher", "I don't know")* 1pt	0.749	0.469	< 0.001
36	Which of these terms describes a knowledge organization system? *("Open Access", "World Wide Web", "Classification", "Bibliography", "I don't know")* 1pt	0.436	0.517	0.023
37	Which of these programs are reference management systems? *("Citavi", "Mendeley", "Facebook", "Wikipedia", "Bibsonomy", "Twitter", "Microsoft PowerPoint", "Endnote", "I don't know")* 2pt	0.366	0.730	< 0.001

38	What is meant by online netiquette? *("A set of rules for communicating with people online", "This way I allow the site's owner to use my private information", "A seal of quality for secure web pages", "I don't know")* 1pt	0.674	0.647	0.439
39	What does it mean when a piece of information (e.g. an image) is labelled "Public Domain"? *("The author is unknown", "It is forbidden to copy it", "You're allowed to copy it as often as you like", "You can only copy it for private usage", "I don't know")* 1pt	0.753	0.724	0.357
40	What does it mean when the following symbol is attached to an image on the Internet? *("The image may be used without any restrictions", "The image may not be used for commercial purposes", "The image may not be edited", "The image may not be passed on", "If the image is used, the original author's name must be stated", "The image must be passed on under the same conditions", "I don't know").* 3pt	0.828	0.945	0.074
41	Do you think that web pages often appear to be adjusted to your own individual profile (e.g. ads that precisely fit your interests)? *("Yes, I think so", "No, I don't think so", "I don't know")* 1pt	0.821	0.943	< 0.001

7 Educators of the Information Society: Information Literacy Instruction in Public and Academic Libraries of Canada

7.1 Introduction

Information Literacy: Key Competence of the Information Society

The most significant aspect of the information society is not only the availability and rapid development of information and communications technologies (ICTs), but the people utilizing those and the movement of information between them. It is the information literate individual who creates and uses information to convey knowledge, and thus stimulates innovation (Stock, 2000; Webster, 2006). In a modern society, knowledge is essential for progress and economic success (Mainka, 2011). Organisational knowledge cannot exist without the knowledge of individuals who form ideas, who "share and develop knowledge" (Nonaka, 1994, p. 15). Creation of knowledge in turn is only possible through the information flow between individuals, communities and organisations. Since information influences every economic sector, and affects every individual in all stages of life (Stock, 2000), there is no doubt that information literacy is one of the key competencies of the information society. Information literacy is not only defined as an essential skill set for every individual living in the information society, but also as a tool of empowerment and a catalyst for equality (IFLA, 2014). But how does one acquire information literacy skills?

Librarians: Educators of the Information Society

In the past "the practice of teaching information literacy skills has been largely restricted to the context of higher education" (Campbell, 2008, p. 18). However, in the information society, instruction may not be restricted to individuals who have the privilege of higher education – it is to be made available for all individuals equally. The nature and purpose of the modern library meets these requirements precisely:

Library and information services are key actors in providing unhindered access to essential resources for economic and cultural advance. In doing so, they contribute effectively to the development and maintenance of intellectual freedom, safeguarding democratic values and universal civil rights. They encourage social inclusion, by striving to serve all those in their user communities regardless of age, gender, economic or employment status, literacy or technical skills, cultural or ethnic origin, religious or political beliefs, sexual orientation, and physical or mental ability. (IFLA, 2003, p. 2)

Today, both public and academic libraries all over the world contribute to promoting information literacy among the people. Librarians take the role of the "experienced, focused guides" supporting individuals at becoming "a more intelligent consumer in this supermarket of information" (Boyer, 1998, p. 27), acting as educators of the information society. This has not always been an objective of the library: "Librarians have a long tradition of offering bibliographic instruction but more recently have expanded their instructional repertoire to include more generalizable information literacy skills" (Julien & Pecoskie, 2009, p. 149). As the information and knowledge-based economy evolves and technology advances, librarians need to address the changes laid out before them, reposition themselves as well as their institutions (Foo et al., 2002), and transition from "transmitter[s] of knowledge to (...) facilitator[s] of learning" (Woodard, 2003, p. 190). It is now our goal to investigate how far and well this transition has progressed, both in public and academic facilities.

Research in Informational Cities

While literature on information literacy instruction is not, actual research on its implementation in libraries is scarce:

The literature relating to information literacy instruction is vast, demonstrating the considerable attention devoted to this area of service, but generalizable empirical research into the practices of instruction in libraries, and the challenges associated with those practices, is very limited. (Julien & Genuis, 2011, p. 103)

Following the lead of Heidi Julien and her colleagues (Julien, 2000; Julien & Boon, 2002; Julien & Boon, 2004; Julien & Breu, 2005; Julien & Hoffman, 2008; Julien & Pecoskie, 2009; Julien

& Genuis, 2011; Julien et al., 2013), we aim to investigate information literacy instruction in public and academic libraries of Canada.

Within the scope of the project "Informational World Cities" of Heinrich-Heine University in Düsseldorf, Germany, 31 informational world cities have been identified and investigated. Among other research, Mainka et al. (2013) evaluated core services of public libraries in all of the 31 informational world cities, resulting in a cumulative ranking. Of particular note are the very high rankings of Canada's public libraries. In Canada, there are three cities currently being acknowledged as informational world cities by Mainka et al.: Montreal, Toronto and Vancouver. As "prototypical cities of the knowledge society" (Stock, 2011, p. 980) informational cities pose a particularly interesting object of investigation for our research.

Our approach is to interview librarians personally, to gain insight into their current practices and challenges of information literacy instruction. The general questions of this survey are: What do librarians of Canadian informational cities expect regarding information literacy instruction? Are their expectations being fulfilled at their own institutions? And if not, what are the reasons? Our priority is to get an overview of the instructional trends in libraries of Canadian informational cities and to identify the greatest deficits and problems of instructional education. Another motivation of the survey, apart from assessing the current developments and tendencies of information literacy instruction, is the investigation of similarities and differences among public and academic institutions, particularly concerning the assessment of the specific competence areas of information literacy.

In the following, the methods of this survey and the structure of the used survey instrument will be described. After a short presentation of the quantitative results, findings will be discussed and compared to results of similar work. Finally, we will summarise the most important points.

7.2   Methods

The Interviews

We approached academic and public libraries in Montreal, Toronto and Vancouver to find participants for our study focused on information literacy instruction and programs in libraries

of informational cities of Canada. We directed our enquiry to individuals in charge of library programs and information literacy instruction at those libraries to ensure that interviewees had the background and insight necessary for our research. The facilities participating in our survey ranged from small institutions – for instance Westmount Public Library with a total of 8122 members (Westmount Public Library, 2012) – to "the largest public library system in North America, Toronto Public Library, serving a population of 2.3 million" (Toronto Public Library, 2014). We visited both academic (n=7) and public (n=6) facilities personally, to work through our questionnaire and initiate discussions on their current situation and work regarding information literacy instruction. Due to the fact that often more than one person in charge of instruction was interested in participating in our work, not only one-on-one interviews – as originally intended – but also group interviews were made possible. We welcomed this opportunity as it would allow a wider perspective on the topics and generate more input for the qualitative evaluation. The interviews were conducted in March and April 2014. The interview procedure was mainly defined by the questionnaire we created beforehand. After a short introduction and explanation of the tool by the interviewer, topics would be introduced by the questionnaire items. After every question, an explanation by the interviewee or even a short discussion of their opinions and experiences would follow to eventually decide on a rating from 1 to 7. This way, quantitative data as well as qualitative information was generated. After the questionnaire there was time for an open discussion or further questions. Questions occurring before or during the interview were clarified directly.

The Questionnaire

The questionnaire was added to the interviews to generate quantitative data, enabling a data-based comparison between academic and public libraries. Its structure was derived from the SERVQUAL diagnostic tool. Introduced in 1988 by Parasuraman, Zeithaml and Berry, SERVQUAL is a model and tool originally intended "for assessing customer perceptions of service quality in service and retailing organizations" (Parasuraman et al., 1988, p. 12). Later, in 1996, Nitecki described the SERVQUAL "as an instrument to measure service quality and what customers value as important" (p. 181). He suggests transferring the model "developed in the business world" to "the academic library setting" (p.188). Here, it can be applied to

measure the perceived service quality of academic library services (Nitecki, 1996). We want to go a step further and apply the SERVQUAL to library work in a different way. We applied the SERVQUAL tool to the library setting and used a modified version as an instrument to measure the quality of information literacy instruction based on what librarians themselves value as important. The objective of this survey was a juxtaposition of the participant's "Expectation" and "Perception" (here: "Experience", see Figure 1), as presented in the concept of Parasuraman et al. – but the system of 22 items spread over the five dimensions "Tangibles", "Reliability", "Responsiveness", "Assurance" and "Empathy" (Parasuraman et al., 1988, p. 23) did not seem applicable to our research. Instead we introduced a questionnaire with 18 pairs of questions specifically composed for our interest. Items are numbered from 1 to 18 and always consist of two questions – one for the "Expectation" column (left side) and one for the "Experience" column (right side) of the questionnaire. All questions are formulated in the same manner (see Figure 1): "How important do you consider _____, in general?" and "What value does _____ have at your library?" are the templates for all items. All items were to be rated by a seven-point Likert-type scale (Likert, 1932) ranging from "Not at all important" (1) to "Extremely important" (7) (Vagias, 2006). Participants were allowed to rate their own expectation and experience, according to these importance levels, by marking the corresponding number below each question.

EXPECTATION(Vision)	EXPERIENCE (Condition)

3 How important do you consider courses that are specifically offered for beginners, in general?

3 What value do courses that are specifically offered for beginners, have at your library?

1	2	3	4	5	6	7

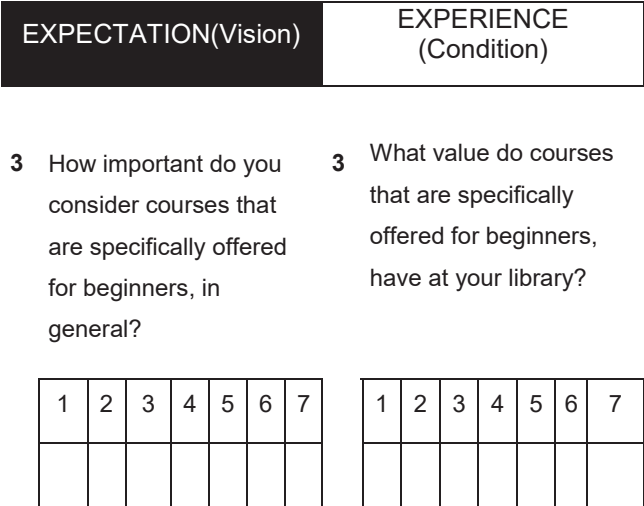| 1	2	3	4	5	6	7

Figure 1: Questionnaire Setup

The questionnaire comprises of two parts: Part I (items 1-11) consists of questions regarding information literacy instruction, in Part II (items 12-18) the seven competence areas of information literacy are being thematised directly (see Table 1).

The first part of the questionnaire includes 11 items, focusing on seven different topics connected to library instruction. More precisely, it covers the following topics: qualification and continuing training of library staff (item 1), assessment of instruction outcomes (item 2), focus of instruction (i.e. beginners or advanced learners, items 3 and 4), contents of instruction (i.e. databases, information technology, online safety, items 9-11), importance of technical-spatial infrastructure (item 5) and methods of instruction for information literacy (items 6-8).

Item 1 was inspired by the principle of life-long learning. This principle applies to library staff as well as to everyone else living in the information society. It includes "regular and continuing education" (Woolls, 1991, p. 109). The rapid development of new information technologies and media as well as the changing expectations require a large range of competencies and a continuing education of librarians (Kaegbein, 1989). With the help of item 2, assessment of instruction outcomes is being discussed. This has become more and more important as libraries "are increasingly called upon to demonstrate student learning outcomes and the tangible benefits of library educational programs" (Schilling & Applegate, 2012, p. 258). Public libraries are experiencing the pressure to "prove and improve institutional effectiveness as part of an

Pt	No	Topic
Part I: Information Literacy Instruction	1	Qualification and continuing training of library staff.
	2	Assessment of instruction outcomes.
	3	Focus of instruction: Beginners
	4	Focus of instruction: Advanced Learners
	5	Importance of technical-spatial infrastructure.
	6	Instruction method: Face-to-face courses
	7	Instruction method: eLearning
	8	Instruction method: Problem-oriented support
	9	Contents of instruction: Specialised databases
	10	Contents of instruction: Online safety
	11	Contents of instruction: Information technology
Part II: Information Literacy Skills	12	Realising and phrasing an information demand.
	13	Locating and exploiting information that is needed.
	14	Critically evaluating information and its sources.
	15	Using information efficiently and constructively.
	16	Managing and organising information.
	17	Generating, quoting and presenting information.
	18	Considering the rights and obligations regarding the use and distribution of information.

Table 1: Questionnaire Content and Segmentation

increased demand for accountability" as well as academic libraries (Hernon & Dugan, 2002, p. 56). Classes and workshops at libraries often are classified into proficiency-levels. An example is the distribution into "Beginner", "Intermediate" and "Advanced" groups (e.g. language courses, Hong-Nam & Leavell, 2006). Academic libraries commonly divide into courses for beginners, and advanced courses (e.g. Hahn et al., 2012), which is thematised in items 3 and 4. Courses for beginners cover basics as for example operating a personal computer while courses for advanced learners require prior knowledge in the respective field. Items 9 to 11 focus on instruction content. There is a large number of different courses available when it comes to instruction in libraries. We chose three topics that we were particularly interested in – especially but not exclusively because we expected responses from academic and public libraries to differ. We wanted to consult librarians on the instruction regarding specialised databases, information technology and online safety. Another piece in the puzzle of information literacy instruction is the technical-spatial infrastructure of the library (item 5). This includes the provision of working spaces as well as access to different technologies and the internet. Libraries are multi-functional social institutions – supplying learning, working and communication spaces (Eigenbrodt, 2011). We believe, that – even in the digital age – the physical library offers a very important added value for the information society. In the questionnaire there are three items contributed to assessing the importance of different methods of information literacy instructions in a library: courses, e-learning and assistance at the point of need (Hütte et al., 2009).

The second part of the questionnaire is based on Beutelspacher's (2014) seven competence areas of information literacy. Beutelspacher evaluated contemporary definitions, models and standards of information literacy to develop a generic list of 62 indicators. The aim of this work was to define a set of abilities individuals should have to assert themselves in the knowledge society. The information literacy indicators are partitioned into seven competence areas which we furthermore centralised into seven ability descriptions:

1. realising and phrasing an information demand;
2. locating and exploiting information that is needed;
3. critically evaluating information and its sources;
4. using information efficiently and constructively;
5. managing and organising information;
6. generating, quoting and presenting information;
7. considering the rights and obligations regarding the use and distribution of information.

Question pairs 12-18 of the questionnaire match these descriptions. This way, librarians are to rate the importance and also their experience of instructing each information literacy competence area (1-7) separately. This part was designed to determine whether library instruction in public and academic libraries of Canada emphasises different aspects of information literacy and if certain competences are deemed more important than others in general.

7.3   Results

Based on the difference between *Expectation score* (E_1) and *Experience score* (E_2), the *gap* score (G) could be calculated ($G = E_2 - E_1$). The gap score G describes the discrepancy between expectation and experience of the current situation as it is perceived by librarians. We use the
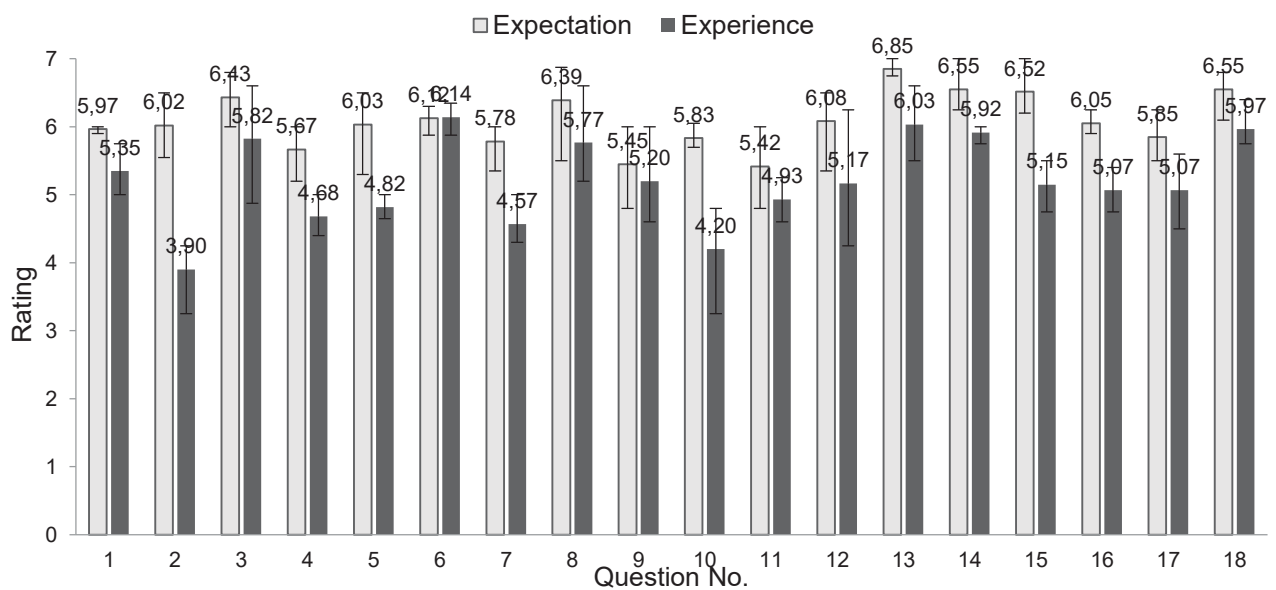
Figure 2: Overall Expectation and Experience Results

gap scores to identify deficits in library instruction: High expectation scores reflect high expectations of the participants, while a corresponding low experience score will result in an equally high gap score, indicating deficits in that respective area. For group interviews the results of the standardised questions and answers of the questionnaire were combined to one rating for each library. Figure 2 shows the overall expectation and experience scores for all surveyed libraries in Canada. Expectation scores ranged from 5.42 (question 11) to 6.85 (question 13) with an average expectation score of 6.09. In comparison, experience scores ranged from 3.9 (question 2) to 6.14 (question 6) with an average experience score of 5.21, resulting in an average difference of 0.88 (absolute value of the average gap score). The absolute deviation of ratings per item is shown in Figure 2 as well. It ranges from 0.1 to 1.38 for expectation values and from 0.25 to 2.0 for experience values on the municipal level. The overall gap scores for all surveyed libraries are shown in Figure 3. Gap scores ranged from 0.02 (question 6) to -2.12 (question 2) with an average gap score of -0.88. The top three deficits recorded are the assessment of instruction outcomes as examined by question 2, online safety awareness (G_{10} = -1.63; question 10) and promotion of the ability to use information efficiently
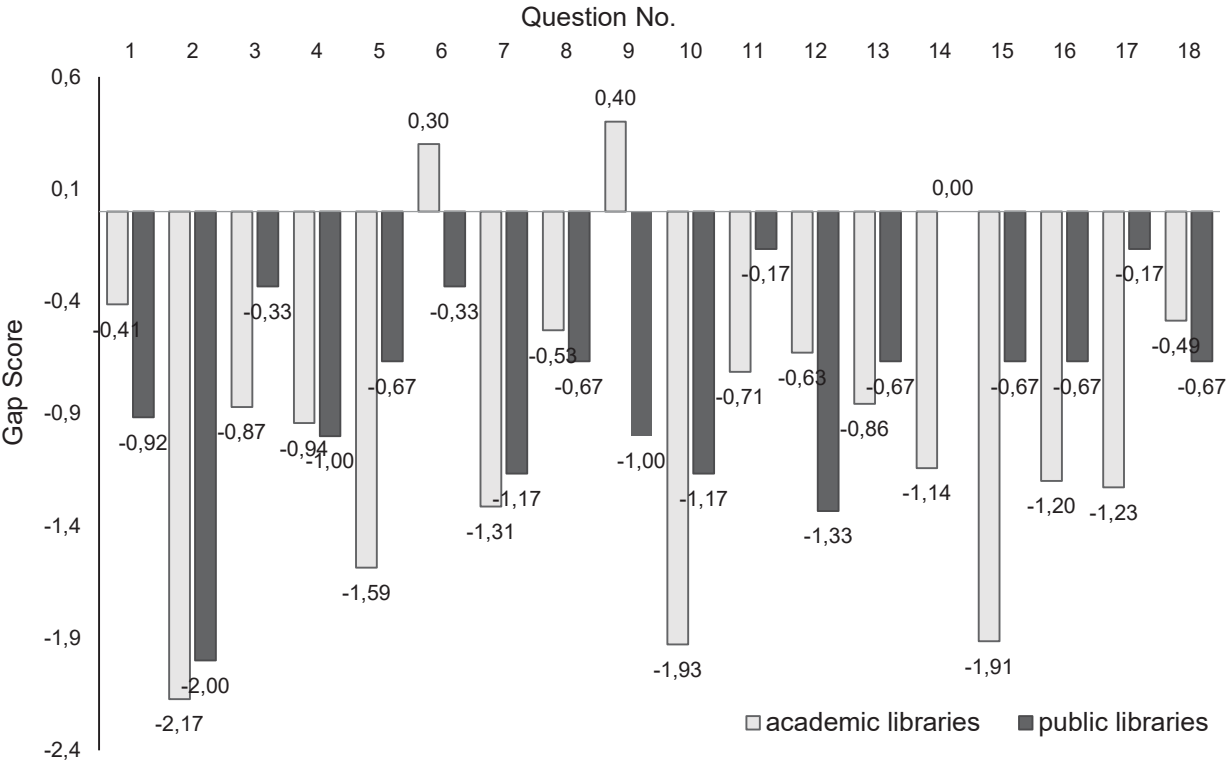
Figure3: Gap Scores for Public and Academic Libraries

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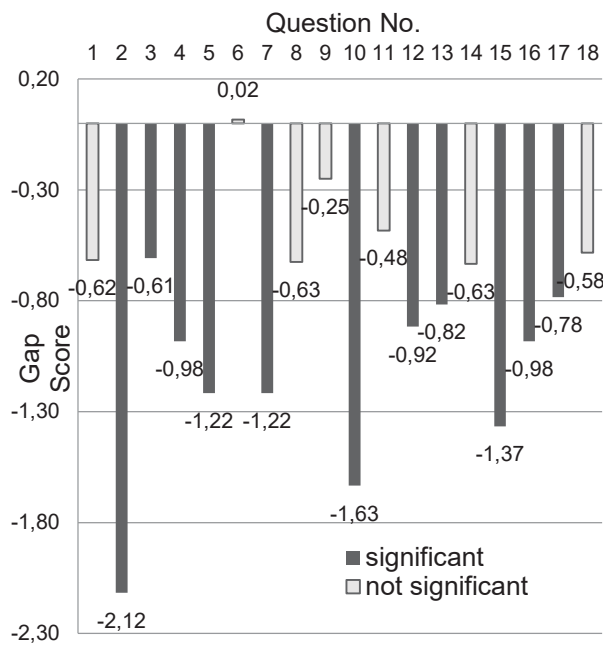
Figure4: Overall Gap Scores for Canada

and constructively (G_{15} = -1.37; question 15). Significance of gap scores could be verified in 11 of 18 cases – but not for questions 1, 6, 8, 9, 11, 14 and 18 (see Figure 3). We divided the collected data set into two parts. Subset S_A consisting of data from academic libraries and subset S_P composed of the data collected from public libraries. A difference between the gap scores of the two subsets S_A and S_P became noticeable (see Figure 4). Significance (t-test) for this difference, however, was exclusively verified for the p-value of question 9 (P_9 = 0.006). Marginal significance could be verified for items 14 and 17 (P_{14} = 0.063; P_{17} = 0.078). The top three highest gap scores for academic libraries were calculated for question 2 (S_A; G_2 = -2.17), question 10 (S_A; G_{10}= -1.93) and question 15 (S_A;G_{15} = -1.91). The top two deficits regarding public libraries were recorded for question 2 (S_P;G_2 = -2.0) and question 12 (S_P;G_2 = -1.33). Questions 10 and 13 share the same gap score ($G_{10;13}$ = -1.17) which is the third highest for all public libraries surveyed. The average gap score for academic libraries is -0.96, while the average gap score for public libraries amounts to -0.75. Taking a closer look at Part II of the questionnaire (see Figure 5), expectation scores for subset S_A range from 6.57 to 7 whereas the score for subset S_P range from 5.0 to 6.67. In this part of the questionnaire, the average expectation score for S_A is 6.81 and the average expectation score for S_P is 5.81, resulting in a rating difference of 1.03 between average expectation scores of academic and public libraries, for an evaluation limited to the items concerning information literacy competence areas. In this field, question 13 (S_A;E_{13} = 7; S_A;E_{13} = 6.67) reached the highest expectation score for both subsets, followed by question 14 (S_A;E_{14} = 7) for academic libraries and question 18 (S_P;E_{18} = 6.34) for public libraries.
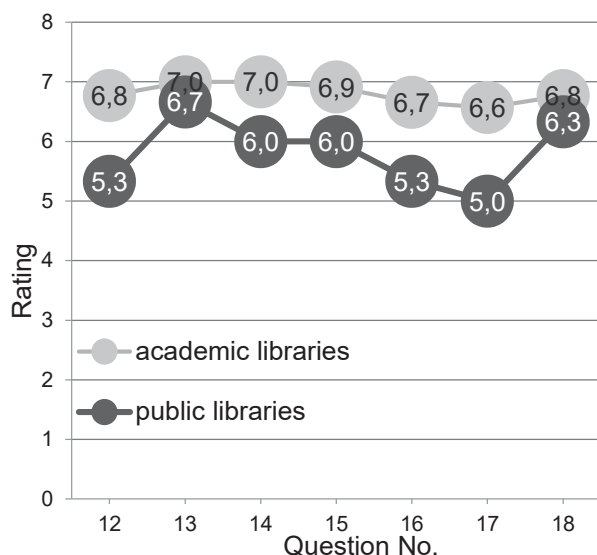
Figure5: Importance of Information Literacy Competence Areas

7.4 Discussion

Findings

The results of this study indicate that the majority of librarians surveyed have high expectations of information literacy instruction and the library services which were discussed throughout this survey. Average expectation scores for all topics covered in the questionnaire were higher than 5, meaning they were considered above "moderately important". Furthermore, eleven out of 18 items were considered to be "very important" or more. Expectations were not always fulfilled, resulting in the origination of gaps. Negative gap scores, indicating deficits ranging from moderate to large, were calculated in units where significance could be verified (see Figure 3). Out of these units, ten are to be rated as moderate deficits (Q3 - Q5, Q7, Q10, Q12, Q13, Q15 - Q17) and one as a large deficit (Q2). Therefore, we can assume that library instruction of the institutions surveyed, in its current state, still leaves room for improvement.

According to our results, librarians were concerned about the assessment of instruction outcomes the most. Although the value of information gained through assessing learning outcomes is being understood, most libraries were still lacking the necessary methods or resources to implement this procedure. Research findings of other parties confirm this concern. Julien and Boon (2002, p. 145) found that "little evaluation of instructional outcomes is apparent" in Canadian academic libraries. In their study, librarians remarked having the impression that instruction evaluation was ineffective or not useful enough. In a later study, they noted that "evaluation or quantitative measures of institutionally significant outcomes of information literacy instruction" were not available at any institution they visited (Julien & Boon, 2004). Hovde (2000, p. 4) reasons that, „unlike education or psychology, the library profession lacks standardized test instruments and the associated body of accrued statistical

data for comparative analysis." She further explains that it is difficult to create these test instruments, due to the fast-paced changes library work is remarkably influenced by:

> Library instruction is also subject to a more accelerated evolution of purpose and design than equivalent instruction in the standard academic disciplines. Where change is speedy and reactive (responding, for example, to the acquisition of new computer platforms or products), it is more difficult to build in evaluation measures (...). (Hovde, 2000, p. 4)

Not only change but also the „hybrid nature" and the „multi-faceted" content of library instruction (Hovde, 2000, p. 4) make it considerably more difficult for librarians to properly assess instruction outcomes. Apart from the fact that the assessment of instruction outcomes is difficult, it is clearly an important issue that has to be taken care of in the near future:

> A professional approach to instruction, as to any activity, requires that the allocation of resources to that activity is justified by evaluating its outcomes. Evaluation may be qualitative and/or quantitative, but must be done in a systematic, reliable, and valid manner, to ensure that intentions are matched by results. Specific advice on evaluation abounds; it is incumbent on instructors to apply it. (Julien & Boon, 2002, p. 148)

Another gap resulted from the question about online safety and security instruction (question 10). While some librarians were planning to implement "e-safety" elements in the future, many participants did not consider this as a task for libraries at all. Indeed, information on e-safety instruction in libraries is scarce. But as new technologies are being developed and "used increasingly in teaching and learning contexts", e-safety becomes more and more important (Becta, 2006a, p. 1). The list of possible risks and dangers is endless: "commercial exploitation", cyber-bullying, "exposure to age-inappropriate material", "exposure to inaccurate or misleading information", "exposure to illegal material", "disclosure of personal information", "physical danger" and "[computer] viruses" are just a few of them (Becta, 2006b, p. 11; Cranmer et al., 2009, p. 28; Chou & Peng, 2011, p. 44). The majority of studies concerning online safety and security are focused on the protection of children and students – but awareness should be raised among members of every target group. Age does not protect from internet scams, spam

mails or accidental copyright violation. We hereby address the need for online safety and security education in libraries of the information society and hope to find more efforts towards this issue in the coming years.

We questioned librarians about their institution's technical-spatial infrastructure. The facilities provided were experienced as not sufficient, resulting in an average gap score of -1.22. Also, a national survey in 2005 found that only a "minority of respondents" from public libraries had "physical space dedicated to [information literacy] training" available in their institutions (Julien & Breu, p. 295). Although the quantity of institutions with this problem seems to have declined (Julien et al., 2013), it is nevertheless still an issue, as indicated by the results of this survey. Not only space for instruction, but also space for recreational activities, social gatherings and other purposes is necessary in a modern library (Weise, 2004). A positive example we had the opportunity to visit was the Bibliothèque Marc-Favreau in Montreal (Bibliothèques Montréal, 2014). The architecturally appealing library building with its modern, light-filled and comfortable spaces as well as multi-medial facilities was designed for library users of all ages and sets a good example for the physical aspects a library of the information society should have.

Library instruction is heading into the direction of e-learning and new technologies as we speak. While librarians were confident in their face-to-face courses and workshops, they experienced a gap regarding e-learning services. Most institutions were still working at establishing online courses and tutorials, videos and other e-learning elements at their library. E-learning was highlighted as an important instructional tool of the future. Academic libraries considered this even more important than public libraries and not without reason: Apart from the "cost-effectiveness" of new media and technologies, Reeves (1998, p. 4) praised their "many other advantages in terms of repeatability, transportability, and increased equity of access." Julien and Genuis (2011, p. 108) also found that "the focus, tools and methods of teaching [in libraries]" are being influenced by "the impact of changing technology". One of their participants said: "The increased use of technology has made the work an ongoing learning experience, challenging and fun. I'm always learning new technology. Wonderful but sometimes exhausting." (p. 108)

Librarians are not only blessed by the advantages of new technologies, but also feel challenged by the high expectations and "the sheer size of the information universe and its complexity" (Julien & Genuis, 2011, p.108). In this context, it is necessary to, again, point out the important aspect of life-long learning for librarians. New technologies are placing "increased demands on teachers' own information literacy skills, their ability to facilitate learning, their capacity to teach critical thinking and inquiry, their determination to empower students to be responsible for their own learning, and their own technological skills" (Goldfarb, 1999, p. 114). The readiness to embrace technological change and to continually learn, will be of great benefit for the modern librarian – for information literacy instruction online and offline, as well as the assistance at the point of need. The latter was still considered to be a reliable and valued service of the library. Some participants preferred to teach information literacy at those occasions, some were convinced that library users just want a quick answer. In the end, many details – be it the decision between teaching the way and just returning the solution or tackling the never-ending task of continuous training – often depend on the individual librarian.

At the beginning of this study, the question aroused as to whether information literacy instruction should focus on beginners or rather on advanced learners. The results of the questionnaire indicate that beginners are deemed to be slightly more important as a target group. Public libraries clearly put more emphasis on their education whereas librarians from academic institutions are still arguing why one of the target groups would be more suitable for information literacy instruction than the other. According to Hanke et al. (2012), programs are not to be restricted to just one target group. Instruction should be equally available for beginners and advanced learners. Against the background of funding issues, budget cuts and the lack of resources, it is understandable that libraries focus on beginner instruction rather than advanced courses – yet we hope that the gap scores for both target groups will decrease with the growing awareness for the importance of information literacy instruction.

Participants from both public and academic libraries understood the value of the information literacy competence areas, although academic librarians deemed them more important than their colleagues from public institutions. The highest gap score for this part of the questionnaire was recorded for the promotion of an efficient and constructive use of

information. Both public and academic librarians put their highest expectations into the promotion of the ability to locate and exploit needed information. Yet, in this second part of the questionnaire, expectation scores of public libraries were always below academic library expectation scores – 1.03 points on average (see Figure 5). Interviewees indicated not considering certain areas of information literacy instruction as a responsibility of the public library. They rather tried to cater to people's every day needs, such as how to use the phone. A survey from 2005 came to the same conclusion: That "[information literacy] training is not a priority in public libraries" (Julien & Breu, 2005, p. 297). Even through academic libraries certainly work on promoting information literacy skills among students and staff, public libraries have to be aware of their responsibility towards the rest of the community:

> People who do not attend postsecondary educational institutions, which typically are mandated to provide at least a minimum level of IL skills training for students, have few places to turn for training in this increasingly important skill set. If citizens are to participate fully in the digital age, in order to efficiently access, effectively evaluate, and appropriately use information to inform their decision making in all aspects of their lives, then these citizens require training in IL skills. (Julien & Hoffman, 2008, p. 39)

In the information society, all citizens require information literacy skills to participate. That is why public libraries have to recognise their duty to teach information literacy skills to those who are not being provided any information literacy instruction or assistance otherwise.

Limitations

The survey instrument was rated to be of acceptable consistency ($\alpha = 0.73$), not all items yielded reliable and, above all, significant results (see Figure 3). But, particularly in the light of this being one first study of many to follow, to get an overview and find tendencies in the direction of library instruction, results were found to be of value in regard of this study's purpose. Also, significance might improve with an increasing number of participants.

Instrument items have been defined in wide terms, to get an outline of the librarian's work and opinions. This holds the advantage that a lot of information could be collected through each item. The disadvantage is, that ratings are clearly not as precise as possible for each item

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respectively. Also, issues we did not include in the questionnaire beforehand could not be traced quantitatively.

In our quantitative and qualitative results, we exclusively rely on the participants' assessment of the optimal and current situation in Canadian libraries. Experience and expectation ratings were not determined by substantive evidence but on the basis of the interviewees' beliefs. There is no valid evidence for these insufficiencies brought to light in the form of gap scores. Yet we place a great degree of trust in the opinion of the information professionals we spoke to and feel confirmed in that due to the occurrence of agreement between most interview participants. As we preferred to conduct interviews personally, we were able to answer questions and clarify any ambiguities directly. However, the validity of results rendered by Likert-type scales can be compromised due to social desirability bias (Rosenthal et al., 1962). Last but not least, the absolute deviations on the institutional level were high. This originates from the fact that public and academic libraries had different priorities regarding information literacy instruction. However, on the municipal level, deviations decrease considerably. We tried to get an overview of the issues concerning library instruction in public and academic libraries, but the topics mentioned here have not been examined in detail yet. The qualitative results of this study, which will soon be published, will support this task and give more insight into the current situation and challenges of information literacy instruction as well as future developments as planned by the library staff. The next steps are to get a deeper insight into the matters relevant to improve the situation, and to find sustainable solutions for the problems stated. We need to further raise awareness of the challenges librarians are confronted with, in their struggle to provide instruction whereas limited resources and further budget cuts complicate the process significantly. The importance and beneficial impact of information literacy instruction for the information society has to be recognised.

7.5   Conclusion

Educating citizens of the information society has become a very important duty of public and academic libraries. By providing access to information and offering instruction, librarians can support us in becoming empowered, successful, information literate individuals. To get a better understanding of the current instruction practices in public and academic libraries we

interviewed librarians in 13 institutions in the three Canadian informational cities: Montreal, Toronto and Vancouver. We investigated different aspects regarding information literacy instruction and the value of the seven information literacy competence areas (Table 1). Inspired by the SERVQUAL diagnostic tool (Parasuraman et al., 1988), a questionnaire consisting of 18 question pairs was used. In the interviews, participants rated their own expectation and experience according to seven importance levels allowing us to calculate a gap score for each topic respectively. Librarians had high expectations for information literacy instruction in their institutions which were not always met. The largest deficits, indicated by high gap scores, were found in the assessment of instruction outcomes, online safety instruction and the promotion of the ability to use information efficiently and constructively (Figure 3). Librarians of public libraries had different priorities regarding instruction than librarians from academic libraries. Especially in regards to the information literacy competence areas where the cumulative expectation scores from public libraries are considerably lower than those of academic libraries (Figure 5). Public libraries play an important role in teaching information literacy skills to those who are not being provided any information literacy instruction otherwise. Therefore the question arises whether they should value the promotion of information literacy competencies as much as their colleagues from academic libraries.

Acknowledgements

Public Libraries

Vancouver: North Vancouver Public Library, West Memorial Public Library; Montreal: Bibliothèque et Archives nationales du Québec, Grande Bibliothèque, Westmount Public Library; Toronto: Public Library Toronto

Academic Libraries

Vancouver: Simon Fraser University Library, University of British Columbia Library; Montreal: Concordia University Library, McGill University Library; Toronto: University of Toronto Libraries, Ryerson University Library, Seneca College Libraries

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8 "We have big plans". Information Literacy Instruction in Academic and Public Libraries in the United States of America

8.1 Introduction and Literature Review

Information literacy pools competencies on searching and finding knowledge as well as on creating and presenting knowledge and plays a vital role in the everyday, in the workplace (Bruce, 1999), and at school and university (Stock and Stock, 2013, p. 78). It is a key competence of the information society (Lloyd, 2003), counteracting the digital divide (Linde and Stock, 2011, p. 93 ff.). Information literacy instruction means the education of people concerning information literacy.

Since around 2000, "information literacy instruction" is a topic of scientific researches. In our small bibliometric survey, we observe a growing number of articles in both, the library-oriented information service LISTA (Figure 1) as well as the multi-disciplinary database Web of Science (Figure 2). And we observe, too, that the research topic "information literacy instruction" is often combined with the topic "library" (see the blue bars in Figures 1 and 2). Obviously, libraries play important roles in information literacy instruction.

Figure 6: Publications on "Information Literacy Instruction" as seen in LISTA ("information literacy instruction" in title; blue: librar* in "all text"; yellow: librar* not in "all text"). N = 214. Source: Library, Information Science & Technology Abstracts / EBSCOhost.

In the literature, most articles treat information literacy instruction in academic libraries, i.e. teaching university students topics of information literacy (e.g., Julien, 2000; Julien and Boon, 2004; Julien, 2005a; Julien, Tan and Merillat, 2013). For Owusu-Ansah (2004), the academic library is even the center of a comprehensive solution of information literacy education. But with academic libraries alone we fail to reach all other citizens besides university students. Here public libraries come into play. The amount of literature on public libraries' information literacy instruction is not too big. We were able to identify a paper by Heidi Julien (2005b) in which she sees a long road ahead for public libraries (especially, in Canada) on their way to comprehensive information literacy instruction. Again, for Canada, there are empirical results on the roles of academic as well as public libraries as "educators of the information society" using the examples of Vancouver, Toronto and Montréal (Henkel, 2015a, Henkel 2015b).

In studying information literacy, we pursue two threads. The first of these deals with practical competences for information retrieval. It starts with the recognition of an information need, proceeds via the search, retrieval and critical evaluation of information, and leads finally to the

application of information deemed positive. Thread 1 has been pursued for more than thirty years. It is rooted in bibliographic and library instruction and is practiced mainly by university libraries. The Association for College and Research Libraries (ACRL) of the American Library Association provides what has become a standard definition: "To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (Presidential Committee on Information Literacy, 1989).
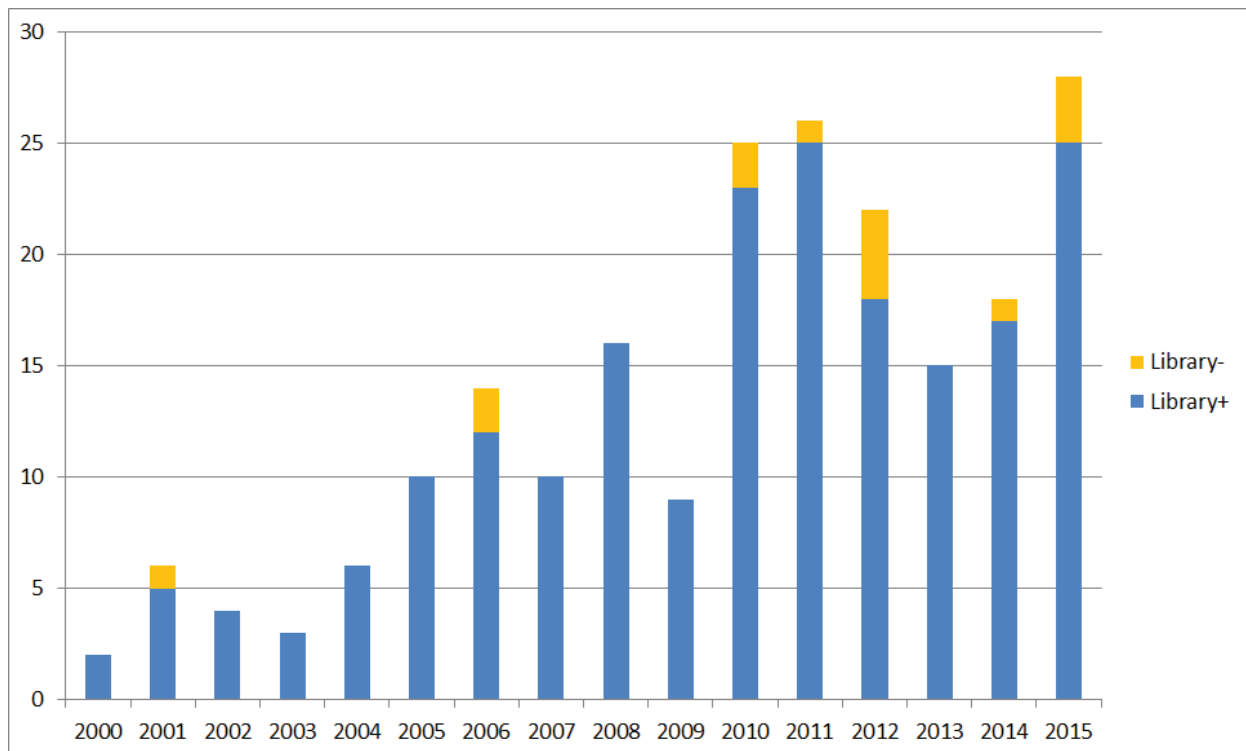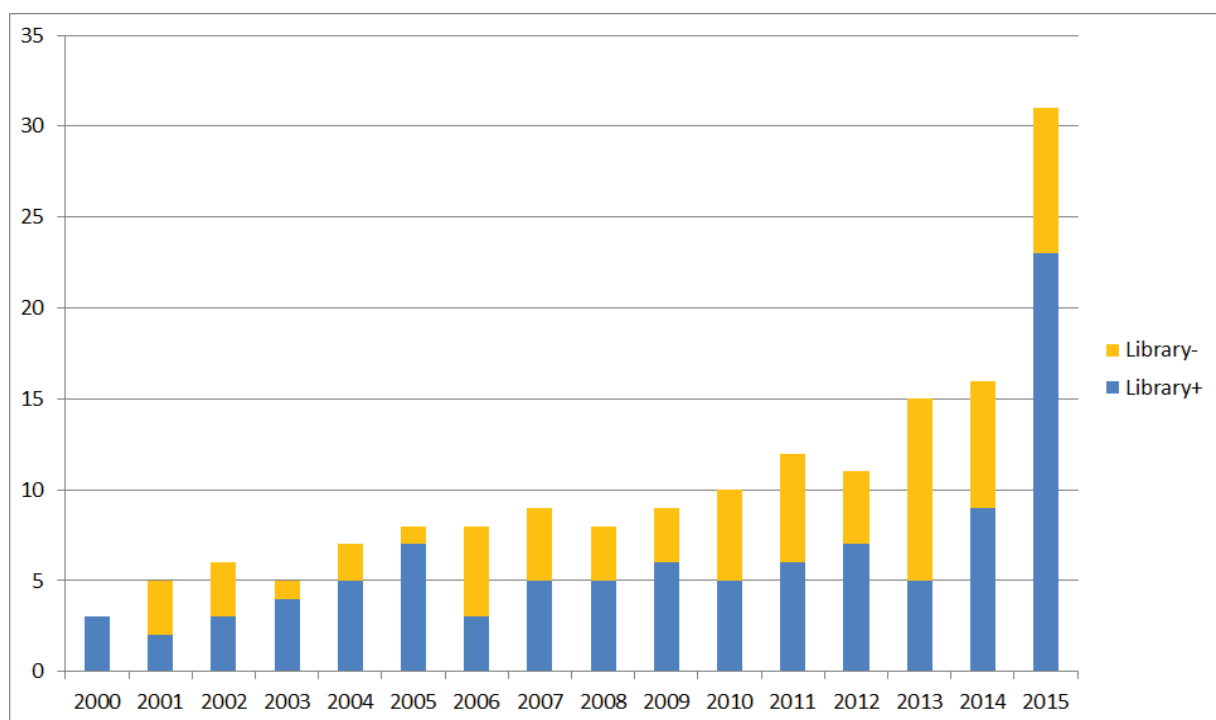

Figure 2: Publications on "Information Literacy Instruction" as seen in Web of Science ("information literacy instruction" in topic; blue: librar* in topic; yellow: librar* not in topic). N = 163. Source: Web of Science Core Collection.

The second thread summarizes practical competences for knowledge representation. Apart from the creation of information, it emphasizes their indexing and storage in digital information services as well as the ability to sufficiently heed any demands for privacy in one's own information and others'. Thread 2 has become increasingly important with the advent of Social Media. Here users, who used to be able only to request information in a passive role, now become producers of information, too. Users create information, such as blog posts, wiki

articles, images, videos, or personal status posts, and storage them digitally via WordPress, Wikipedia, Instagram, YouTube, YouNow, Facebook and – especially faculty and students – Mendeley or ResearchGate. It is, of course, important that these resources be retrievable, and so their creators give them informative titles and index them with relevant tags or hashtags in the context of folksonomies. Additionally, the user is expected to have a keen sense for the level of privacy they are willing to surrender and the risks they will thus incur. For both of these threads, it is of great use to possess basic knowledge of information law and information ethics. Figure 3 exhibits the two lines of threads of information literacy.
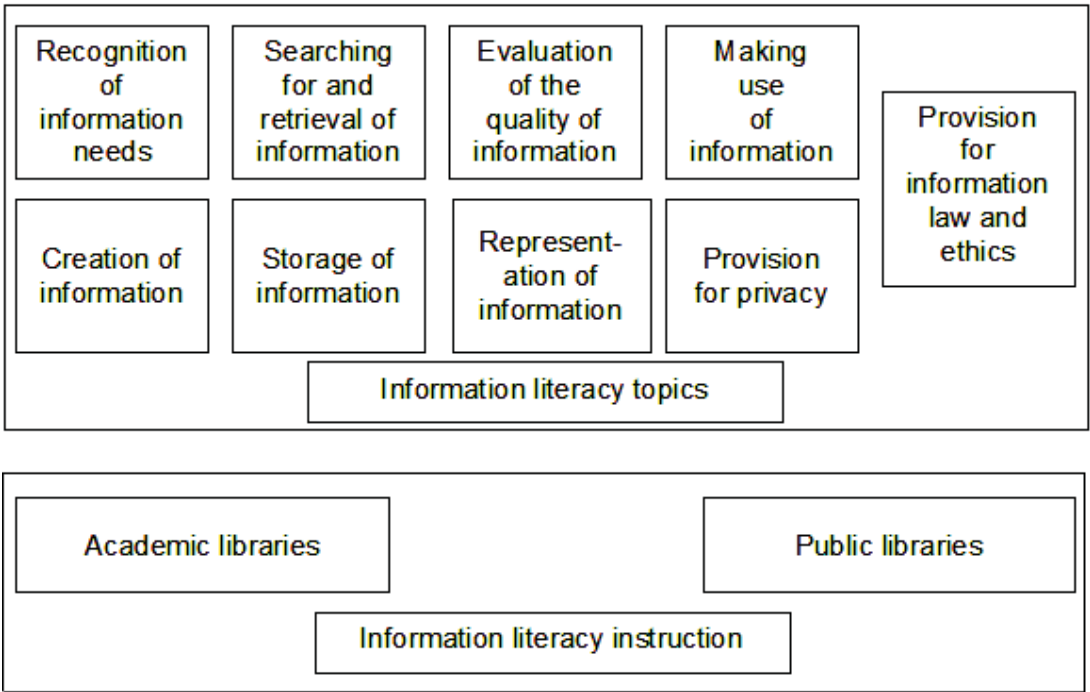
Figure 3: Topics of information literacy and institutions of information literacy instruction.

Based upon the framework of the two thread lines of information literacy, Beutelspacher (2014a) created generic indicators for the different building blocks and questionnaires to assess users' states of information literacy (Beutelspacher, 2014b). The questionnaire has been evaluated by a university class (Beutelspacher, Henkel and Schlögl, 2015). We adopted Beutelspacher's generic indicators for our survey on competence areas (Table 1, items 12 to 18).

Since we are not able to study all libraries in a country, we have to select certain cities and their libraries for our research. In a project on prototypical cities of the knowledge society (Stock, 2011; Stock, 2015) the researchers were able to identify so-called "informational world cities". Such cities meet two criteria: they are world cities and they are called "knowledge city", "creative city", "digital city" or "smart city" in the literature. For the U.S., Mainka et al. (2013) identified Boston, MA, Chicago, IL, Los Angeles, CA, New York, NY, and San Francisco, CA, as informational world cities. So we chose those cities as our case studies. In this article, we focus on information literacy instruction in academic and public libraries in informational world cities in the United States of America.

8.2 Methods

In the third quarter of 2015 we interviewed librarians of public (n=4) and academic (n=6) libraries in Boston, Chicago, Los Angeles, New York and San Francisco. We met with those librarians in charge of library programs and information literacy instruction personally, to work through our questionnaire and initiate discussions on their current situation and work regarding information literacy instruction, but also to get a better impression of the conditions and challenges of the libraries. Due to the fact, that often more than one person in charge of instruction was interested to participate in the interviews, not only one-on-one but also group interviews were made possible. We welcomed this opportunity as it would allow a wider perspective on the topics and generate more input for the qualitative evaluation. Our aim was to survey at least one public and one academic library in each city. With the exception of New York, we were able to visit the main branches of all cities' public libraries. A full listing of all institutions surveyed can be found in the acknowledgements at the end of this article.

The interviews were structured by the questionnaire we created beforehand. An overview of all topics covered by the questionnaire can be found in Table 1. After a short introduction and explanation of the tool by the interviewer, topics would be introduced by the questionnaire items. After every question an explanation by the interviewee(s) or short group discussion on their opinions and experiences would follow to eventually decide on a rating from 1 to 7. Thus, every item was a starting point for qualitative contribution by the librarian(s). After the questionnaire there was time for an open discussion or further questions. Questions occurring

before, during or after the interview could be clarified directly. The interviews were recorded to summarize qualitative contributions later on.

The questionnaire was derived from the SERVQUAL diagnostic tool (Parasuraman et al., 1988) and was already used in an earlier survey of public and academic libraries in the informational world cities of Canada (Montreal, Toronto and Vancouver) (Henkel, 2015a; Henkel, 2015b). It comprises of two parts: Part I (question pairs 1-11) consists of questions regarding information literacy instruction, in Part II (question pairs 12-18) the seven competence areas of information literacy (Beutelspacher, 2014) are being thematised directly (Table 1). Items are numbered from 1 to 18 and always consist of two questions – one for the "Expectation" column (left side) and one for the "Experience" column (right side) of the questionnaire (see Figure 4). Questions are each formulated in the same manner to compare the expectations of the interviewed person (their vision for a perfect library) with the experiences they had in the past and also the current condition in the library they are working in.

Table 1: Content and structure of the questionnaire

PART	NO.	TOPIC
PART I: INFORMATION LITERACY INSTRUCTION	1	Qualification and continuing training of library staff
	2	Assessment of instruction outcomes
	3	Focus of instruction: Beginners
	4	Focus of instruction: Advanced Learners
	5	Importance of technical-spatial infrastructure
	6	Instruction method: Face-to-face courses
	7	Instruction method: eLearning
	8	Instruction method: Problem-oriented support
	9	Contents of instruction: Specialised databases
	10	Contents of instruction: Online safety
	11	Contents of instruction: Information technology
PART II: INFORMATION LITERACY SKILLS	12	Realising and phrasing information demand
	13	Locating and exploiting information that is needed
	14	Critically evaluating information and its sources
	15	Using information efficiently and constructively
	16	Managing and organising information.
	17	Generating, quoting and presenting information.
	18	Considering the rights and obligations regarding the use and distribution of information.

EXPECTATION (Vision)	EXPERIENCE (Condition)
3 For how important do you consider courses that are specifically offered for beginners, in general?	**3** What value do courses, that are specifically offered for beginners, have at your library?

1	2	3	4	5	6	7

1	2	3	4	5	6	7

Figure 4: Example for a questionnaire item.

Items of the questionnaire are to be rated by a seven-point Likert-type scale (Likert, 1932) ranging from "Not at all important" (1) to "Extremely important" (7). The seven levels of importance (Vagias, 2006) are:

1 – Not at all important

2 – Low importance

3 – Slightly important

4 – Neutral

5 – Moderately important

6 – Very important

7 – Extremely important

The distances between two adjacent numbers are considered equal. In line with Likert (1932, p. 42) we are able to calculate average values.

Participants may rate their own expectations and experiences, according to these importance levels, by marking the corresponding number underneath each question. The collected data from closed questions of the questionnaire were analysed quantitatively, the topic discussions and qualitative comments were analysed thematically. For group interviews the results of the standardised questions and answers of the questionnaire were combined to one rating for each library.

Based on the difference between expectation score (E_1) and experience score (E_2), the gap score (G) can be calculated ($G = E_2 - E_1$). The gap score G describes the discrepancy between expectation and experience of the current situation as it is perceived by librarians. We use the gap scores to diagnose perceived deficits in library instruction.

With our methods, quantitative data in form of expectation, experience and gap scores was generated as well as additional qualitative information regarding all topics and information literacy ability areas covered by the research project and beyond. In this article we would like to concentrate on the latter and discuss the current situation in both public and academic libraries as well as future developments and differences between the two groups.

8.3 Results

In the following section, the results of the survey will be presented and discussed. While the focus lies on an evaluation of the qualitative results, the quantitative results will be helpful in evaluating the significance of explained problems and to assess differences between public and academic libraries. The average gap scores for each questionnaire item can be seen in Figure 5. The separated gap scores for public and academic libraries are pictured in Figure 6. A table with all results can be found in the appendix.
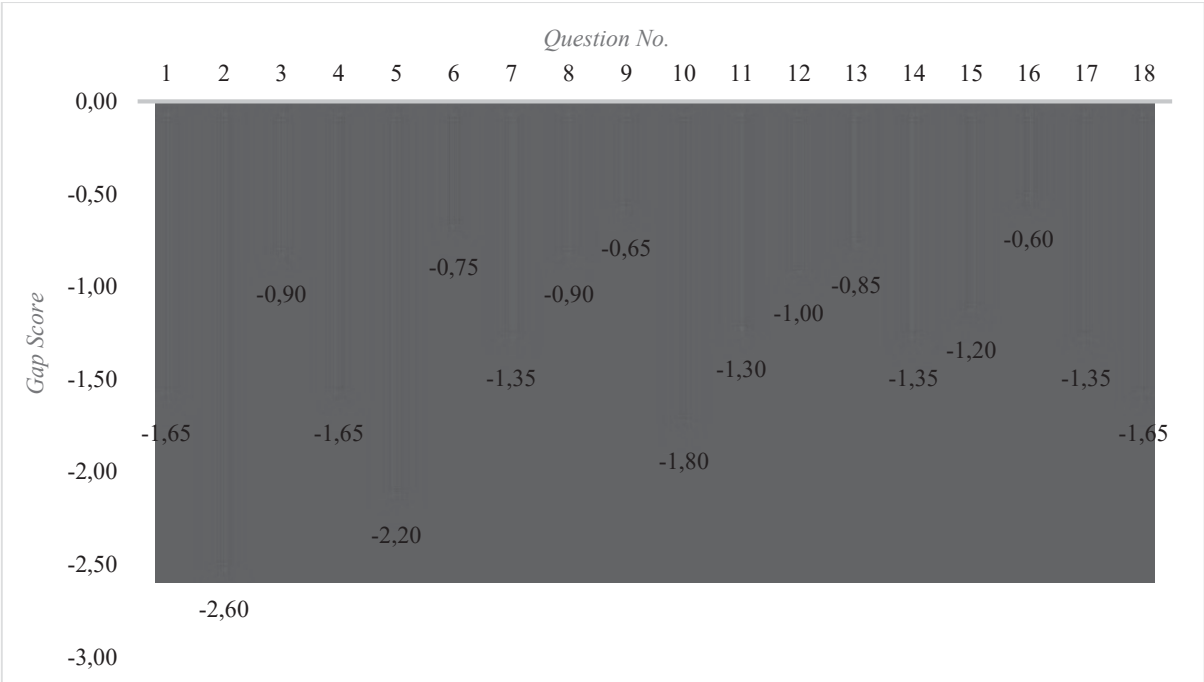

Figure 5: Overall gap scores for all interviewed libraries.

8.3.1 Professional Development (1)

At first interviewees were asked about the importance of professional development for librarians in general and whether they felt they were supported enough in this matter.

"Learning is part of our profession, we have a responsibility to do professional development" (L9) is a quote that sums up most opinions. The librarians felt they needed to do it to get "new ideas" and find "new ways of doing things" (L3). While all agreed that it is very important to extremely important in general, many felt that there is either not enough financial support or time for it. A total gap score of -1,65 underlines this (see Figure 5). Librarians stated that "it could be better" (L2), "there are not enough funds for even one conference" (L3) and that "budget prioritizes different things" (L2) or "support varies in departments" (L5). Some mentioned that there is support but not all use it due to time constraints or a lack of interest. Two interviewees told us, that professional development happens on site: in monthly meetings or via in-house classes and workshops or with the help of online classes (L6, L8).

8.3.2 Assessment (2)

We asked all interviewees whether they deemed the assessment of instruction outcomes important or not and if – and how – it is being done at their library. This questionnaire item yielded the highest overall gap score (-2.6, see Figure 5). It should be noted that this is due to the high gap score resulting from the interviews in academic libraries (-3.25 see Figure 6). Librarians from academic libraries rated this as "very important" (L2) or "becoming more and more important" (L7), but admitted that they were not doing it or that "very little is being done" (L3, L2). They said that it is "hard to evaluate the outcomes" (L1) and some were "still struggling with the 'how'" (L7), while others stated that it "strongly depends on the individual" (L9, L5) since "some are not motivated to do it" (L1) or "don't want to be judged" (L5). They also explained this with the lack of "clear learning outcomes" (L1) for one-shot classes without follow-up or stated that this "is a faculty domain" (L5). Some are doing a 1-Minute-Paper (L2) or pre/post-tests in classes (L7). For the future, workshops (L5) or student surveys (L3) were planned. Public libraries did not assess at all and were planning to do this in the future (L4, L10) or were evaluating satisfaction rather than learning outcomes (L4, L6, L8). One library started to use external data sets, for example the performance of pupils and students who visited the library, because assessment in class might "kill the joy of learning" (L6). Librarians said that assessment could help "to gear the future classes" (L8) and that private funders have the "desire to see a proof of social benefit" (L6).
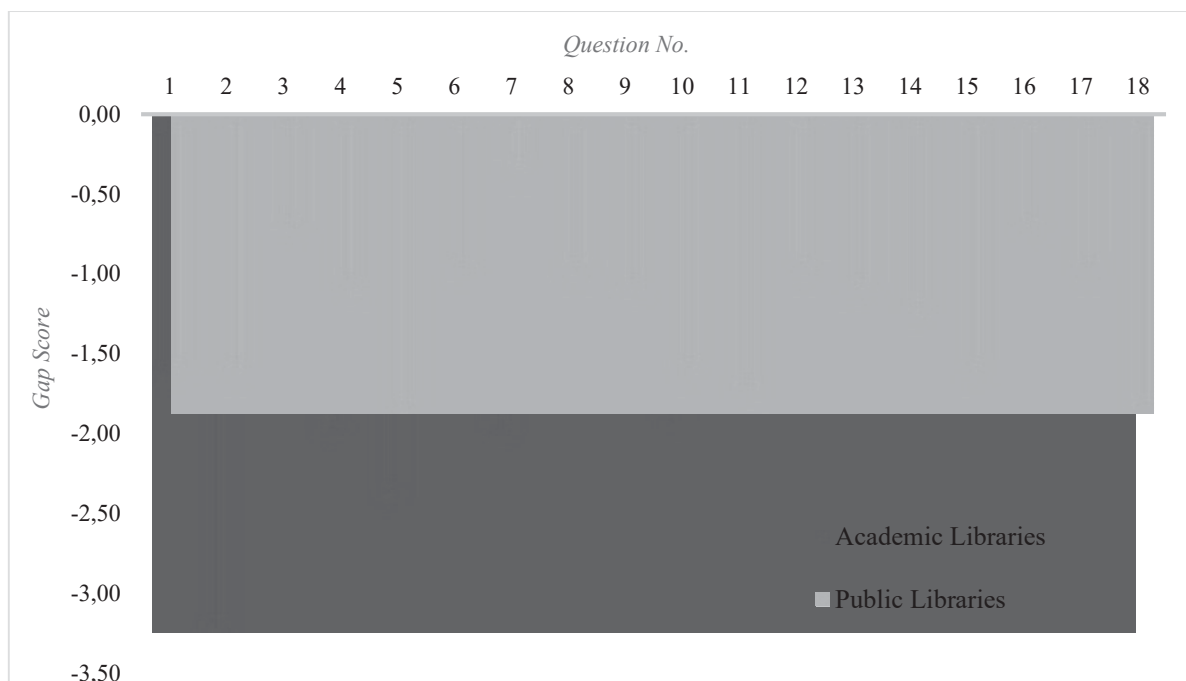
Figure 6: Gap scores for public and academic libraries.

8.3.3 Focus of Instruction (3-4)

We wanted to know if and why librarians were focussing rather on beginner or advanced courses and if they felt they were offering enough services for both target groups. Almost all interviewees agreed that both groups are equally important, but gap scores for instruction on an advanced level were higher for both public (-2.0, see Figure 6) and academic (-1.13, Figure 6) libraries compared to gap scores for instruction on a beginner level (-0.75 and -1.00, Figure 6). With the exception of two libraries, all were stating to do more for beginning patrons. Especially conversations in public libraries emphasised the need for basic computer classes like "How to use Google", "Computer Comfort" or "Creating and organising E-mail Account" to help senior citizens and those who do not have any experience at all. Librarians from public libraries told us, that there are patrons who have to learn to use a mouse and that, while there are many other possibilities for citizens who know how to use a computer and the internet, there is nowhere else to go for rudimental computer knowledge and training (L6, L8). Often, material and advanced courses are offered online, with the help of external partners like Lynda.com (2016). There are also libraries which did not offer any courses at the time of the survey. All

librarians were planning to improve the situation by offering courses, more courses and/or courses for all target groups in the future, but often there is not enough time, staff or space for it. Also, many interviews in academic libraries showed, that librarians there were wishing for more time with the students and in classes. Some do "one-shots" for first year students or in writing classes, but they felt they had more to offer than what they were doing already. Librarians "offer instruction to faculty but they are not always successful" (L1, L9).

8.3.4 Technical-Spatial Infrastructure (5)

We asked librarians to tell us about the importance of a library's technical-spatial infrastructure and to rate the infrastructure at their own library. We wanted to know whether they thought to have enough rooms for classes and space for patrons to read and work in. We also asked about their technical equipment: What is being used, is it working properly and "up-to-date"? This question resulted in the second highest gap score of the survey (-2.2, see Figure 5). Librarians need flexible classroom and workspace, software has to be up-to-date and most importantly reliable, modern libraries need WiFi and enough power outlets. Reality looks different in most cases. Some libraries have no or only one classroom. "It's never enough, and not what we want" (L1) sums up what many librarians told us. We were told that it is "important to have staff dedicated to technology" – this staff as well as administration have to understand the work and the needs of the librarians. In some libraries, this infrastructure or parts of it can be found. Other libraries are currently renovating or planning this in the future: "We have big plans" (L4). New buildings with big windows and comfortable areas, numerous computers for the public or students to use, business centers, e-classrooms, maker labs, are being planned or already in use. Some lend out laptops, e-readers and tablets, or have an audio/video-recording lab. For public libraries this is often part of a strategy to address young citizens and show them what the public library can offer: "We want to create a space for children, where they feel at home, where they want to spend their time in a creative and productive and positive way" (L6). Sometimes, freeing space for new projects means sending parts of the reference collection away. Librarians described this as a "balancing act" (L7) since many found that browsing among the stacks was still very valuable for patrons.

8.3.5 Way of Instruction (6-8)

In a library, there are many ways to assist patrons and to promote information literacy among students and citizens of the information society. Three of those ways are face-to-face courses at the library, e-learning courses and assistance at the point of need, for example when approached by a patron in the library or at the reference desk. We asked our interviewees, how important they deemed each of those and whether or how much they are a part of the daily work at their own library. Face-to-face courses were seen as a very important form of instruction. Academic librarians value the opportunity to form a relationship with the students and show them that they are welcome at the library. Public librarians stated that especially senior citizens and children need the face-to-face interaction in courses or activities like "Story Time". Many libraries were already offering e-learning courses or online materials, for example electronic subject guides, video tutorials, subject courses, or even online programs to earn a high school diploma. Positive aspects of these e-resources as the possibility to learn at one's own pace and at home were mentioned – "e-learning is an opportunity for students who can't make it to the campus" (L1) or for patrons who are looking for particular contents the library is not offering in a course. Some libraries, who did not offer any courses at the time of the survey felt "behind the curve" (L5) or "behind the time" (L4) and were planning to do this in the future. Also, the gap score for e-learning was higher than those for face-to-face courses or assistance at the point of need (Figure 5) because especially interviews in academic libraries yielded low experience scores for this item (Figure 6). Although e-learning was seen as a good complementary service to offer in libraries, face-to-face instruction was still valued more. Librarians said that "e-learning can teach specific skills very well but face-to-face is important for others like critical thinking" and that "higher learning has to happen in class" (L9). All interviewees agreed that assistance at the point of need, for example at the reference desk, is most important. We were told that "librarians take their work at the reference desk very seriously" (L1). Nowadays, librarians have found several ways to assist patrons as good and as fast as possible: Not only in person, but also via e-mail, telephone, chat and even messaging service. Some of those services are offered 24 hours every day. Compared to the other two ways of instruction, this topic got the highest expectation ratings from both public and academic libraries.

8.3.6 Contents of Instruction (9-11)

Librarians were asked about the importance of the proper use of specialized databases, online safety and security and about teaching how to use modern communication devices, such as smartphones, e-readers or tablets.

In many interviews, the question arose, whether it is still important to know how to use specialized databases, since many libraries use a surface tool or discovery service. With those new interfaces, searching in databases and the library catalogues is as easy as using Google or other web search engines. They "make it easier to jump in and find results" (L5). But especially interviewees at academic libraries thought, that it is still important to use specialized databases because they "offer much more" (L1). Students have to learn to "define a search strategy" and become a "smart researcher" (L2). Some academic libraries teach this a lot, some want to do it more but also said that the purpose decides about necessary tools, needed results and sources: "Sometimes Wikipedia is fine" (L3). Public librarians stated that their "audience is not primarily doing research" (L6) and that "database classes are not as popular" (L4), therefore it was rated to be "not as important for public libraries" (L6). The overall gap score for this item is -0.65 (Figure 5).

Except for one case, there were no courses on online safety and security in any of the other libraries we visited. Librarians from academic libraries said that they "don't have time for it" (L1), or that it is "not very important in an academic library" in general (L3, L9) – but some also said that it "is part of being information literate and of being in society" (L1) and that it should be mentioned more: "We don't talk enough about privacy and protecting user information" (L5). Librarians from public libraries stated that "particularly new users need this" (L4) to protect themselves from viruses, fraud, and other threats. Public librarians want to "protect [their patrons] from being exploited" (L6). Some try to teach a little of it in other internet-related classes, but most said that it was not enough since it is becoming more and more important. The overall gap score for this topic is -1.8 (Figure 5).

New communication devices and how to use them is no topic in academic libraries. Librarians say that "students already know this" (L1, L5, L9) and focus on content rather than instruction on how to use tablets and e-readers. This is a little different in public libraries. Some "do this a

lot" (L4) and show patrons how to use their camera, manage apps on tablets or similar. Many lend out devices as well. While some want to do more of this in the future, to enable patrons to use their e-content, others want to focus on tools and content more than on the device itself. They think that target-focused instruction is more important. The overall gap score for this topic is -1.3 (Figure 5).

8.3.7 Information Literacy Skills (12-18)

Librarians had high expectations for instruction regarding information literacy and the promotion of particular information literacy skills. They rated all of the seven information literacy competency areas to be "very important" to "extremely important". Gap scores in this part of the questionnaire ranged from -0.6 to -1.65 (see Figure 5).

While some librarians from academic libraries did not feel like they had enough time to teach the ability to realize and phrase an information demand in classes and that "students have assignments and not questions" (L9), others claimed to concentrate on this in research courses. The opinion was that "phrasing a demand is almost more important than finding the answer" (L3). Public librarians try to help with this while sitting at the reference desk.

Librarians found locating and exploiting information that is needed to be very important and some recognized it as the "main task of the library" (L7). Academic librarians reported to do this a lot in classes or one-shot instruction courses. Public librarians told us, that there is also pressure to be successful in helping patrons with this step: "If you can't find something, they won't come back" (L4).

Librarians regarded the ability to critically evaluate information and its sources as very important, especially in times of Google: "Evaluating is essential because they can find anything on the web" (L7). They also found that patrons trusted in their expertise in this matter. Many academic librarians were not satisfied with reality because they wished to have more time with the students to do it and raise more awareness for this among them.

Using information efficiently and constructively was another ability area. Some librarians try to incorporate this by answering questions like "How do I use what I am finding?" (L7) with the students, some think that this process does not have to be efficient but students have to

make their own mistakes and find own ideas. Some public librarians stated that they did not feel like they "get to see this part of the process" (L6).

Especially interviewees from academic libraries found the step of managing and organizing information important because students have to learn to use citation tools and manage their research. They try to help students by teaching how to use helpful tools.

Academic librarians try to support faculty with teaching the generating, quoting and presenting of information, some also offer courses. We heard that this is "not so important for public libraries" (L6) but there were also public librarians who stated they "would love to help with that" (L4).

Considering the rights and obligations regarding the use and distribution of information was valued very highly. Some librarians admitted that they "don't cover very much of it at all" (L1), some give out information sheets on copyright or creative commons, some claimed to "do this indirectly" (L8). There are academic libraries who offer advice for national and international students who are not familiar with the rules and we were also told about workshops on "ethical research" (L7). Librarians want students to "think about how information is produced" (L3) and authorship. Public libraries valued this as "important for the public" (L6).

8.4 Discussion

"Information literacy instruction" is a fairly new research topic, which is strongly associated with libraries. We analyzed in a quantitative and a qualitative way information library instruction in academic as well as public libraries in informational world cities in the United States of America. By the means of the questionnaire used, the perceived quality of library instruction as seen by the librarians themselves was measured. For all studied aspects of information literacy instruction, the gap between the librarians' expectation and their experience was high or even very high. The greatest gap scores were calculated for the assessment of instruction outcomes, the libraries' technical-spatial infrastructure, courses on online safety and security, courses for advanced learners, and instruction on information law and ethics. We spoke to instruction librarians and to groups of up to five librarians in charge of training where often several different opinions were represented. However, results are not representative for all libraries in the United States or even the libraries we visited as a whole. Nevertheless, we learned of many developments and challenges, sometimes different ones for public

or academic libraries, sometimes for both kinds of libraries alike. Most of our interviewees realized problem areas in the current state of information literacy instruction in libraries, but they see also solution possibilities – and some "have big plans".

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Table 2: Complete and Average Survey Results

No.	Academic Libraries			Public Libraries			Overall		
	Expectation	Experience	Gap	Expectation	Experience	Gap	Expectation	Experience	Gap
1	7.00	5.33	-1.67	6.75	5.13	-1.63	6.90	5.25	-1.65
2	6.42	3.17	-3.25	6.88	5.25	-1.63	6.60	4.00	-2.60
3	6.25	5.25	-1.00	7.00	6.25	-0.75	6.55	5.65	-0.90
4	6.17	4.17	-2.00	5.50	4.38	-1.13	5.90	4.25	-1.65
5	6.25	3.83	-2.42	7.00	5.13	-1.88	6.55	4.35	-2.20
6	6.08	5.50	-0.58	6.75	5.75	-1.00	6.35	5.60	-0.75
7	5.25	3.25	-2.00	5.88	5.50	-0.38	5.50	4.15	-1.35
8	6.67	5.83	-0.83	7.00	6.00	-1.00	6.80	5.90	-0.90
9	6.17	5.83	-0.33	5.63	4.50	-1.13	5.95	5.30	-0.65
10	4.00	2.08	-1.92	6.75	5.13	-1.63	5.10	3.30	-1.80
11	2.67	1.67	-1.00	6.25	4.50	-1.75	4.10	2.80	-1.30
12	6.58	5.58	-1.00	6.75	5.75	-1.00	6.65	5.65	-1.00
13	6.67	6.00	-0.67	7.00	5.88	-1.13	6.80	5.95	-0.85
14	6.92	5.50	-1.42	7.00	5.75	-1.25	6.95	5.60	-1.35
15	5.92	5.00	-0.92	7.00	5.38	-1.63	6.35	5.15	-1.20
16	6.25	5.75	-0.50	6.00	5.25	-0.75	6.15	5.55	-0.60
17	6.75	5.17	-1.58	5.75	4.75	-1.00	6.35	5.00	-1.35
18	6.67	5.17	-1.50	6.75	4.88	-1.88	6.70	5.05	-1.65
Avg.	**6.04**	**4.67**	**-1.37**	**6.53**	**5.28**	**-1.25**	**6.24**	**4.92**	**-1.32**

Part II: Libraries in the Knowledge Society

9 Qatar National Library as Part of a Countrywide Knowledge Infrastructure

9.1 Introduction

Once rapidly grown due to large oil and gas reserves, the governments of the Gulf Cooperation Council (GCC) states are nowadays aware of ending resources and declining demand of oil- and gas-burning countries due to electric mobility and enhanced ecological awareness. Additionally, new oil production methods as hydraulic fractioning, increasingly used, for instance, in the United States, intensify competition on the oil markets.

One GCC member, the state of Qatar makes great plans for the era after the oil (Fromherz, 2017; Kamrava, 2015; Roberts, 2017; Salama and Wiedmann, 2013; Ulrichsen, 2014, 2016). Nowadays, Qatar is one of the wealthiest countries of the world. Furthermore, the prospect of Doha hosting the FIFA World Cup in 2022 has led to further changes within the country. In respect of this spectacle, Qatar invests heavily in world-class infrastructure (e.g., a new metro system and with Lusail a newly constructed "smart" city) and in the improvement of its education and healthcare systems. By hosting renowned sports events and international conferences, as well as marketing itself as a brand, Qatar has successfully managed to attract global interest and awareness. It is safe to say that Qatar's capital city Doha became "an important emerging regional and global capital in the Middle East" (Salama and Wiedmann, 2013, p. xxi) that attracts attention not only to the oil and gas sector, but also to culture and sports, tourism, politics and policy initiation.

Qatar's government has the task to bring the country and its people on the right track – a track that transforms Qatar into a knowledge-based society (QF, 2013). To achieve this goal and to spread the nation's task, the previous Emir of Qatar Sheikh Hamad bin Khalifa Al Thani and his political supporters introduced the Qatar National Vision 2030 in 2008 (GSDP, 2008, p. 2). For the supplementary Qatar National Development Strategy, the main goal is to build on knowledge. "As Qatar's economy diversifies more from its reliance on gas and oil, success will

increasingly depend on the ability to compete in a global knowledge economy. Educating and training Qataris to their full potential will be critical to continuing progress" (GSDP, 2011, p. 122).

An important reason to select Qatar and its national library as a case study lies in the starting position for the transformation process towards a knowledge society. About two or three decades ago, there was nothing in Qatar we could associate with a knowledge economy: no functioning education system K-12, nearly no universities, no knowledge-intensive companies, no knowledge-based development. In contrast, in "old" countries as the US, UK, France, Germany, Japan or China, knowledge institutions look back on centuries of history. In Qatar, we are able to study the transitioning towards a knowledge society and the role of libraries in the development from scratch, thus from the very beginning.

Since the late 1990s Qatar's capital Doha has developed rapidly into a city characterized by skyscrapers (Figure 1), shopping malls, museums, stadiums, and artificial islands. The Pearl, an artificial island with new apartments, houses, villas, a yacht harbor, parks, restaurants, and high-class retail strips, is already inhabited to a large part. A gorgeous waterfront and the famous Museum of Islamic Art, as well as the fact that the city will be the venue of the soccer world championship in 2022, have put Doha into the limelight. The Arabian oryx is Qatar's national animal. "The Oryx takes off," Conventz et al. (2015, p. 65) state. "The oryx antelope is the iconic logo of Qatar Airways, which can be regarded as one epitome of Doha's being a rising hub in the Gulf region." Following Gremm et al. (2015) we can carefully say that Kuwait is the past, Dubai is the present and Doha is the future in the entire Gulf region when it comes to the transition towards knowledge societies (Gremm et al., 2018). However, in Qatar (and the entire Gulf region) there are remarkable obstacles to arrive at a functioning knowledge society, resulting from problems of the transition of (especially native) graduates into the labor markets and the mentality of the native population to work hard (Kosior et al., 2015). Maybe there is another problematic habit of Qataris. People in Qatar do not like to read because "reading and writing are activities restricted exclusively to school" (Ulmer, 2009, p. 112).

On April 16th, 2018, the one millionth book was placed in the new building of Qatar National Library (QNL) in Doha's Education City as part of its inauguration ceremony (Saleem, 2018;

Varghese, 2018). Earlier, in November 2017, QNL opened its doors to the public for the first time (Saleem, 2017; Varghese, 2017). Our basic research question is: What is the role of QNL in the countrywide process of its transformation towards a knowledge society? As a combination of public library (for the citizens of Doha and the entire state), academic library (for the universities in Education City) and national library, QNL unifies important library types in one single institution. Further research questions are: What services are provided? Will it be adequately used – also under the perspective of the often stated restricted motivation of the Arabian population to read books? Is there any information literacy or media literacy instruction offered by QNL? Is the location in the outskirts of Doha optimal for broad usage?

9.2   Methods

We applied three methods in order to acquire information on QNL and its position on Qatar's way towards a knowledge society. Besides literature review (method 1), we conducted rapid ethnographic field research (Millen, 2000) on-site (i.e., we visited Education City and Qatar University in February 2016) (method 2) and conducted semi-structured interviews with 13 experts in both institutions (method 3).

9.3   Qatar's Way Towards a Knowledge Society

Made rich by large reserves of oil and especially natural gas, the country is more than capable to react to the thread of ending resources. Due to its resources, Qatar is not only the country with one of the world's highest per capita income, but also the country with the lowest unemployment rate – leading the Qataris to show a "rentier mentality." In a rentier state, "only few are engaged in the generation of this rent (wealth), the majority being only involved in the distribution and utilization of it" (Beblawi, 1987, p. 51). The principal recipient of the external rent is the state's government, which in turn distributes the rent to its citizens in the GCC states. In a rentier state, there is a break in the work – reward causation. "Reward – income or wealth – is not related to work and risk bearing, rather to chance or situation," Beblawi (1987, p. 52) emphasizes. It is problematic to motivate the privileged citizens to work hard (as money comes anyway). This will become a challenge for Qatar: mastering the transition towards knowledge society and motivating the native people to let go of their rentier mentality.

Qatar has developed a plan to diversify its economy, manifested in the Qatar National Vision 2030. The goal is to transform Qatar into a pioneering state with a knowledge-based and extremely competitive economy while maintaining its strong cultural and traditional values. Results are already visible in the progress that the country has made in economic, social and political fields (GSDP, 2008). Remarkable institutions reflecting the efforts towards knowledge society are the newly built knowledge-intensive areas Education City and Qatar University.

Figure 1: Business District in Doha's West Bay. *Source:* Authors.

9.4 Education City and Qatar University

To advance the education system in Qatar, an Emiri Decree established the Qatar Foundation for Education, Science and Community Development (QF) in 1995. Under the leadership of Sheikha Moza (the former emir's wife) the private, non-profit organization QF has set itself to improve the quality of life in Qatar and the surrounding region by providing world-class educational opportunities. This vision is realized in a new higher education campus located in the northwest of Doha called Education City (Figure 2). Based on the model of the branch campus concept, the 2,500 acres big area accommodates world-class universities that "offer their most prestigious programmes to Qatar as fully-fledged partners of Qatar Foundation" (Salama & Wiedmann, 2013, p. 55). These foreign universities offering their programs to

Qatar's students are from the UK, the United States and France and include Virginia Commonwealth University (Art and Design; since 1998), Weill Cornell Medical College (Healthcare; since 2001), Texas A&M University (Petroleum Engineering; since 2003), Georgetown University (Politics; since 2005), Northwestern University (Communication, Journalism; since 2008), HEC Paris (Business and Management; since 2010), and the University College London (Librarianship and Museum Practice; since 2012). Additionally, there is the national Hamad Bin Khalifa University (since 2012) with a widespread offer of study programs (Computer Science, Energy, Healthcare, Islamic Studies, Islamic Finance, Law and Translation; Gremm et al., 2018, pp. 171 f.).

The world's most expensive national education project is the first step of Doha's plan to become an important knowledge center with a knowledge-based economy. Nowadays, the universities in Education City enroll about 2,700 students. QNL is located inside Education City.

Figure 2: Doha's Education City. *Source:* Authors.

The second pillar of Qatar's higher education is Qatar University (QU). It has reached substantial international attention and is frequently mentioned in international media. At QU, more than 20,000 students are enrolled. QU is a university running nine colleges, namely Arts

and Sciences, Business and Economics, Education, Engineering, Health Sciences, Law, Medicine, Pharmacy as well as Sharia and Islamic Studies. According to Times Higher Education, Qatar University is the most international university in the world (Bothwell, 2016). However, Education City and Qatar University are only sparsely connected. The institutions are placed at different locations in Doha; Qatar University acts more traditionally (e.g., by offering gender-separated undergraduate courses and separate libraries for males and females), while the international universities in Education City follow Western standards. As it is very problematic for Qatari girls to study abroad, it seems that in Education City, the universities came to the girls (and not the girls to the universities in foreign countries). Prospectively, Qatar has to face the challenge "of aligning Arabian Gulf expectations, traditions, and norms with those of knowledge economies" (Wiseman, Alromi, & Alshumrani, 2014, p. 2).

There are further higher education institutions in Qatar, all run by foreign educational establishments (Gremm et al., 2018, p. 184). The biggest institution is the College of the North Atlantic, a technical university operated by Canadian instructors, with about 3,000 students. Worth mentioning are Stenden University Qatar, Calgary University Qatar and the Qatar College of Aeronautics.

9.5   Qatar's Library System

Qatar National Library was established in the year 1962 by merging Doha's Public Library (founded in 1956) and the library of the Education Department (established in 1954). With the foundation of Qatar University (in 1973) and its academic library, a second main library in Qatar came into life (Aman and Khalifa, 1983; Rashid, 1988). For 1988, Raschid (p. 216) concludes, "despite increasing efforts the library system in Qatar has not reached the standard found in American libraries;" the library services are "inadequate" (Raschid, 1988, p. 217). This is the poor situation of Qatar's library system about 20 years ago.

"Over the last twenty years, the State of Qatar has witnessed colossal developments in its various sectors such as economy, society, technology, and education" (Medawar and Tabet, 2016, p. 52). Today, there are many academic and few public libraries in Qatar. The university

libraries in Education City (Gyesly, 2010; Medawar and Tabet, 2016) include (in brackets the amount of physical resources as an estimation of the library's size)

- Academic Bridge Program Library (12,700 print resources),
- Carnegie Mellon University in Qatar Library (16,000),
- Georgetown University School of Foreign Service in Qatar Library (90,000),
- HEC Paris in Qatar Library (1,000),
- Northwestern University in Qatar Library (34,000) (Clausen, 2015),
- Texas A&M University at Qatar Library (10,000) (Gilreath, 2006; Yang and Gyeszly, 2009),
- Translation and Interpreting Institute Library at Hamad bin Khalifa University (2,000),
- University College London Qatar Library (in cooperation with Georgetown Univ. Library; additionally, UCLQ offers an MA study in Library and Information Studies),
- Virginia Commonwealth University Qatar Library (40,000),
- Weill Cornell Medical College in Qatar (e-library).

The physical collections of the branch campuses' libraries are rather small; however, there are always close ties to the home campus' libraries. A remote access to all holdings of the home university (including the catalogs, online databases, e-books, e-journals and document delivery) is given for the entire faculty and their students (Gyeszly, 2010).

Outside Education City, there are further academic libraries:

- College of the North Atlantic Qatar Library (14,000),
- Community College Qatar Library (5,000),
- Stenden University Qatar Library (6,000),
- University of Calgary Qatar Learning Commons (3,000), and, finally,
- Qatar University Library (330,000) – the biggest library in Qatar after QNL (Kindilchie and Samarraie, 2008).

Governmental libraries comprise diverse topic-specific libraries, as, for instance, the Agricultural Affairs Ministry Library or the General Retirement and Social Insurance Authority Library. Special libraries can be found, for example, at the Arab Center for Research & Policy Studies, Hamad Health Services, Sidra Medical & Research Center, and the Museum of Islamic Art.

In Doha as well as in smaller towns as Al-Khor, Al-Shamal and Al-Wakra, public libraries have been established. However, "the public library sector continues to emerge; most libraries are not automated" (Medawar and Tabet, 2016, p. 64).

Similarly suboptimal is the state of school libraries. There is a long tradition of school libraries in Qatar, as all schools have libraries. When public schools were launched in 1951, the school library "was considered from the very beginning to be a major component of the Qatari school" (Khalifa, 1992, p. 484). However, there are no professional librarians working in the schools (Rashid, 1988, p. 215). The principal service of the school libraries is lending books (Khalifa, 1992, p. 494). In 2016, the circulating library collection in public schools amounted to 5,600 books on average, in contrast to international schools with nearly 9,000 books (Medawar and Tabet, 2016, p. 66). Furthermore, many school libraries still lack advanced integrated library systems.

As a major strength of Qatar's library system Medawar and Tabet (2016, p. 68) emphasize the role of QNL.

9.6   Qatar National Library (QNL)

"Higher education and research, as much as a knowledge-based economy in general, need access to international information and knowledge and the development of a national knowledge base," Lux (2014a, p. 175), former QNL project director, states. According to Mainka and Khveshchanka (2012), libraries are important knowledge hubs of knowledge-based societies because they are the traditional institutions of knowledge management. Beside print publications, libraries need to provide sufficient digital material and an attractive physical infrastructure for their users (Mainka et al., 2013).

QNL states that their library is a "third place," a "community space" (QNL, 2018a). The concept of a "third place" was introduced by Oldenburg and Brissett in 1982. "Third places are characterized in terms of sociability and nondiscursive symbolism" (Oldenburg and Brissett, 1982, p. 265; Oldenburg, 1999), they are places outside the home and the workplace as, for instance, coffee houses and neighborhood taverns (Oldenburg and Brissett, 1982, pp. 268 and 281). Referring to Harris (2007, p. 145), "public libraries are in a unique position to become

the next great good places, places where people can freely gather and interact." Not only books and other media are important for a library, but additionally the provision of spaces (Mainka et al., 2013). In knowledge societies and in their prototypical cities called "informational cities" or "smart cities" (Castells, 1989; Stock, 2011), we have to distinguish between "libraries as a third physical space" and "libraries as a third digital space." "People who frequent third places create community" (Montgomery and Miller, 2011, p. 233). In this sense, the library provides the spaces for building and cultivating communities as well. QNL sets high standards by referring to third places:

- an attractive building (as a condition for the supply of any spaces),
- optimal collections and services on-site (as classical library functions),
- offer of digital spaces (access to digital resources), and
- offer of physical spaces (for community building).

"The profession of librarianship in the State of Qatar is currently in a phase of rapid growth, development and transition" (Johnston and Williams, 2015, p. 86). For a long time, librarians in Qatar did not play a significant role in the country. However, with the establishment of QNL and the will of Qatar to develop a knowledge-based society this is changing for the better. Librarians provide access to the most important resource in this form of society, namely knowledge, and provide spaces (physical as well as digital) for the people's community cultivating.

9.6.1 Building and Staff

Since the "library as a space" (Lux, 2016, p. 105) is an important aspect of libraries, we should give attention to QNL's building in Education City (Figure 3). The new building of QNL was created by Rem Koolhas and his associated company, the "Office for Metropolitan Architecture" (OMA) in Rotterdam, The Netherlands. In the self-image of QNL the building is "a community space for Qatar's residents and a place for learning, contemplation and exchange of ideas" (QNL, 2018a). The building looks like two papers "that are pulled apart and folded diagonally at the corners to create a shell-like container, which encloses the open-plan interior" (QNL 2018d). The first floor is constructed as one huge space reminding of an urban plaza. There are cascading levels, which can be accessed by stairs, ramps, lifts, and the so-called "People Mover System" (a hybrid of an elevator and an escalator). Below the first floor, the heritage library is situated, resembling an archaeological site. The bookshelves are arranged on the different levels. Standing in front of them gives the impression of being in an amphitheater with thematically arranged bookshelves on the different galleries.

This futuristic looking arrangement of books reminds of scholar Camillo Delminio's idea in the Early Modern Age (1990; the manuscript is from 1530). He proposed the library to be a

"memory theater" in form of an amphitheater with the knowledge items on the steps in order to "stage the knowledge" and allowing the users to easily attain and retain the knowledge (Stock and Stock, 2013, pp. 507 f.). There is no doubt that the library building is a landmark in Qatar and one of the most attractive libraries on a global scale.

The library staff includes many expatriate employees. Even the management is (still) in the hands of foreigners. The project director was Claudia Lux, a German (Lo, Cho and Chiu, 2017, pp. 111-128; Lux, 2014b); the current executive director, Sohair Wastawy, is an American citizen with roots in Egypt. About 200 professionals were hired to work for QNL (Interview partners 2 & 12).

9.6.2 Collections and Services On-Site

QNL's homepage (Figure 4) gives an overview of the library's services. In its main collection, QNL hosts almost 1 million books. The main physical collections of non-fiction books on the shelves are systematically arranged following the Library of Congress Classification System (LCC), while the children's and teen's books are ordered by the Dewey Decimal Classification (DDC). All other media (fiction books and the heritage collection, for example) are arranged by local classification systems (QNL, 2018c). In the heritage library, users are able to find manuscripts, early printed Arabic books, globes, maps and objects on Qatar and the region (QNL, 2018a). Of course, QNL provides further typical and classical library services such as "Ask a Librarian" and document delivery.
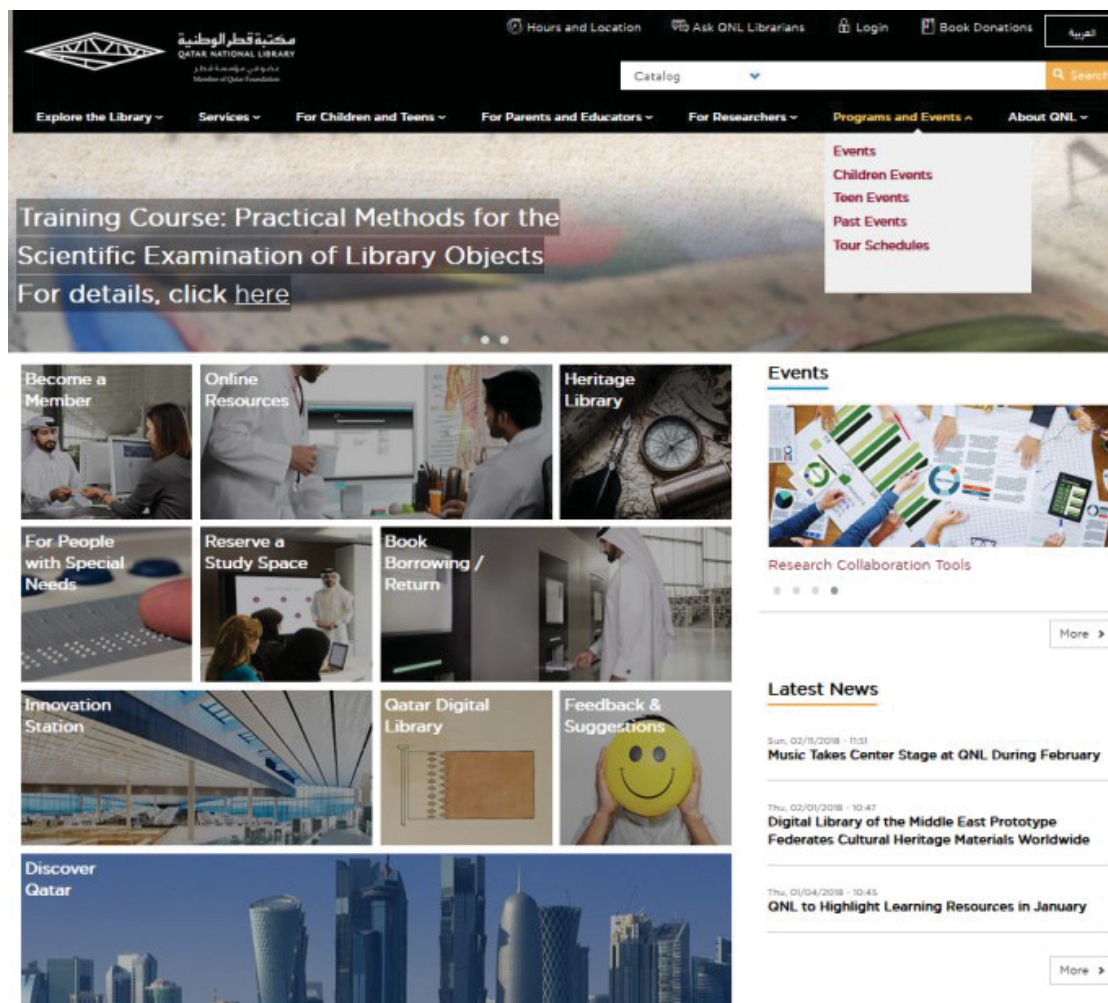
Figure 4: Qatar National Library / Homepage. *Source:* https://www.qnl.qa/en.

Apart from about 100,000 printed books especially for children, QNL has developmental toys, computer stations with software for children, iPads with learning applications and audio-visual materials for children (QNL, 2018e). For teenagers, there are about 30,000 printed books and gaming kiosks with consoles and video games (QNL, 2018b).

To make use of QNL's services, one has to become a member. Membership is bound to living in Qatar, be it as Qatari citizen or as expat resident. All library services are free of charge for members (QNL, 2018a); as well as the library card, therefore the membership is free (QNL, 2018c).

9.6.3 Digital Spaces

The digital spaces of QNL include four sub-spaces, namely

- the library catalog,
- online resources,
- Qatar Digital Library, and
- digitized materials.

Besides the online catalog of all physical holdings (Figure 5) QNL offers access to professional information services. It is a typical service comparable to good academic libraries; it includes, among many others, ProQuest, Wiley, JSTOR, Springer eBooks, Taylor & Francis, De Gruyter, Emerald, SAGE, Science Direct eBooks, and Web of Science (QNL, 2018f). Access is provided

to 178 databases and 318,000 e-books as of August 2016 (Owino and Dudek, 2016, p. 233). Due to national licenses, some online resources may be accessed – for free – by every QNL member from everywhere in Qatar. The Qatar Digital Library provides access to a collection of historical archival items related to Qatar, the Gulf region and the Middle East as well as manuscripts of Arab Islamic sciences. In cooperation with the British Library, more than 1.3 million items were cataloged and digitized (Figure 6).
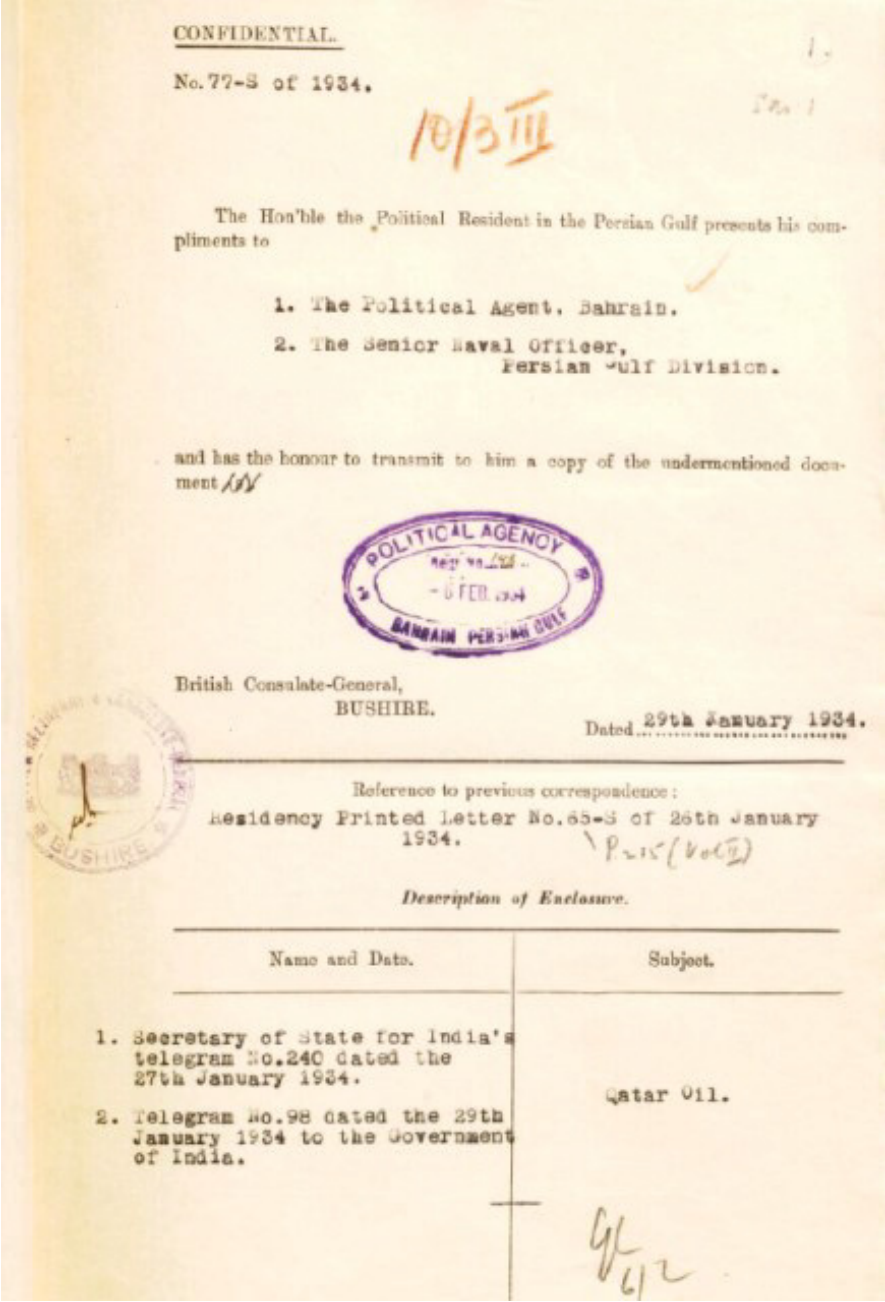
Figure 6: Example from the Qatar Digital Library: Qatar Oil Concession from Jan. 29, 1934. *Source:* Qatar Digital Library (www.qdl.qa).

QNL's digitization center has the task to make heritage materials accessible for the public (QNL, 2018g). Books which can no longer be physically available "due to format obsolescence or fragile condition" (QNL, 2918g), images and Arabic manuscripts are being scanned. This includes a project for word-by-word indexing of (handwritten) manuscripts (Al-Maadeed et al., 2014).

9.6.4 Physical Spaces

QNL offers lots of spaces for reading. There are more than 600 seats all over the building and additionally nearly 30 carrels as quiet spaces for individual study (QNL, 2018b). Furthermore, many group study rooms, instruction rooms (one room specialized for information fluency instruction) and event spaces (e.g., for exhibitions). The "Innovation Station" includes computer workstations, 3D printing and scanning, videography and photography equipment as well as stations for old media conversion (e.g., to transform VHS tapes into digital formats). Of course, QNL offers publicly accessible PCs, printers and scanners. In QNL, users can use large media walls and two-sided media pillars (called "totems") for infotainment, for instance, for interactive games, drawing and e-souvenirs. The library includes an auditorium with about 450 seats. Here, performances of the Qatar Philharmonic Orchestra take place (Figure 7). Needless to say, QNL also houses a restaurant and a cafe.

Figure 7: The Qatar Philharmonic Orchestra at QNL. *Source:* Twitter / Sebastian Wilke (courtesy of the photographer).

9.7 Evaluation of QNL and Qatar's Library System

The role of librarians in the state of Qatar is now to strongly support education and encourage information consumption and development (Interview partners 2 & 12). At Weill Cornell Medical College in Qatar, for instance, "librarians become 'knowledge navigators and information mediators'" (Küster, 2010, p. 18). Moreover, the need for well-trained librarians increases strikingly because they require the skills to "serve multiple groups of clients with distinct library and information needs" (Lux, 2014a, p. 177).

Our interviewees are of the opinion that librarians in Qatar are mostly well-trained. The librarians from the university libraries located in Education City sometimes even join the classes at their universities to share their knowledge with the students (Interview partners 1, 3, 8, & 9). Interview partner 2 says that most of the librarians are educated properly to do their job in the country. However, they are trained differently than their colleagues in Western societies. Furthermore, many of the librarians in Qatar only hold an undergraduate degree rather than a master's degree. This is due to the replacement of the library science postgraduate program of Qatar University by an undergraduate LIS program (Daniel, Meho, and Moran, 2015). To change this situation in preparation for the increasing need of well-educated library professionals in the country, the University College London in Qatar offers a master's program in Library and Information Studies (LIS) since October 2013 (Johnston and Williams, 2015). Apart from the undergraduate LIS program from Qatar University, which was abandoned in 2012, the postgraduate LIS program of University College London is the first such program in Qatar (Johnston, Mavodza, and Jirjees, 2015). According to interview partner 12, Qatar likes to hire expertise. "Senior library professionals, from overseas, are the most sought after for their expertise and experience in strategic planning and management capabilities" (Kumaresan and Swrooprani, 2013, p. 2).

The majority of the LIS workforce in Qatar comes from Western and other Arab countries. Only about 10 percent of the librarians are Qatari because qualified and experienced Qatari librarians are scarce (Johnston and Williams, 2015). The country hopes that qualified professionals from other countries are likely to train Qatari librarians. It is also important to note that there is a huge difference in the training of librarians in public and private libraries.

Nearly every school in Qatar contains its own library that requires library staff (Interview partner 12). This is in line with Al-Kaabi (2015) who states that it is at least intended that every school in Qatar has its own library. In public school libraries, the staff is not trained at all. However, these schools do not place importance on employing professional librarians and on further education for the staff (Interview partner 12). Most of the school librarians only work part-time while lacking the knowledge and needed skills (Al-Kaabi, 2015). School librarians already have the feeling that they receive even less training than other librarians in the country and that they are not appreciated as education providers. This might become a problem: While Qatar does not focus on supporting school libraries, most of the librarians in Qatar are of the opinion that there is a strong need for school librarians in the country (Johnston and Williams, 2015). Qatar National Library wants to address this issue by offering special training to school librarians (Lux, 2014a). Unlike public libraries, private libraries do provide training to the librarians (Interview partner 12). However, most of Qatar's librarians state "that they were not satisfied with the level of professional development opportunities that were available to them in Qatar" (Johnston and Williams, 2015, p. 95). Reasons for this opinion are the absence of development support and the requirement to travel to another country to participate in training. This shows that in Qatar librarians themselves feel the need to expand their professional knowledge and skills to do their jobs appropriately.

QNL is, despite any delays, important for Qatar's libraries' changing role. Traditionally, public libraries have not been well resourced and used. Most of the people did not even know that they exist. The aim of Qatar is to change this ignorance with the opening of the National Library. Everyone living in Qatar will be enabled to access all the print and online resources as well as the spaces of the library. QNL has purchased national licenses so that the people will be able to use online databases for the acquisition of knowledge. The library allows people to access knowledge from everywhere, which is an important aspect in a knowledge-based society (Interview partners 2, 4, 10, & 12). The combination of print and online resources and of different collections will enhance the people's experience and usage of the library (Lux, 2014a).

All in all, the evaluation of Qatar's library system is ambivalent. There are weak public libraries (except for the new QNL) and there are also weak school libraries. However, the academic libraries in Education City (with their close ties to the home university's libraries) and especially at Qatar University are comparable to other university libraries all over the world. And, finally, QNL is a world-class library.

When it comes to information dissemination via text and the provision of information in libraries, there is one big problem in Qatar, namely censorship. Books ordered by libraries in Qatar are reviewed before they are imported. If a book argues unlike or against the holy Qur'an, it is not acceptable to list the book in the libraries. Some books that are needed did not pass the review. Additionally, some librarians hold back books that arrive at the libraries because they are unsure about putting them on the shelves for the public to read. Sometimes it takes up to two months until a review is completed (Interview partners 1, 2, & 4). Even websites are blocked by Qatar, more precisely by Ooredo in accordance with the guidelines that are defined by law-enforcing authorities (OpenNet Initiative, 2009), but most of the people living in the region know how to use a virtual private network (VPN). And people in Qatar obviously use it if they need anything they cannot access otherwise (Interview partners 2 & 3).

9.8   Book Culture and Reading Habits in Qatar

The libraries in Qatar, especially the public libraries, are barely visited. Al-Kutub Library, the former QNL, and its branches were rarely used (Lux, 2014a). For academic libraries, this fact does not seem to apply because teachers tell their students to go there (Interview partner 12). Our interview partners say that when talking about reading and visiting libraries in Qatar, one needs to distinguish between the habits of Qataris and those of expats. Due to Qatar's nomadic history, a book culture does not exist in the country (Interview partners 1 & 11). "The book is something that is far, far away" (Interview partner 9). A survey conducted by the Childhood Cultural Center of Qatar revealed that children in Qatar are not interested in reading books, stories and magazines (Fahmy, 2015).

> "Even in parts of the Arab region with considerable financial wealth and access to education, book reading is suspected to be low (...). Reasons for this are numerous:

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Lack of texts translated into Arabic, censorship, political instability, competing classical and colloquial dialects, weak library networks, and piracy all contribute to the diminution of reading in Arab countries" (Martin, Martins, and Naqvi, 2017, p. 3374).

Bendriss and Golkowska (2011) found out that one in four university students in Qatar had never been read to as a child. Nearly 30% of the students say that they never or rarely saw their parents read for pleasure.

Expats, who were born in foreign countries, read and use libraries more frequently than Qataris, but expats that are born in the country probably show similar habits to Qataris because they adapt to the local culture. Indeed, there is no statistically significant difference between the book reliance of Qatari nationals (15.34 on a scale between 4 and 20) and Western expatriates in Qatar (15.83) (Martin et al., 2017, p. 3383). From all Arab nationals, Martin et al. (2017) studied, Qataris performed best – similar to nationals from the United Arab Emirates (15.28) or Saudi Arabia (15.28), but much better than people from Egypt (10.81).

Maybe, if the needs of Qataris were acknowledged by employing Arabic-speaking librarians in libraries, the natives would change their habits regarding visiting libraries (Johnston and Williams, 2015). Just as people in Qatar do not use libraries very often, they seldom visit bookstores. Actually, only 10 percent of the goods in bookshops are books. Customers of those stores are rather expats than Qataris, but the variety of sophisticated literature is described as poor (Interview partners 4 & 11).

We have to mention some exceptions. Not everyone in Qatar hates reading, some Qataris actually really like to read and the book fairs are even crowded (Interview partners 1, 2, & 3). The Doha International Book Fair is an annual event where publishers present their books, regardless of genre, to the Qatari community. This event is a chance for Qatar to convince the people of the importance of acknowledge the worth of libraries and educational institutions. Interviewee 11 says that people in Qatar just skip the step of reading a book. They go from a culture where knowledge is transferred orally to one where knowledge is acquired online. If people are looking for knowledge of any kind, they consult the internet (Interview partner 8)

and are most interested in articles from social media platforms (Interview partner 1). However, when it comes to learning materials, students in Qatar, as many of their colleagues worldwide, prefer to print out their course readings rather than reading them with the help of digital devices (Johnston, Salaz, and Alsabbagh, 2016).

"To get more people in Qatar to embrace reading, new efforts are underway to make books more accessible to the public, especially children" (Khatri, 2016, 1st paragraph). With the establishment of QNL and the idea to therein include a Children's Library with children being recognized as a "core user group" (Johnston and Williams, 2015, p. 92) of libraries, Qatar is attempting to create a culture that is keen on reading and where using libraries for knowledge consumption is commonplace (Interview partner 12). Interview partner 1 fears, however, that due to their attitude towards libraries, Qataris will not even visit the new National Library. Interviewee 12 also has doubts that the library will be well visited.

9.9   Media and Information Literacy

Medawar and Tabet (2016, p. 68) describe a lack of awareness among the people in Qatar "about the libraries and their role." Perhaps, there is a problem with the Arabic language, as the word مَكْتَبَة (maktabah) means both, "library" as well as "bookstore." Library staff in Education City indeed needs to explain that there is a difference between bookshops and libraries (Sandercock, 2016, p. 5). Pullman (2016) asked Qatari native students of Carnegie Mellon University Qatar regarding their pre-college experience with information literacy and libraries. Almost 40% of the students used their high school library "regularly" or "always." And, obviously directed by their instructors, more than 51% of university students visited a university library regularly or always. In contrast, only 2.3% of all respondents used a public library regularly – and no single student always (Pullman, 2016, p. 60). Medawar and Tabet name a threat to strengthening even the students' perceptions of the library's role:

> "The library is not the first stop to many who research. Students often turn to Google
> or other Internet search engines rather than library resources as their first choice to
> find information. Because libraries invest heavily in database subscriptions, libraries

need to play an increased role to guide users to search the correct databases and get better search results" (Medawar and Tabet, 2016, p. 71).

Media and information literacy (MIL) is a fairly new aspect in the country, but the Doha Center for Media Freedom (DCMF) realizes its significance with information becoming more and more important in modern societies. DCMF, a non-profit organization that fights for press freedom and quality journalism, has made it its business to provide media and information literacy education. The organization feels that the younger generations need to be encouraged to become media literate critical thinkers. Since 2011, the organization is actively pursuing and expanding its long-term project to provide MIL education in various schools in Qatar and the region (DCMF, 2013).

Sandercock (2016) asked instructors at the College of the North Atlantic in Qatar on their perceptions of the state of information literacy among their students. "Instructors perceive that only

- 39% can identify an information need,
- 29% can scope their information problem,
- 31% can plan and construct a strategy for locating information,
- 35% can gather the information and data needed,
- 17% can evaluate information for credibility,
- 20% can manage information professionally and ethically, and
- 23% can present and synthesise the results of their research" (Sandercock, 2016, p. 19).

On average, only 28% of the students display all seven information literacy skills. Using the same method and the same questions in the U.S., Weetman DaCosta (2010, p. 215) saw a 48% success rate (by the way, this result is still suboptimal).

Information literacy does not seem to be a big topic in Qatar's Education City university libraries, given that our interviewees do not know a lot about it. Interviewees 1 and 12 say that information literacy in Qatar is not high. There are some information literacy courses for students in the libraries of the branch campuses, but they call it differently (Interview partners 2 & 3). For instance, the library of the Virginia Commonwealth University in Qatar offers information, media and materials literacy instruction that is tuned to the core curriculum of the University College (VCU, 2014). According to CMU (2015), librarians from Carnegie Mellon

University in Qatar hold information literacy workshops in the course of the year. Moreover, if librarians were asked to help, they would, but nobody asks them (Interview partner 1). Qatari librarians feel the need for information literacy instruction. Librarians that teach information literacy are important for the country and information literacy training for librarians is urgently required (Johnston and Williams, 2015).

QNL is starting to recognize the importance of information literacy; by now, on a very low level. In April 2018, QNL promotes a symposium on information literacy to beat fake news.

> "For libraries, …, it is not enough to merely provide access to information; we have been promoting literacy for centuries, and will continue to do so, but now more than ever the idea of 'information literacy' is a necessary next step," Stuart Hamilton, QNL's Deputy Executive Director, states (2018).

However, at the time of our researches, we were not able to identify any systematic program of information literacy instruction at QNL.

9.10 Location of QNL

Since Qatar National Library is located in Education City, there was once the idea for it to be the main library for students of Education City. The idea resulted from the fact that "Education City currently lacks a central library" (Gyeszly, 2010, p. 87). All the students would use one and the same library instead of visiting the libraries of the branch universities they are enrolled in (Interview partner 12). This idea, however, was not realized and the building that should have become Education City's central library is now the new establishment for QNL. And while students might use and benefit from the QNL, they still have to be given the chance to obtain curriculum-focused resources from the branch campus libraries that are specialized on the topics taught by the universities (Flanagan and Wiebe, 2015). According to interviewee 2, the branch campus libraries will cooperate with the National Library, but at present the agreement with their home campus is the main source of Education City's university libraries.

QNL's location is ideal for students and faculty of Education City. However, there are long distances to Qatar University (about 15 km), to Doha's commercial center West Bay (14 km), and to the reconstructed old city center of Msheireb and Souk Waqif (15 km) (Figure 8). In the

future, there will be a metro station of the green line, connecting QNL directly with Msheireb. However, in the meantime QNL's users have to go by their car or to take a cab.

Figure 8: Location of QNL in Doha. *Source:* Google Maps.

According to Interviewee 12, QNL is as a public library at the wrong place. The location in Education City might be problematic due to its distance to the city center of Doha. Qataris who do not like to use libraries anyway, would not go all the way to Education City. Qatar has also recognized this problem and has already thought about opening further branches of QNL. So far, to attract many visitors, social and recreational aspects, like a cafe and a special events area, as well as cutting-edge technology are included in the library. Moreover, the technical service department and librarians from the public service department promote the new library at public places where many people are reached (Lux, 2014a).

9.11 Conclusion

We conducted a literature review, rapid ethnographic field research and semi-structured interviews to acquire information on QNL and its position in Qatar. Qatar's government makes great plans for the country and its economy and its people for the "era after the oil." The main goal is to build on knowledge and transform Qatar into a knowledge-based society. For years, Qatar has been heavily investing in the infrastructure of knowledge institutions, among them the newly built knowledge-intensive areas Education City and Qatar University in Doha. Qatar

National Library is situated in Education City. It opened its doors, the doors to a national library, a public library, and an academic library all in one, in autumn 2017. An important reason to select Qatar and its national library as a case study is that here, we are able to study the transition towards a knowledge society and the role of libraries in this development from the start.

Twenty years ago, the library system of Qatar was described as subpar (Raschid, 1988) and librarians did not play an important role. Since then, the educational sector has undergone significant development. Today, there are many academic libraries in Qatar. A major player in further development will indeed be QNL as it aims to become the knowledge hub of Qatar. It not only fulfils an important role in providing access to information and knowledge but also as a "third place" for Qatar's diverse communities. A heavy burden lies on the well-designed corners of QNL, as this library is an important building block of Qatar's knowledge society; however, there are much more projects and incentives in Qatar to successfully establish a knowledge society (Gremm et al., 2018), for instance, the operation of universities and further institutions of higher education, of research institutions (such as Sidra), of science funding institutions, of conventions centres, etc., finally, – most important – the education of people and the enhancement of their motivation to work hard in knowledge-intensive institutions. Looking at the entire library system in Qatar, QNL and most academic libraries are world-class. However, there are only few public and school libraries in Qatar holding up to the same world-class standards. While QNL will address this issue partly by providing training for school librarians, it will need more work to strengthen the public and school libraries throughout the country.

Right now, QNL stands as an excellent example for a modern library. An attractive interior and exterior, as well as space for reading, playing, learning, interaction and entertainment, will surely attract many people. Many of our interviewees told us, however, that libraries in Qatar, especially the public libraries, are barely visited. Furthermore, one should distinguish between the habits of Qataris and those of expats when it comes to reading and visiting libraries. While expats welcome a good library as QNL and indeed use its services, a book culture does not seem to exist among Qataris hindering the nationals to use the QNL to its full extent. Even the

majority of QNL's library staff and management consists of expatriate employees. Efforts such as QNL's Children's Library are a way to change the Qatari culture in regards to reading, but some of our interview partners have doubts that the library will be visited by their countrymen. The location of QNL, far away from Qatar University and the city centre, does not improve this argument.

Another important task in transitioning towards a knowledge society is to educate Qataris in Media and Information Literacy (MIL). At the current state, MIL instruction does not seem to be well established in public or academic libraries of Qatar. In April 2018, QNL promotes a symposium on information literacy to beat fake news. Apart from that, no systematic program of information literacy instruction could be detected. We are looking forward to observe future developments in this area.

Finally, for Lux (2014a, p. 176) "it is time to overcome the separation between academic, research and public libraries, and concentrate on a unified service with diverse content for the user. Qatar National Library has a historic chance to start the first fully integrated library from scratch." Such symbiosis grants facilities through the optimal utilization of resources (Stock, 2017, p. 466). Nowadays, in Qatar there are weak public libraries and school libraries, much better academic libraries, and with QNL a world-class integrated library. The knowledge infrastructure is definitely laid; QNL can play a decisive role in Qatar's development towards knowledge society.

However, will the people in Qatar – especially the national Qataris – really change their habits concerning reading, their level of information literacy, and their unproductive rentier mentality?

Acknowledgements

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10 Singapore's Library System and Its Place in a Smart Nation

10.1 Introduction

"Readers for life, learning communities, knowledgeable nation …" is the vision of National Library Board (NLB) Singapore. To realize this vision, NLB librarians "make knowledge come alive, spark imagination and create possibilities." On the homepage of NLB we read, "NLB promotes reading, learning and information literacy by providing a trusted, accessible and globally-connected library and information service through the National Library and a comprehensive network of Public Libraries. By forging strategic partnerships to cultivate knowledge sharing, the libraries also encourage appreciation and awareness of Singapore's history through their wide range of programmes and collection on Singapore and regional content. The National Archives of Singapore oversees the collection, preservation and management of public and private archival records, including government files, private memoirs, maps, photographs, oral history interviews and audio-visual materials" (NLB, 2018a). In order to fulfill all these tasks, NLB manages 26 Public Libraries, the National Archives, and the National Library.

In several countries around the world we can observe that the role of libraries fundamentally changed from a quiet place to read or to borrow media (with only minimal influence on the country) into vital knowledge centers serving people, businesses, and administrations (Nicholson, 2017)—now with huge influence on "smart" cities (Barth et al., 2017; Mainka, 2018) and on entire countries of the knowledge society. Paramount examples are the Qatar National Library (Henkel et al., 2018; Gremm et al., 2017) and Dokk1 in Århus, Denmark (Bech-Petersen et al., 2016). In Singapore, there were huge transformations of the library system (Rajsic, Bucher, and Osei-Poku, 2012). NLB's buzzword for all those developments is "journey" (e.g., Choh, 2014). What are the steps on this journey?

After a construction phase of about 40 years, the city-state of Singapore has realized its leading position in the emerging knowledge-based economy and in knowledge society (Luterek, 2018). The government of Singapore successfully finished its master plans from the first National Computerisation Plan (1981) to the Intelligent Nation plan (iN2015) (iDA, 2006) and now works on the implementation of the idea of a Smart Nation. Additionally, there were specialized master plans on Singapore's libraries: Library 2000 (1994), Library 2010 (2005) (Library 2000 Review Committee, 1994; NLB, 2005), and Libraries of the Future Masterplan (MCI, 2015).

Smart Nation is about transforming Singapore through technology (Tan and Yimin, 2018). "We envision a Smart Nation that is a leading economy powered by digital innovation, and a world-class city with a Government that gives our citizens the best home possible and responds to their different and changing needs" (SNDGO, 2018a). Singapore's concept of a Smart Nation includes a digital government (SNDGO, 2018c), a digital economy (IMDA, 2017a), and the digital readiness of all people (MCI, 2017). Especially public libraries play an important role to guarantee the citizens' digital readiness (MCI, 2017, p. 34).

The Smart Nation program tends to be technologically oriented (it is mainly on digital innovations such as the national digital identity, e-payment, a sensor platform, urban mobility, cybersecurity, and digital inclusion). Already in 2015, NLB reacted to the challenges triggered by the Smart Nation program with its Libraries of the Future master plan. "Moving forward, libraries in Singapore must keep pace with the changing knowledge landscapes, technological advances, and the evolving demands and aspirations of our growing user population" (Kang and Koh, 2015, p. 2). One of the key principles of the Libraries of the Future master plan is capitalizing "on Singapore's Smart Nation programme to build more meaningful interactions with content and community" (Kang and Koh, 2015, p. 2).

Which role did libraries play in the transition process towards knowledge society in Singapore? Which role do they play nowadays in the smart nation? Our leading research question is: Which place do libraries have in the ongoing development of the knowledge society and smart nation Singapore?

10.2 State of Research

Mahbubani (2017, p. 311) is not overmodest; for him Singapore is "the smartest city on our planet." For Khveshchanka, Mainka, and Peters (2011, p. 111), Singapore is definitely a knowledge city as there are many knowledge-intensive institutions (as, for instance, world-class universities), a science park, business parks, and a network of libraries. Libraries, especially the libraries of the NLB, are vital building blocks of Singapore's development towards a knowledge society. Since about the millennium, "NLB has been frequently lauded as being a trailblazer of library innovations" (Gill and Siew, 2018, p. 36). For Mittermaier (2007, p. 7), there was even

a "library tourism", because in Singapore there were the "most modern libraries in the world." Scholars from all over the world published papers or even books on Singapore's library system, for instance, from China (Li, 2014), Japan (Miyahara, 2014), France (Bosc, 2008), or Germany (Hornidge, 2007; Mittermeier, 2007). The two library master plans, Library 2000 and Library 2010, led to various publications discussing the plans and their outcomes (e.g., Choh, 2008; Choh, 2011; Choh, 2014; Chellapandi, Han, and Boon, 2010; Sharma, Lim, and Boon, 2009; Tan and Foo, 2006).

We found 45 documents on Singapore' libraries on Web of Science, 143 hits on LISTA, and 69 documents on Scopus (and, additionally, 131 secondary documents, i.e. documents from reference lists, which are not directly available in Scopus) (search argument: Singapore AND librar* in title; as of August 22, 2018). These are hints for strong international research activities on Singapore's library landscape.

Our study excludes academic libraries (Cribb, 2017; Sabaratnam and Ong, 2013) as they only rarely cooperate with the publicly accessible libraries (under NLB). The reason for this lack of cooperation is structural. Additionally, academic libraries (apart from professional relations) similarly interact infrequently with other academic libraries in the country. Their funding institutions, i.e. the universities and polytechnics, compete with each other, and their respective library and its information literacy instruction courses are firmly competitive factors contributing to the institutions' success.

As research methods, we applied case study research on-site and literature review; we analyzed official documents, especially from the Ministry of Communication and Information (MCI) and its statutory boards Infocomm Media Development Authority (IMDA) and National Library Board (NLB), and, most important, we systematically studied the institutions' web pages.

10.3 "Knowledge Society" and "Smart Nation"

What do "information society", "knowledge society" and "smart nation" mean? "Information society" is mainly technologically defined; it is based on information and communication technologies (ICTs). A "knowledge society" is an information society as well; however, here

knowledge will be available for everyone at any time and any place. The economy in a knowledge society is driven by knowledge, called "knowledge-based economy".

Table 1: Singapore's Master Plans towards Knowledge Society and Smart Nation.

Plans	Years	Objectives
The National Computerisation Plan	1980 – 1985	Computerization of the civil services; development of IT industry and IT manpower
The National IT Plan	1986 – 1991	Electronic networks for government and private sector
IT2000	1992 – 1999	Transforming Singapore to an Intelligent Island
Library2000	1994 – 2000	Public library system; NLB; digital catalog for public libraries
Infocomm 21	2000 – 2003	Domestic and international connectivity; e-government (first steps)
Connected Singapore	2003 – 2006	Information harnessed in key sectors; education; e-government
Library2010	2005 – 2010	New online platforms; digital library; public libraries as learning spaces
iN2015	2006 – 2015	Intelligent nation; Singapore as a global center for knowledge, talent, and business
Smart Nation	2014 – (ongoing)	Digital government, digital economy, people's digital readiness

In a knowledge society or in a knowledge-based economy, knowledge itself is not an end-product. No one is able to live from knowledge alone. However, knowledge takes full effect if implemented in commercial or public products and services, in entire markets, and in industries. In such a way, "smart" products, "smart" services, "smart" industries, "smart" cities, and "smart" countries may emerge (Stock, 2011). For Mainka (2018), the "smart society" displays all characteristics of information and knowledge societies. Additionally, networks are growing and include the Internet of Things as well as open data; sustainability and health

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become important factors, and empowered citizens are engaged "in a more creative, innovative, and democratic future" (Mainka, 2018, p. 13). While the prototypical city of the fifth Kondratieff banks on ICT and especially the internet, the city of the emerging sixth Kondratieff cycle is guided by sustainability, the citizens, and their health (Mainka, 2018, p. 12).

In Singapore, the smart nation initiative is a "whole-of-nation approach to enhance the quality of living for the country" including government efforts to "co-create innovative people-centric solutions with the industry and citizens" (Hoe, 2016, p. 327). Co-creation does not only mean the adaption of, for instance, ICT in the citizens' "smart homes", but also the "smart participation" in the construction of city-related smart products and smart services, e.g. by attending hackathons (which, in turn, means that the citizens are able to code or at least to understand software development) (Ho, 2017). What is the development status towards a smart nation in Singapore?

10.4 Singapore's Way Towards a "Smart Nation"

Singapore is a tropical city-state located at the southernmost tip of continental Asia just about 100 km north of the equator (Figure 1). It is an independent country since 1965. In the 2016 ranking of world cities of the Globalization and World Cities Research Network (GaWC), Singapore is an Alpha+ city and is ranged in the third place behind London and New York City and ahead of the other Alpha+ cities Hong Kong, Paris, Beijing, Tokyo, Dubai and Shanghai (GaWC, 2016).

Singapore exhibits special conditions (Kiang, 2017): it is an island with limited land areas and very limited natural resources (there is not even potable water), it is simultaneously a city and a state, and it is entirely administered by a centralized and stable government (sometimes called a "soft authoritarianism"; Ho, 2017, p. 3112). "Singapore's small geographic size and unique political landscape allow for a highly sophisticated and efficient public infrastructure network (including the libraries, a/n) that supports the daily lives of its residents," Chellapandi et al. (2010, p. 40) emphasize.

Singapore's government focused on the development of a knowledge society and a knowledge-based economy since about 1980. As a country without natural resources and without a strong

manufacturing sector, Singapore has no other choice as to concentrate on trade (especially with its port) and on knowledge-based economy. From 1980 until today there is an uninterrupted sequence of plans towards a knowledge society (Table 1). "Singapore appears to be a KBE (knowledge-based economy, a/n) in a perennial hurry," Sharma, Lim, and Boon (2009, p. 92) state. From the very beginning of these development plans, libraries played a crucial role, as they manage knowledge (explicit knowledge in documents as well as implicit knowledge in bringing people together). "The Government of Singapore has strongly acknowledged the crucial role played by libraries in a KBE" (Sharma et al., 2009, p. 100). Consequently, Singapore's government drew up the two library programs (Library 2000, Library 2010).

Figure 2: The National Library Building in Singapore.

As a very young state, Singapore is still looking to establish a national identity. For instance, it is not clear who the "real" Singaporeans are: Foreign talents count as Singaporeans, do they (Ortmann, 2009)? Education reforms in Singapore will foster economic competitiveness, social

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equity, and national identity (Lee and Gopinathan, 2018). For Lin and Luyt (2014), the National Library of Singapore creates a sense of community and forms a building block of the national identity of this city state. A "sense of community" includes members' feelings of belonging, feelings that members matter to one another as well as to the group, and that members' needs will be met by the group (McMillan and Chavis, 1986). Indeed, there are close ties between NLB and Singapore's citizens. "Many individuals or organizations were actively involved in the transformation of the National Library of Singapore. Equally important, many individuals were deeply influenced by the National Library of Singapore" (Lin and Luyt, 2014, p. 665). Additionally, NLB provided Singaporeans "with a place of interpersonal contacts" (Lin and Luyt, 2014, p. 669). Singapore has a population of about 5.6m, thereof about 4m residents; NLB has about 2.4m members. Consequential, 61 per cent of all Singapore's residents are NLB members. Mean values for visits per member and year are 10.5 for physical visits and 32.3 for digital "visits" (i.e., downloads) (all figures from 2017). In international comparison, these values are very high and impressive. Using a "reach index", aggregating different indicators as unique physical visitors, active members, participants of programs, users of digital platforms, and volunteers (Lee, 2018), NLB is able to determine population segments that are well-reached and under-reached. Using marketing activities (e.g., Dresel and Kaur, 2010) deficits in awareness can be avoided. To conclude, NLB successfully created a sense of community.

One task of a library is the provision of information to help its community to transform this information into knowledge (Stock and Stock, 2015, p. 36). However, additionally a community space is needed, a so-called "third place", a (physical as well as digital) space besides home and work or school (Choy, 2007). The concept of a "third place" was introduced by Oldenburg and Brissett in 1982. "Third places are characterized in terms of sociability and nondiscursive symbolism" (Oldenburg and Brissett, 1982, p. 265), they are places outside the home and the workplace as, for instance, coffee houses and neighborhood taverns (Oldenburg and Brissett, 1982, pp. 268 and 281). Referring to Harris (2007, p. 145), "public libraries are in a unique position to become the next great good places, places where people can freely gather and interact." Not only books and other media are important for a library, but additionally the provision of spaces for its community (Mainka et al., 2013; Born et al., 2018). NLB actually

offers such third places. Considering the physical third place, the new environmental green designed building of the National Library of Singapore opened in the year 2005 integrating a reference library and the central public library (Sabaratnam and Ong, 2013). It is called a "knowledge icon located in the heart of the arts, cultural, entertainment and civic district of Singapore" (Hornidge and Kurfürst, 2011, p. 360). Since 2013, the National Library building hosts "My Tree House" being a green library for children "built with environmental sustainability in mind" (NLB labs, 2013). In the national library as well as in the regional and branch public libraries "the envisioned spaces for collaborative learning, brainstorming sessions and free discussion have systematically been created (i.e. cafes, group learning spaces, discussion corners, etc.)" (Hornidge and Kurfürst, 2011, p. 363). The libraries are located at frequently visited places in Singapore; 13 (out of the 26 public and regional libraries) are in shopping malls, and further five are integrated in community centers hosting sports centers, polyclinics, and retailers besides the library (Ho, 2018). Practical experiences at a shopping mall library indicate fostering community engagement and nurturing life-long learning (Abdullah, 2013).

Digital third places are realized via social media, e.g. library blogs or posts on Facebook; for example, the library@esplanade blog and Facebook page support information and discussion on performing arts (the Esplanade is a theater) or the library@orchard runs a blog about the design and lifestyle public library at Orchard Road (which is the major shopping belt and tourist attraction in Singapore). However, Hornidge and Kurfürst (2011, p. 360) critically mention that for cultural and legal reasons self-censored rather than open discussions are promoted.

NLB is engaging people from its community as volunteers at Singapore's public libraries (Siew, 2006). The "Friends of the Library", i.e., the volunteers, support several small libraries, organize some programs, or participate in the kidsREAD program (helping to develop the reading habit among children from less well-to-do families between the ages of four and eight).

The process of forming one of the best library systems of the world fostered not only a sense of community among Singaporeans, but "the library also facilitated the formation of a Singaporean national identity" (Lin and Luyt, 2014, p. 670). In the same way, the successful construction of a knowledge society, wherein the libraries are fully integrated, is mentioned as

a focal point of Singapore's identity (Hornidge, 2010). However, what is the present state of this library system and how will it develop further?
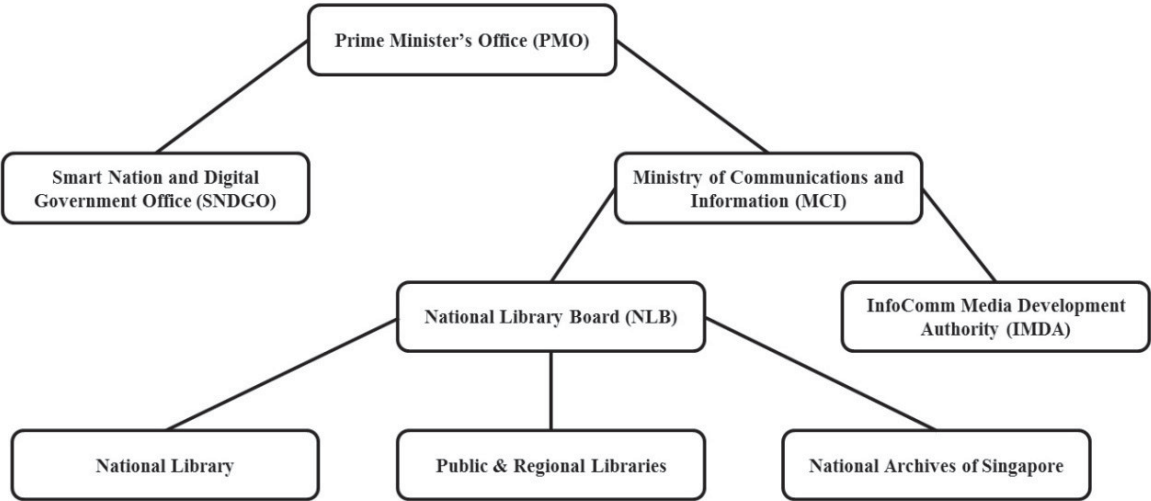
10.5 National Library, Public & Regional Libraries, and the National Archives

With the National Library Board Act (NLB Act, 2018), NLB is regulated by the government since 1995; it is by law the umbrella organization for three institutions, namely the National Library, the system of Regional and Public Libraries, and the National Archives of Singapore (Figure 3). In turn, NLB is (with its sister organization, Infocomm Media Development Authority, IMDA) an agency of the Ministry of Communication and Information (MCI). IMDA develops and regulates the converging ICT and media sectors, while NLB promotes library, information, and archival services. In order to include all Singaporeans in the knowledge society and the smart nation MCI oversees all activities concerning digital readiness (including digital skills, media literacy, cyber wellness, information literacy, and code for fun enrichment) (MCI, 2018).

Task	Legal foundation
Establishing and maintaining libraries; provision of library information services	§6(a)
Promotion of reading, encouraging learning	§6(b)
Provision of a repository for library materials published in Singapore	§6(c)
Acquiring and maintaining a comprehensive collection of library materials relating to Singapore and its people	§6(d)
Establishment of standards for the training of library personnel	§6(e)
Provision of advisory and consultancy services concerning libraries and information services	§6(f)
Compilation of a national union catalog and a national bibliography	§6(g)
Advising the government in library-related aspects	§6(h)
Provision of a repository of records of national or historical significance	§6(i)
Conduct of records management programs for the government	§6(j)
Conduct of oral history interviews, production of transcripts, preservation of the interviews	§6(k), §14J(2)
Examination of public records in any public office, classification of the records	§14A(2)(a)(b)
Conduct of archive-related publications, exhibitions and promotions	§14A(2)(c)
Establishment of a NLB endowment fund (for the provision of training programs for librarians, delivery of lectures, sponsorship for promotional programs, and financing of research on reading and librarianship)	§23

The Smart Nation and Digital Government Office (SNDGO) as well as the Government Technology Agency (GovTech) work directly under the Prime Minister's Office (PMO). SNDGO plans the Smart Nation projects, drives the digital transformation of government, builds long-term capabilities for the public sector, and promotes adoption and participation from the public and industry. GovTech is the implementing agency of SNDGO.

All institutions, which are concerned with Singapore's development towards a knowledge-based economy and smart nation, are organizationally located at the top of the country's government. This clearly shows the importance of this development path and its institutions for the nation. All major tasks of NLB's institutions are regulated by law (Table 2).

In the fiscal year 2016/17, NLB and its subsidiaries (the "group") have had expenditures of SG-$271m (about US-$ 196m) and income from investments, rents, consultancy, professional library services, etc. of SG-$38m (US-$27.5m), and, additionally, grants of SG-$236m (US-$171m) (NLB, 2017, Financial Report, p. 11). As New York City is the world city just in front of Singapore (GaWC, 2016), we are going to compare NLB's financial situation with the statement of the New York Public Library (NYPL); however—in contrast to NLB—NYPL does not run the city archives. Also in 2016/17, NYPL have had expenses of US-$319m, self-generated income of US-$102.5m, and grants of US-$195.5m (NYPL, 2017). NLB Singapore has less self-generated income (only about 27% of NYPL's figures), less grants (88% of NYPL's grants); however, also considerably less expenses (only 61%).

NLB's activities are guided by the smart application of technologies and standards. This includes physical techniques as the optimization of the library distribution network through pre-sorting of media at individual libraries and searching for the shortest vehicle routes (Li et al., 2013). As it became clear that the Resource Description and Access (RDA) rule book became a standard on a global scale, NLB quickly decided to implement RDA (Choi, Yusof, and Ibrahim, 2014). Singapore's libraries started early using digital technologies as, for instance, the application of radio frequency identification (RFID) for the location of books (Ramchand, Devadoss, and Pan, 2005). NLB experiments with shelf-reading robots (equipped with an RFID reader) in order to identify books located in the wrong place (Basu, 2016). To connect documents from different sources (e.g., from the library catalog and one of the image databases), NLB banks on RDF (Resource Description Framework), URI (Unique Resource Identifier), and linked data (Hussein, 2015). Heok and Luyt (2010) report about early on-site internet access in Singapore's public libraries.

Often public sector organizations are called dysfunctional, bureaucratic, and inert. NLB is a public organization. However, in contrast to many public services, Heracleous and Johnston

(2009) call NLB an inspiring example for private businesses. They praise the internal organization (human resources practices, the reward system, customer feedback, and the performance management system) as well as the offered services (for instance, digital reference, called "cybrarian service", and assistance in the library, called "concierge service"). Over the years NLB has received a number of prestigious awards in customer service, innovation and human resources, benchmarking against international world class leaders as a testament to continuous excellence. The Public Libraries have changed into a "lifestyle library" system equipped with cafes, music, multimedia, concerts, and is located in central urban spaces as well as in shopping malls. There are three lessons private companies can learn from NLB, namely (1) technology use: "With regard to re-invention, the NLB has leapfrogged competing offerings and re-defined what the public library industry should be about (using RFID, multi-media offerings, SMS service, self-service libraries, etc.);" (2) strategic change: "The NLB has redefined both librarians' as well as citizens' view of libraries should be about; no places where librarians safeguard books and tell everyone to keep quiet, but welcoming places for the public facilitating knowledge exploration in an engaging way and for businesses helping create and share knowledge through 'knowledge communities';" and, finally, (3) sense of competition: NLB "knew that citizens have choices about how to spend their leisure time, and it wanted to be near the top of the list of these choices; even where no direct competition was apparent" (Heracleous and Johnston, 2009, p. 376 f.). What is the reason for such a success story? What are NLB's resources? What services and programs does NLB provide?

10.6 Services

Using most of NLB's services and programs requires a membership. However, basic membership (with loan quotes of eight library items, including three audio-visual materials, in a loan period of 21 days) is free for Singaporeans and permanent residents. The Premium Plus membership with a fee of SG-$42 (about US-$30) p.a. permits higher loan privileges.

In our article, we distinguish between services and programs. We understand "Services" as activities in the long run, which are strongly associated with the institution, its vision and its tasks. We are going to briefly describe the following services of NLB:

- OneSearch and the NLB App,
- Reference and Information Services of the National Library,
- Singapore Memory Project,
- Oral History Interviews (@Archives Online).
- Other (e.g., Newspaper SG, Singapore Infopedia, MusicSG)

Physical and Digital Resources at a Glance

However, in the first place we should describe NLB's resources. In 2017, the physical collections contain about 7.5m books and other media; in the digital collection there are 0.7m e-books. Additionally, NLB hosts 1.3m Singapore-related materials. The digital collections include fiction and non-fiction books, e-magazines, e-newspapers, and databases from online aggregators (as, for instance, ABI/INFORM, EBSCOhost, JSTOR, ProQuest, and—especially relevant for circles of interested people in LIS—the full text database Library Literature & Information Science). Most important resources in the public libraries are Overdrive (e-books) and PressReader (newspapers and magazines).

All NLB members are able to return borrowed materials at any library in Singapore. The digital resources can be accessed from home or work place and—of course—at all libraries. There is additional access to local e-newspapers and further databases inside the libraries, for instance, Factiva or Bloomberg professional service (the latter only in one library).

For NLB, their users are prosumers, they may consume services and programs provided by NLB, and they may contribute to the services by own material (for instance, photos or music pieces for the digital archives) (Wah and Choh, 2008). All self-created digital resources are packaged on an own microsite, but also available on Google (Wah, Davasagayam, and Choh, 2009), which was a great success: "From a small number of 400 accesses a month in Nov 2006 when the content was only accessible through the NLB's digital library, we now get 150,000 accesses a month in Mar 2008" (Chow, 2008, p. 7).

OneSearch and the NLB App

OneSearch is a retrieval system that allows searching for all (physical and digital) resources of the National Library Board (NLB), the digital collection of the National Archives of Singapore (NAS), and further public libraries as well as online archives and databases (Tang, 2015).

The system supports "Exact Phrases", via placing quotation marks around the search phrase, and Boolean operators like "OR" to expand a search or "NOT" to narrow a search. Furthermore, there is an option to use the advanced search. On the advanced search one can search for terms in exact search fields: keyword, title, creator, publisher, subject, or categories of content. The content is divided into nine different categories, namely books, magazines as well as articles, audiovisuals, images, newspapers, records and papers, websites, physical objects, and e-journals (Figure 4a). After searching for the query terms one may use refine filters (e.g., type, collection, subject, language, publisher, etc.) to modify and reduce search results. The filters are shown in a list on the left side and are applied by simply clicking on it. Also, one may sort the search results by relevance, date, title, or creator (Figure 4b). Everyone is able to search for resources without being logged in. But, for access of some content (home access is limited) users have to be logged in.
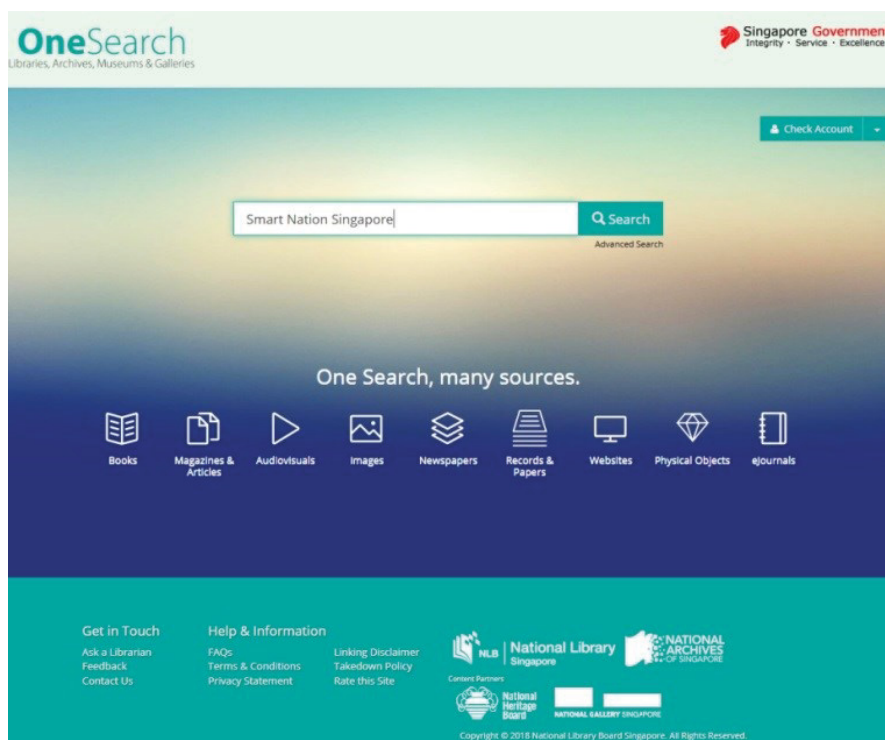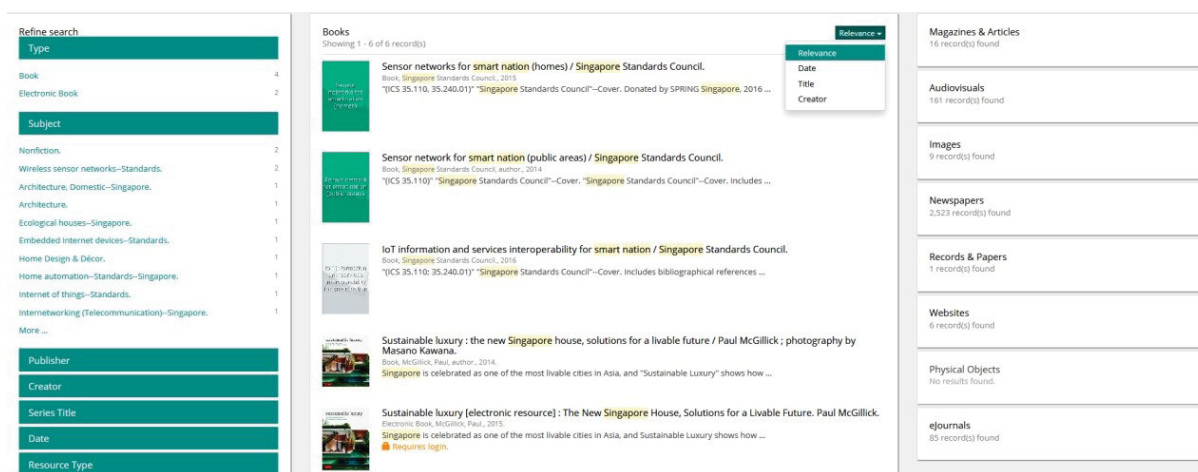
Figure 4: OneSearch: (a) Search Interface, (b) Results Presentation (Excerpt).

As Singapore is a multi-lingual country and names (of persons, organizations, and places) are spelled differently in the respective languages, NLB runs a controlled vocabulary for all named entities (Tang, Hong, and Jailani, 2018). Since 2016, OneSearch supports Named Entity Recognition (NER). To detect the names besides intellectual efforts, automatic NER is applied on unstructured data (from, for instance, Singapore Infopedia) and metadata (from digital

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catalogs) (Goh, 2018). Additionally, NLB applies linked data technology to bring different data sets together (Hussein, 2015).

<table>
<tr><td>(a)</td><td>(b)</td><td>(c)</td></tr>
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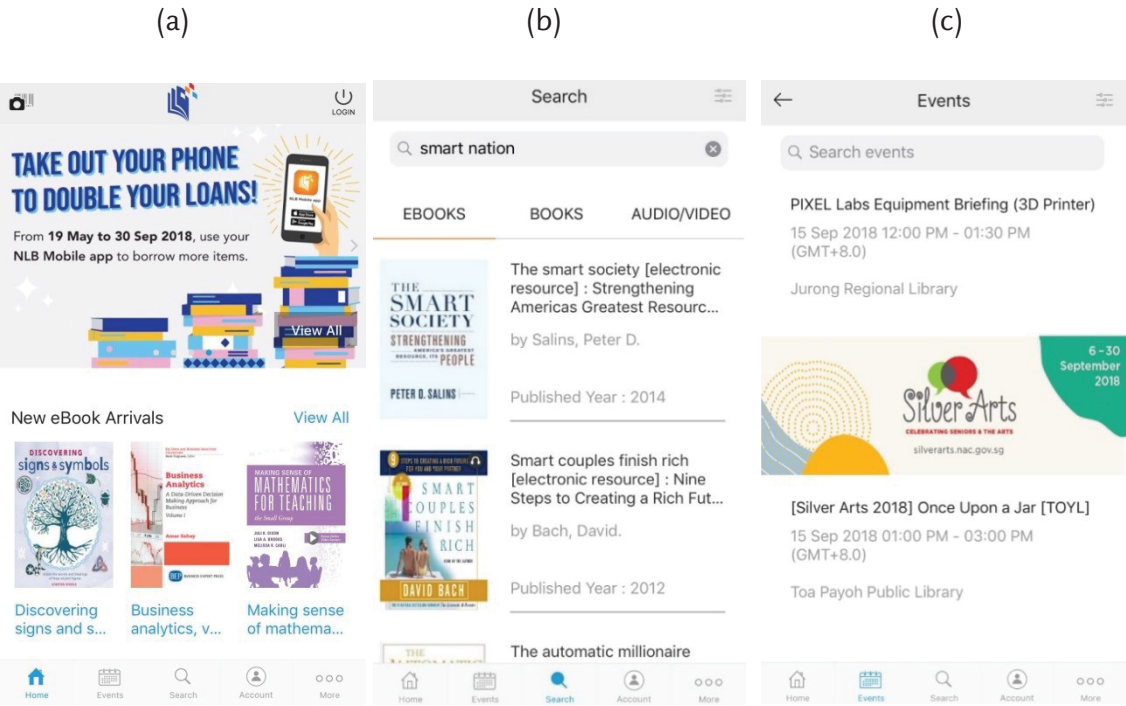
NLB provides a mobile application, called "NLB Mobile" (Figure 5a), which is available for iOS as well as Android systems. Following Lee (2018), 4.1 per cent of Singapore's residents are using the NLB mobile app. Through the app users are able to get access to digital resources as well as library and account information. Everyone can search for resources of the NLB (Figure 5b) and check their availability in all supported libraries. The retrieval system supports advanced search to search for specific kinds of terms (title, author, subject, language, or e-book type). An important feature of the app is the barcode scanner that allows customers to scan and borrow library materials on the spot, skipping the step of having to queue up to use a borrowing station. Furthermore, one may browse through and search for events (Figure 5c). It is possible to refine the search for an event through several filters, like date, venue, or category (e.g. arts, business, children, heritage, etc.). Also, users are able to view a map or a list of all supported libraries and their corresponding information, for instance opening hours or the distance from the user's actual position. Registered users have an account with the opportunity to create additional profiles for family members. They have an overview about their

transactions, loans, and reservations. Also, users have the opportunity to pay fees in-app. The NLB has additionally its own prepaid system which is called "NLB Prepaid".

One may borrow audiobooks and e-books in the app to read on the go, too. The e-books are automatically "returned" after 21 days. Additional functions are a bookmarking system by tagging resources as favorites or sharing a resource on a social networking service (SNS) as Facebook or Twitter, or with the help of a messaging service as WhatsApp. Furthermore, the app supports the function to recommend a resource's title for new acquisitions, to give feedback, and to view frequently asked questions.

Reference and Information Services of the National Library

The Lee Kong Chiang Reference Library is a resource for works on or about Singapore and the region; it is part of the National Library and is located on seven levels in the National Library building (Law, Gao, and Ng, 2009). The users may browse through more than 600k books and non-print materials. Additionally, they find access to databases, a document delivery service, reprography, microfilm, other audio-visual media, and—of course—professional reference assistance. In contrast to NLB's public libraries, the reference library primarily addresses users with information needs concerning research or self-improvement. The reference library runs a call center, called "Reference Point" (Chaudhry and Jeanne, 2004). Reference Point is a local hotline for information (especially about Singapore) and provides reference services via e-mail. The National Library offers a training program for its reference librarians (Loo et al., 2014) including topics as reference work, knowledge in a subject area, collection politics, and social engagement.

Singapore Memory Project

The Singapore Memory Project is a nation-wide initiative "to enable the cultural and intellectual memory of Singapore to be collected, organized, preserved and promoted for research and discovery" (Chellapandi et al., 2010, p. 47; see also Foo, Tang, and Ng, 2010). The project gets its documents through crowdsourcing. "Personal memories are crowdsourced from the public on a national scale in both physical and digital formats. SMP is interested in acquiring all personal memories that relate to Singapore, be they past or present memories, and whether

they are contributed by citizens or non-Singaporeans" (Tang, 2013, p. 5). In 2018, more than 1m memories (i.e., Singapore-related stories, images, videos, or drawings) were added by citizens and (in some cases) by the National Archives themselves.

(a)

(b)

Figure 6: Singapore Memory Project: (a) Results List, (b) Document Display.

For Rickum (2016, p. 34), the Singapore Memory Project is an impressive example of inter-cultural memory and metropolitan library work. Following Gonzaga (2018), the archival project is a sign for certain nostalgia, epitomized by the longing of life in the *kampong*, the (now non-existent) traditional Malay village in Singapore's early days, and the nowadays lost *kampong* spirit.

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Figure 7: Exemplary Map from the Online Service of the National Archives of Singapore.

Figure 6 exhibits an example of a search process on the Singapore Memory Project. We looked for "Singapore Sling", a cocktail originated in this country. We arrived at 13 hits (Figure 6a) and took a look to one of the documents (Figure 6b). The photo is result of crowdsourcing; however, also the user may contribute to the further development of the database by work on tags (we added the tag "cocktail") and comments—crowdsourcing again.

Collections of the National Archives and Oral History Interviews

Founded in the year 1968, the National Archives of Singapore (NAS) is an institution under the umbrella of NLB since 2013. The archive collects Singapore-related video and sound recordings, government records, maps (for an example see Figure 7), photographs, posters, speeches, and private records. The NAS is going to digitize their collections of audio and video documents in order to foster their (online) use (Phang and Soh, 2017).

One of NAS's tasks—even by law (Table 2)—is the conduct of oral history interviews (NLB, 2017b). The archive offers a remarkable collection of such interviews, presenting Singapore's history, politics, trade and culture from the individual perspectives of the interviewees. All in all, the National Archives collected about 23,000 hours of recordings with personal recollections from more than 4,100 people. From those about 17,000 hours of interviews are available online, all other only in the National Archives' building. As only a quarter of all audio or video clips are transcribed, volunteers may contribute to the Citizen Archivist Project by transcribing speech to written text. If available, the transcript will be presented to the user as a (non-printable) e-book.

Other Services

Arisen from the project Flickr SNAP (Singapore National Album of Pictures) (Hoon and Pwee, 2009), *PictureSG* is a collection of photographs and artworks on Singapore. It includes complete collections as, for instance, from Lee Kip Lin (about 18,000 photographs) or from the Singapore Children's Playhouse (1,500 images). *Singapore Infopedia* (Chellapandi et al., 2010, pp. 44 f.) is a collection of articles on Singapore, its history, culture, people, and events, edited by reference librarians of NLB. *NewspaperSG* (Chellapandi et al., 2010, pp. 45 f.) is a historically oriented bibliographical database of articles published in Singaporean newspapers as "The Straits Times", "The Singapore Free Press and Mercantile Adviser" (published between 1884 and 1942), "The Business Times", and "Malayan Tribune". Only articles from selected sources and the time between 1831 and 2009 can be read online from home. As all 24m documents are stored on microfilm, the facsimile of all newspaper articles is available on reels at the Lee Kong Chian Reference Library. *MusicSG* is a digital archive of music composed by Singaporeans

(Loh, 2014). It covers all musical genres. For all music pieces, there are 30 second previews, lyrics (insofar applicable), and metadata. For copyrighted material, the full form of the music piece is only available onsite in one of the libraries. There are lots of further services as, for instance, *PublicationSG*, a catalog of Singapore-related material on NLB, or *BookSG* being an online collection of digitized books (including rare and historical imprints) on Singapore and Southeast Asia.

10.7 Programs

"Programs" are short-range activities (only for some years) with a specific thematic orientation. NLB runs a lot of programs; we will mention only two important ones:

- READ! Singapore, and
- Digital literacy instruction programs (e.g., S.U.R.E.)

READ! Singapore

Besides activities of school libraries (Loh, 2016; Loh et al., 2017), there are further projects to improve the literacy of all Singaporeans. Having in mind that Singapore has an excellent education system leading to top scores in, for instance, the Program for International Student Assessment (PISA), for *READ! Singapore* "reading" means a culture of dealing with fiction among Singaporeans. There is a long tradition of NLB to engage people for reading, e.g. the *Readers for Life* strategy with specialized initiatives for preschoolers (kidsREAD) and older children (Young Read! Singapore) (Rajaratnam, 2013). "Promoting lifelong reading and learning remains the core of the National Library Board's mission. It lies at the heart of the many programmes, events and content that the National Library, Public Libraries and National Archives of Singapore have created over the past year" (NLB, 2017a, p. 3). Presented in Singapore's official languages (i.e., English, Chinese, Malay, and Tamil), READ! Singapore features book discussions, meet-the-author sessions, book clubs, writing workshops, storytelling sessions, and book-derived workshops. Additionally, there are specialized programs to foster the reading competency especially for students (Read@School) and for the elderly (Luyt and Ann, 2011).

Digital Literacy Instruction

In June 2018, Singapore published the Digital Government Blueprint (GovTech Singapore, 2018) stating to aim for 90-95 per cent of government transactions to go digital by 2023. The goal is an adaptable and effective government that is "Digital to the Core, and Serves with a Heart" (GovTech, 2018). This phase of government digitalization is in tune with Singapore's vision of a smart nation. But for Singapore to become a smart nation, smart citizens are needed. A digital government can only function if all citizens really want and are able to participate. Therefore, Singapore has to prepare its citizens by not only providing access but also equipping them with the skills necessary to utilize digital (government) services and fully participate in this transformed, digital society. Two terms often mentioned in this context, are *digital readiness* and *digital inclusion*.
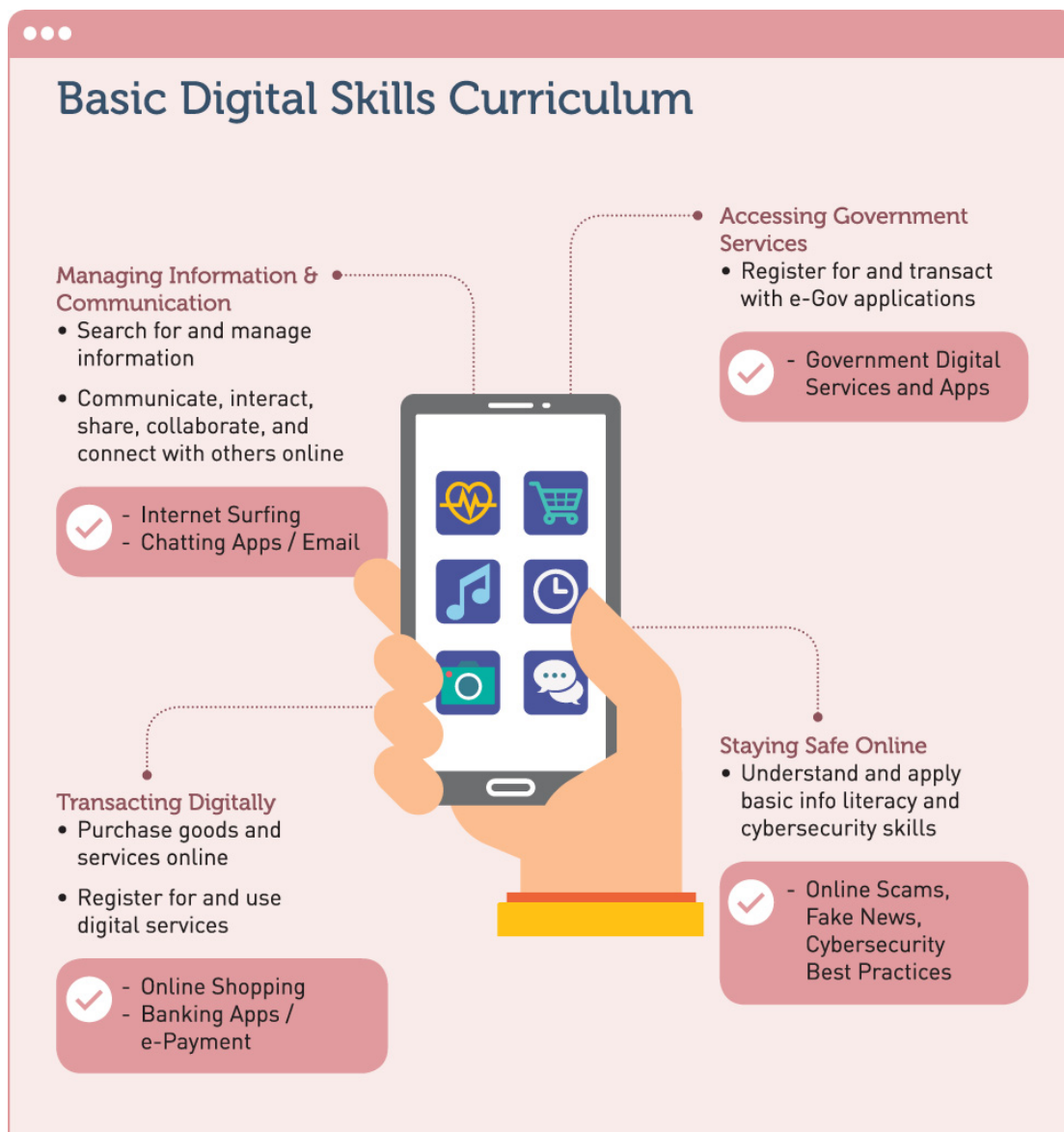
Figure 8: Basic Digital Skills Curriculum from the Digital Readiness Blueprint 2018 (*Source: MCI, 2018b*).

In this matter, the Ministry of Communications and Information (MCI) has established the Digital Readiness Workgroup in 2017 to collaborate and formulate strategies. They launched the Digital Readiness Blueprint to give (MCI, 2017a) recommendations on how Singaporeans can become "digitally ready" to build a smart nation. Digital readiness is defined as: "a) having access to digital technology, b) having the literacy and know-how to use this technology, and c) being able to participate in and create with this technology" (MCI, 2017a, p. 10). The Digital Readiness Workgroup recommends ensuring that all citizens have access to digital technology, the necessary digital skills, and the ability to participate in digital life. Regarding digital skills,

they identified a set of basic skills (e.g., internet surfing, e-mails, e-payment, cybersecurity) that should be promoted among citizens (see Figure 8) but also emphasize the importance to "focus on information and media literacy, to build resilience in an era of online falsehoods" (MCIa, 2017). Here, it should be noted that the Info-communications Media Development Authority of Singapore (IMDA) defines digital literacy as "the ability to use, create and share digital content safely and responsibly" (IMDA, 2017b) which includes technology competency, information literacy, and media literacy.

Furthermore, the Blueprint stresses the value of the digital by design principle, and designing digital government services to be as easy to use as possible, which ensures that all government services support digital inclusion. The goal is for every single citizen to be able to participate. In his speech during the MCI Workplan Seminar 2018, S. Iswaran, Minister for Communications and Information, explains why it is that important: "While MCI can do much to create exciting opportunities in the digital economy, it will be meaningful only if all Singaporeans are able to share in this progress. (...) Ultimately, our progress as a nation must be measured not just by our economic achievements, but also by how well we ensure that all Singaporeans are able to partake of the benefits" (MCI, 2018b, par. 28-29). He also emphasizes the crucial role libraries play in an inclusive digital transformation of Singapore: "Our libraries are social levellers—they provide access to lifelong learning opportunities to keep up with changes in the digital economy and society" (MCI, 2018b, par. 40). The public libraries of Singapore provide not only access to information but are also perfectly positioned to provide the necessary support and education for using it. And, although they have evolved into "community institutions" meeting many and important community needs, Thomson et al. (2015, p. 133) state, that for a public library "digital literacy and digital inclusion remain at the center of all of initiatives."

Singapore on the one hand identifies "having a digitally literate population" as one of their strengths in regards to building a successful smart nation (SNDGO, 2018b) but on the other hand admits "a pressing need for greater awareness of media and information literacy skills so that Singaporeans are able to discern, evaluate, and manage information in an increasingly complex digital environment" (MCI, 2017a).

What is the actual state of information literacy (IL) in Singapore? Mokhtar et al. (2013) and Foo et al. (2014) found there are still problems with the information literacy level of Singaporean people (as elsewhere in the world as well). Foo, Majid, and Chang (2017) investigated the information literacy skills of Grade 5 students in Singapore. Out of a maximum of 100, the overall mean score was only 53.39, i.e. a little bit more than the half. Girls (mean: 55.38) scored slightly but significantly better than boys (mean: 51.50); students with internet access at home (mean: 53.67) scored significantly better than students without access (mean: 45.81). "Having internet access appeared to be distinctly advantageous for such students as they have more opportunities in engaging in information seeking activities, reading, researching and using information" (Foo et al., 2017, p. 346). However, also the value of students with internet access is not that high (scores above 60 or 70 are seen as adequate). The authors conclude, "the overall weak score signals a need to reassess all IL-related initiatives" (Foo et al., 2017, p. 348)—be it at Singapore's schools, its universities and polytechnics, or at its libraries.

Information literacy education is one of NLB's main goals. Over the last years, and in tandem with many other initiatives, NLB has established several services and programs to raise awareness and competence among their patrons. As early as 1997, NLB conceptualized an information literacy program (Choh and Munoo, 2005) because "information literacy has emerged as a critical skill in the Internet-based knowledge economy" (Narayanan and Munoo, 2003, p. 1). In this year, Singapore's Ministry of Education published the Information Literacy Guidelines as well as the Masterplan for ICT in Education. Singapore's first information literacy program was announced in 2001. The National IT Literacy Programme (NITLP) was launched with the goal to equip 350,000 Singaporeans with basic computer and internet skills. The National Library Board belonged to the 22 Authorised Trainings Centres (ATCs) (IMDA, 2001). In September 2002, the Infocomm Development Authority of Singapore (iDA) organized "the Great Singapore Surf". At this mass IT training event 10,000 citizens attended to learn basic computing and internet skills. After that, during Infocomm Literacy Month, an island-wide training program was available at 13 ATCs (IMDA, 2002).

The Silver Infocomm Initiative was launched in 2007 to "to promote IT awareness and literacy among seniors so that they can be actively engaged in the digital age" (iDA, 2015). Today, NLB has partnered with IMDA and offers basic computer and internet classes, e-entertainment and social communications sessions (NLB, 2018b). There is also the Seniors Tech and Read (STAR) program at public libraries in Singapore since 2017. Here, participants of ages 50 and above get one-to-one assistance with library-related technology problems (e.g., using the NLB Mobile app) from a volunteer (MCI, 2018). For other questions, for example using WhatsApp and Facebook on the smartphone, or connecting to a Wifi hotspot, seniors can visit the libraries' Digital Clinics (IMDA, 2018). Indeed, senior citizens are often mentioned when discussing the digital divide or digital inclusion. But social and digital exclusion are complex and multi-layered problems, and there are more influencing factors than age—such as education, disability, employment status, or motivation (Helsper, 2008). Therefore, digital literacy and inclusion programs should not only focus on older generations.

Singapore's National Information Literacy Programme (NILP) "aims to raise public awareness on information literacy skills in today's complex information landscape" (MCI, 2017b). They launched S.U.R.E. in 2013 to "encourage Singaporeans to adopt good information literacy practices." S.U.R.E. is an acronym for "Source – Understand – Research – Evaluate" and is NLB's state-wide initiative to foster people's information literacy (Tan, Pin, and Ten, 2014). "The mastery of information literacy (IL) skills hence becomes extremely critical to the current generation of information users, as IL capacity affects users' lifelong competency to reason, to think critically, and to take in varied information from numerous sources to synthesize it for their own needs" (Tan et al., 2014, p. 2). The four steps of a "simplified" IL include

- Check whether the information source is reliable,
- Understand the context of the information,
- Research into other sources to verify the accuracy of information, and
- Evaluate the best way to use the information (Tan et al., 2014, p. 3).

Goals of this program are, for instance, to increase public awareness of IL, the production of learning resources for teachers, and to groom expert information seekers (via S.U.R.E. club activities). Additionally, S.U.R.E. provides guides for NLB services as NLB e-resources, NLB mobile app, NewspaperSG, or Singapore Infopedia.

Furthermore, NLB plans to introduce almost 6,000 digital readiness and future skills programs over the next five years, to "to infuse digital literacy into Singaporeans' everyday life—to build interest, confidence and capability in digital adoption and creation with tech" (MCI, 2018b).
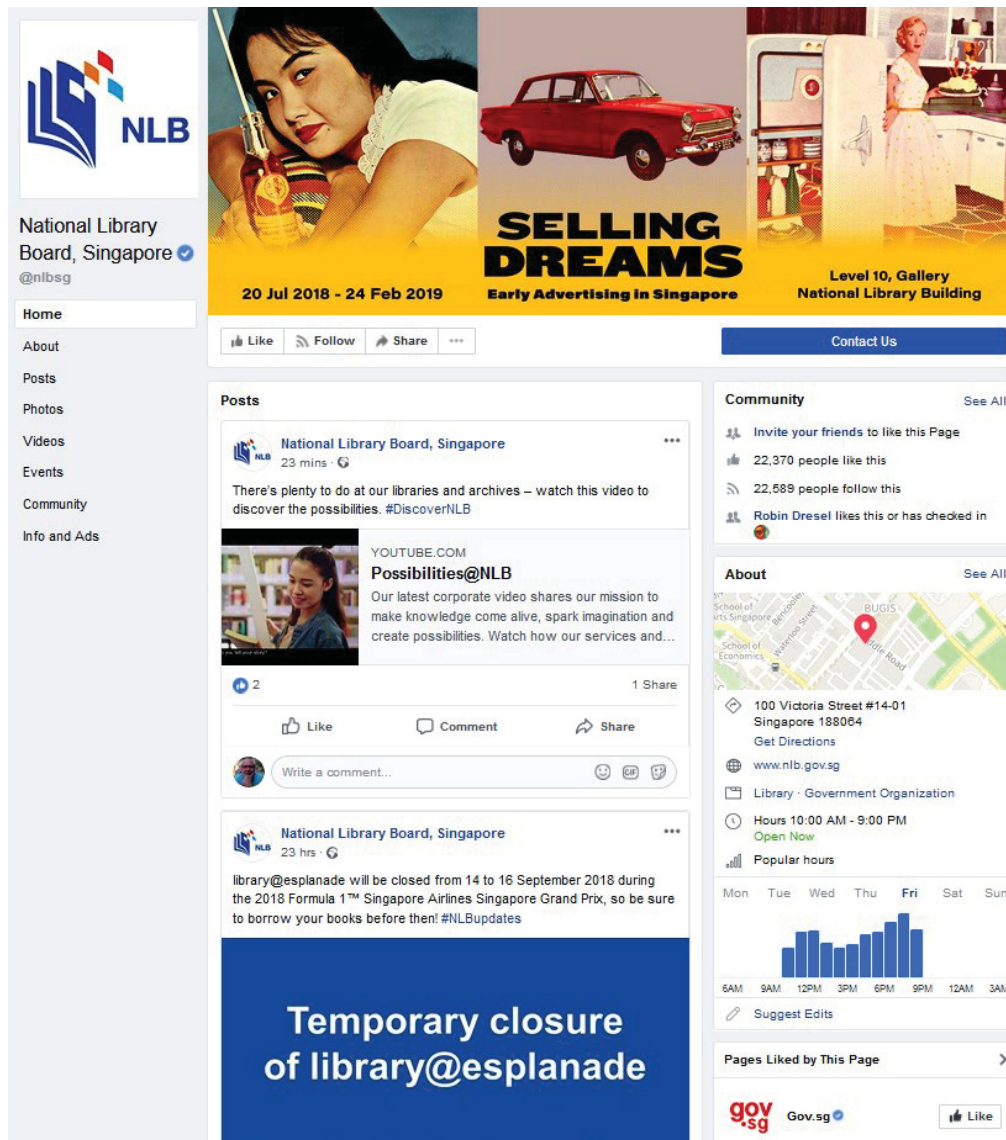
Figure 9: Screenshot of the NLB Facebook Page.

10.8 Social Media Services

In a country where social media is a part of everyone's daily life, as 96 per cent of Singaporeans own at least one social media account and spend a daily average of 2 hours 27 minutes on them (Lee, 2018), NLB utilizes social media platforms to a great extent.

NLB adopted social media early on. The first entry on its blog titled HighBrowseOnline (now inactive), which focused on book reviews is dated on the 22nd October 2005 (Dresel, 2012). At

the end of 2011 the libraries handled eight blogs, four Facebook sites, one picture platform, and a Twitter account. Some of the former blogs were, for example, Read And Reap, where interesting small parts of a book are published to start discussions. Y.O! was a blog focused on teenagers, with the themes ranging from music to sports and of course, reading. The most popular blog was ASK!, on which people could ask all sorts of questions, for example "how can I get the best airplane seat?" (Dresel, 2012).

NLB's Facebook page (Figure 9), @nlbsg, which publishes the latest news about the NLB, is still active, as well as their Twitter account @NLB. The libraries at Esplanade and Orchard have active blogs (library@esplanade, library@orchard) as well as their own Facebook accounts. A blog called Librarian's Blog dedicated to the younger readers on the website discoveRead updates on the latest events for children in the library, tackles social issues like cyberbullying, or gives book recommendations.

Furthermore, the National Library, additionally to their Facebook account @NationalLibrarySG, handles an Instagram account, @nationallibrarysg, and even has its own YouTube channel, launched in April 2017, called National Library Singapore. On the National Library's YouTube channel one can find (140, as of October 2018) educational videos teaching how to use academic databases or how cross-referencing and citations work, show interviews with experts, as well as information on current exhibitions and book collections. On its Instagram page historic pictures of Singapore and information on current exhibitions or books are shared.

The Public Library also has their own Facebook page (@publiclibrarysg), Twitter account (@PublicLibrarySG) as well as Instagram account (@publiclibrarysg), where book recommendations are shared. The Twitter account also focusses on interactions with the readers and encourages them to participate in polls, for example.

The NLB programs are also represented on social media. For example, the Singapore Memory Project (irememberSG) even has six accounts (Facebook, Twitter, YouTube, Instagram, Pinterest, and a blog). There are also Facebook and Twitter accounts for READ! Singapore and S.U.R.E., as well as a YouTube channel for READ! Singapore.

All in all, NLB puts great emphasis on realizing the digital third places by using social media accounts that are accessible to everyone. The wide range of different social media forms, e.g. Instagram and YouTube (584 videos of NLB, and, as mentioned, additional 140 videos of the National Library), which are generally more popular with younger users, as well as more traditional services as Facebook and Twitter, makes sure to reach all generations in Singapore. However, the number of users of the social media accounts is rather low (Table 3). In comparison to the New York Public Library (NYPL), only the Singapore Memory Project on Facebook makes a good score. Here is still room for improvement for all NLB institutions to reach (much) more people in Singapore via social media.

Table 3: Social Media Outreach of NLB Institutions (as of Sept 7, 2018).

	Facebook Likes	Instagram followers	Twitter followers
NLB	22,370	---	33,800
National Library	46,946	4,530	---
Public Libraries	29,844	9,628	7,886
National Archives	---	---	---
library@esplanade	3,303	---	---
library@orchard	3,135	---	---
irememberSG	241,608	17,800	10,100
For comparison: NYPL	280,000	277,000	2.5m

10.9 Open Innovation, User Participation, and Design Thinking

Open innovation considers both, importing external ideas into an institution's knowledge and innovation processes as well as exporting its experiences to others. Chesbrough (2003) was the first who introduced open innovation into research. In library environments, open innovation is often called "design thinking." One crucial aspect of librarian design thinking is the active participation of the library's stakeholders, primarily its users.

Henkel et al. (2018) distinguish between user participation on a large scale (for instance, planning new library buildings) and on a small scale (e.g., slightly modifying an existing library service). In Singapore, small scale user participation for information inflow can be found in the NLB's crowdsourcing projects. For the Singapore Memory Project citizens may archive all kinds of Singapore-related documents, for PictureSG images on Singapore. For MusicSG, composers and musicians may contribute with their own musical artworks. In the Citizen Archivist Project (Ming and Masramli, 2016) volunteers act as citizen researchers as they transliterate newspapers, transcribe and translate record labels, transcribe audios, describe photographs, and transcribe handwritten documents. NLB cooperates not only with its users, but also with other libraries (e.g., in the ASEAN digital library) and with private companies (as, for instance, with Singapore Press Holdings for NewspaperSG or with various vendors for eReads) (Pak and Kia, 2015).

Concerning successful information outflow, NLB offers data and services for open access, enabling external parties to create innovative applications and mash-ups. This service was first conceptualized based on feedback and interest expressed by information service providers. For Web developers, data are accessible via API (Henkel et al., 2018).

User participation on a large scale takes place on large single projects. The Libray@Orchard has been planned with the help of people who worked or lived at Orchard Road (including over 100 in-depth interviews) as well as of (more than 1,000) users who attended at a prototype exhibition (See, 2015). Additionally, co-creation sessions with identified stakeholders were conducted and the designs were further refined and developed (Koh, Kang, and Chan, 2015). Before starting the planning of re-opening the Sembawang Public Library, a total of 70 people were interviewed in the library. "The comments received formed the basis of key ideas in the library's design" (Koh et al., 2015, p. 7). NLB plans to revamp its public libraries progressively, and will continue to design the new libraries in a way that they are responsive to the community and to the user needs. With each newly designed library, NLB is going to learn from the experiences from each library in order to improve the design and the services of the next library (Koh et al., 2015).

In our informed estimation, design thinking can be very successful, but it requires a lot of training in advance and, above all, a lot of time to understand the users, and additionally a lot of the users' time to collaborate with the librarians. Indeed, time is the sticking point, because librarians as well as users have to be able to afford the time. Without sufficient time, the design process can quickly end in an exercise that serves only to justify some old ideas. Furthermore, it takes courage on the part of the management to get involved in new insights and to test out the corresponding suggestions.

NLB designs open innovation projects for a win-situation for all partners, including the NLB itself, organizational partners, and citizens. It is essential for NLB's libraries to ensure "that stakeholders support the library" (Choh, 2014, p. 156).

10.10 Conclusion

Now we are prepared to answer our research question. NLB is politically recognized as an essential building block of Singapore's knowledge society and smart nation. "Libraries that are better structured to contribute towards the nation's development come from countries where governments are aware of the importance and contribution that libraries can make to their countries' development. In these instances (and Singapore is definitely such a country; a/n), investing in libraries, as the nation's informal arm of education, is tied to the need to improve the literacy levels of their people" (Gill and Siew, 2018, p. 37). Singapore's politics and government strongly supports NLB through two important pillars, namely (1) the legal pillar (NLB act) and (2) the organizational pillar (NLB's prominent position in the hierarchy of political and governmental institutions).

Are there any serious prognoses for the future development of NLB? There are political statements and visions. Taj (2016) mentions one major asset of NLB's longevity: "It's that libraries are not just about books. If anything, they're about communities. Spaces for people to meet, share ideas, and form memories." "We are part of their (the Singaporeans, a/n) lives," Elaine Ng, NLB's CEO, adds (in Taj, 2016). The then Minister for Communication and Information counts the merits of Singapore's libraries—today and in future:

- Libraries as exemplars of digital transformation,
- Libraries as community spaces for lifelong learning,
- Libraries as facilitators of digital readiness, and, finally,
- Libraries as anchors of the heritage (Ibrahim, 2018).

Singapore's libraries fill physical as well as digital spaces for the acquisition of knowledge, for learning, entertainment, and community development and maintenance. In a highly aggregated indicator of public libraries' services in informational (i.e., smart) world cities (Born et al., 2018, p. 192), Singapore is ranked in the fifth place (out of 29 analyzed libraries) only slightly behind the North American libraries in Toronto, San Francisco, Chicago, and Vancouver. In comparison to an older ranking by similar criteria (Mainka et al., 2013, p. 312), Singapore climbed up two ranks in the international comparison. The study of Born et al. (2018) was conducted in early 2017, as there were no self-produced maker spaces in NLB's libraries (which was one of the main criteria of the indicator). However, the first maker space in an NLB library (PIXEL labs@Jurong Regional Library) was introduced in 2015, conducted by Infocomm Development Authority (iDA) as a component of IDA's partnership with NLB. And, in the meanwhile, in Tampines Regional Library we could identify additional maker spaces (equipped with, for instance, 3D printers and green screen technology), meaning that Singapore's libraries now would receive more or less the same scores as the top North American libraries.

In addition to formal education in schools, NLB provides informal learning spaces for the entire population of Singapore. There is access to knowledge resources from the homes or work places (via the digital space) and physically onsite in the library buildings. Most of the public libraries are integrated in shopping malls or community centers, which is of great advantage of the users as they may combine shopping and other activities with library visits. Some of NLB's institutions work with social media in order to strengthen their outreach and user participation. NLB's libraries fulfill the tasks of being a third place next to home and work.

We have to highlight that resources of different institutions (National Library, Public Libraries, and—which is exceptional in comparison to other library systems—the National Archives) are combined in one single metasearch engine (OneSearch as well as NLB app). We were able to identify high-class Singapore-related services as, for instance, the Singapore Memory Project,

the Infopedia, NewspaperSG, PictureSG, MusicSG, Oral History Interviews as well as the collections of the national archive. With those projects, cultural heritage of Singapore in guaranteed from multiple points of view. NLP's programs try to foster the reading culture among Singaporeans and their digital literacy.

Nowadays, open innovation and design thinking are becoming more and more important for the (re-)construction of library services as well as of library buildings and their layout. Abraham Lincoln's famous description of government holds true for libraries, too: "Libraries of the people, by the people, for the people" (Henkel et al., 2018, p. 4151). NLB fosters user participation both on a small scale (user participation in single services, e.g. the Memory Project) as well as on a large scale (co-designing or co-redesigning of entire libraries).

NLB's applies smart technologies not only for its users, but for its internal workflows, too. Since years, the libraries work with RFID; recently, they introduced shelf-reading robots. To realize OneSearch, NLB banks on automatic named entity recognition and linked data.

With its very large member base, its services and programs, design thinking and its establishment as a third (physical as well as digital) place, NLB indeed makes sense of community and is a part of Singapore's national identity (Lin and Luyt, 2014).

Table 4: Main Assets of Singapore's NLB on the Country's Way towards Knowledge Society and Smart Nation.

NLB's assets
Strong political support and a strong legal base
Establishment of a third place next to home and work, also as (partly) "lifestyle libraries"
Ubiquitous offer of knowledge resources (anywhere and anytime)
Provision of learning spaces
Location of libraries in frequently visited places
Offer of prestigious services (long-term activities) and programs (short-term activities)
Realizing cultural heritage; extensive offer of Singapore-related activities
Fostering of reading habits; instruction of digital literacy
Fostering citizen participation (by social media, design thinking, and cooperation on projects)
Working with elaborated technology; optimizing internal workflows
Making sense of community; being part of Singapore's national identity

In Table 4, we summarize the main assets of the NLB and its institutions concerning the country's *journeys* towards knowledge society and smart nation. We cannot ignore challenges, for instance, the level of digital readiness of the citizens of Singapore (including information literacy, media literacy, digital literacy, and critical literacy) and the rather low citizen participation in social media (besides the successful Memory Project); however, NLB proves to be an important travelling companion and—even more—a tour guide on these journeys into the 21st century society.

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11 How Public Libraries are Keeping Pace with the Times: Core Services of Libraries in Informational World Cities

11.1 Introduction

The rise of the knowledge society has brought along a new type of city prototypical of this culture, informational cities. The theory of informational cities is based on research by Castells (1989), Stock (2011) and Yigitcanlar (2010); in addition to the "spaces of place" their leading factor is the "spaces of flow," specifically flows of information, capital and power (Castells 1989; Stock 2011). In the knowledge society, the innovation of information and communication technology has allowed humans to transform information into knowledge and vice versa in real time through diverse technologies (Stock 2011). This has, in turn, transformed how information is produced and consumed and changed the way in which libraries are acknowledged and used today (Hyysalo et al. 2014). In the face of these changes various questions arise: how do libraries meet these new needs? Are there best practice examples of library services?

Public libraries inhabit a special role within the cognitive infrastructure of informational cities and are a vital part of the city's soft location factors. Nowadays, public libraries offer space for learning, working and socializing (Mainka et al. 2013). Based on a study conducted by Mainka et al. (2013), we investigated the services provided by public libraries to show how the range of these services has changed in the meantime, including the special service of disseminating information literacy through seminars or related material as an important aspect of the knowledge society. To round out the picture, we interviewed chief librarians and library staff about the recent developments of physical library space. Following on from these interviews, creation and face-to-face activities have been identified as a recent development within public libraries which will be scrutinized in the investigation as well.

11.2 Informational world cities

An informational world city is a complex construct that cannot be attributed exclusively to one facet (Figure 1). It combines aspects of different city types. On the one hand, it inherits aspects of a world city, which is indicated by its degree of cityness, as defined by Friedmann (1995), Sassen (2001) or Taylor (2004), rather than population size. On the other hand, it is also characterized by its creative and knowledge infrastructure, reflecting the growing importance of the creative class (Florida 2005; Landry 2000) rooted in the importance of creative and knowledge capital as a factor for economic success (Florida 2003; Ergazakis, Metaxiotis and Psarras 2004). Hence, an informational city is deeply linked to the emergence of the knowledge society (Mainka et al. 2013). Drawing from smart city research, an informational city also focusses on the city as "green" space and an overall high quality of life (Hollands 2008; Shapiro 2006). Finally, information and communication technology infrastructure grows more important, similar to what has been found for digital cities (Yigitcanlar and Han 2010). By this measure, digital cities are also called "ubiquitous cities" (Hwang 2009).
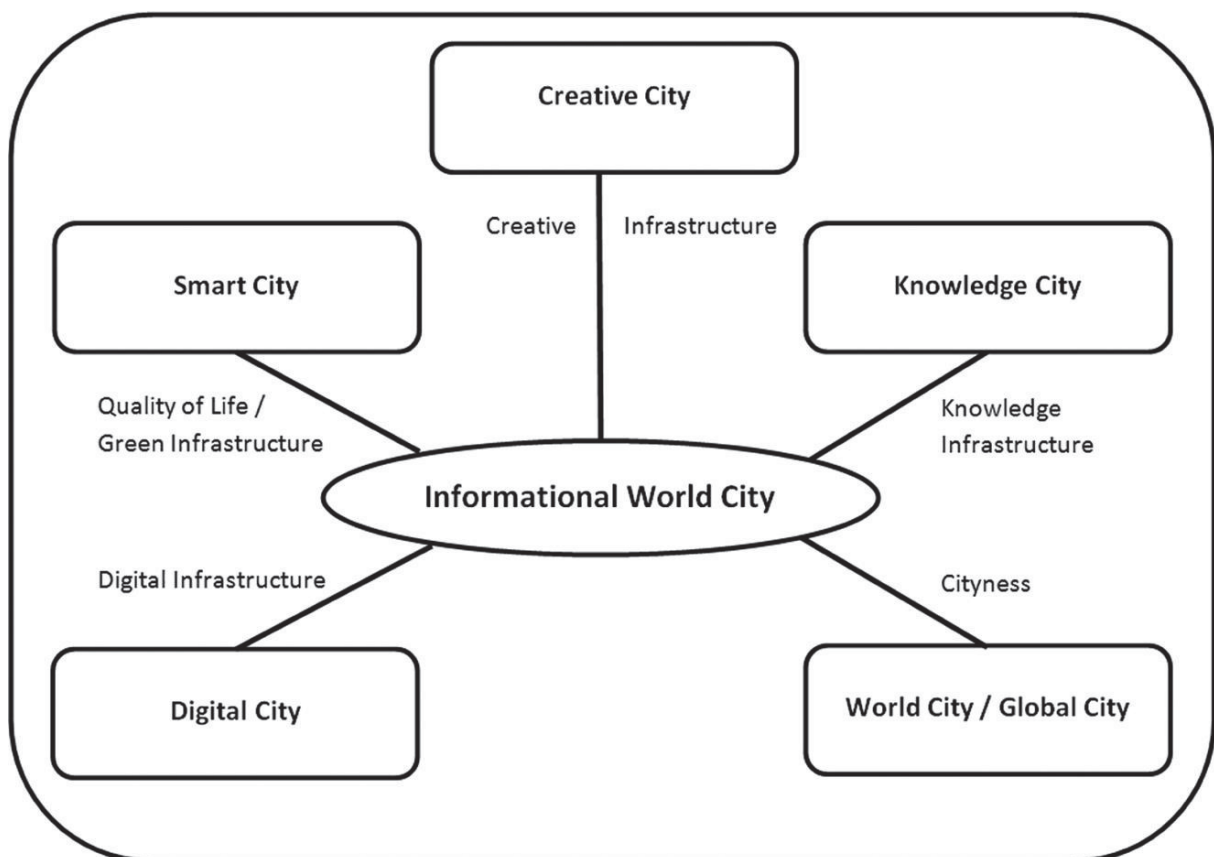
Figure 1: Infrastructures of an informational world city (Source: Mainka et al. 2013, p. 296).

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The set of investigated cities is based on the selection of Mainka et al. (2013). That selection was determined by two conditions: firstly, a city had to be referred to as a world city in the literature. Secondly, the given city had to be mentioned at least once as an example of a digital, smart, knowledge or creative city. The full list of all investigated cities is provided in the chapter "Methods."

Informational world cities become alive through information literate citizens who utilize modern information and communication technology to access, use, create and share knowledge. Through the information flow between individuals, communities and organizations, the sharing and developing of ideas and innovation is stimulated (Stock 2011; Webster 2006). The term "information literacy" summarizes the necessary competencies to master information and communication technologies as well as the "reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" (Association of College & Research Libraries [ACRL] 2015). It is an essential skill set for every individual living in the knowledge society (Lloyd 2003; International Federation of Library Associations and Institutions [IFLA] 2015) and it is therefore critical that knowledge institutions, among them public libraries at the forefront, provide citizens with access to information as well as information literacy education. This will establish a culture of lifelong learning and of knowledge sharing (Mainka and Khveshchanka, 2012; Henkel 2015).

11.3 Public libraries and informational world cities

Public libraries have a special role in the knowledge society and are confronted with various tasks. Thorhauge (2010) develops three visions for public libraries in knowledge societies:

1. The focus shifts from the sole lending of materials to providing access to learning rooms, meeting areas and stages for artists.
2. Public libraries operate a digital library. This service offers commercial information as well as web 2.0 services.
3. The library functions as a partner and connects different people, institutions and companies.

As one might already derive from these three visions, the spaces in public libraries can be split into physical and digital spaces (Adkins and Bala 2014; Boyce and Boyce 1995; Freeman and Hovde 2003), analogous to the spaces in informational cities (Castells, 1989). Public libraries are also known as "knowledge hubs" in informational world cities (Ergazakis, Ergazakis, Metaxiotis and Charalabidis 2009; Mainka & Khveshchanka, 2012), as they provide access to high-quality knowledge (Hayes 2004). This access is also achieved by using information technology and offering their patrons internet access as well gathering educated people and fostering collaboration among them (Miao 2002).

Apart from their role as knowledge hubs, public libraries also support the different infrastructures in informational world cities. The basis for the digital or ubiquitous city is internet access for all residents (Mainka et al. 2013). By providing Wi-Fi in their buildings and even lending technology to access the internet elsewhere, public libraries are a great support for the digital city. In informational cities, knowledge can be accessed from everywhere (Linde and Stock 2011), which is a basic condition of a solid knowledge infrastructure.

Furthermore, public libraries impart information literacy and provide relevant information. Thus, they transform their patrons into "smart" users (Gust von Loh and Stock 2013). In addition, the reuse of offered materials by the patrons contributes to environmental sustainability (Mackenzie 2000) and through these means public libraries support smart cities (Mackenzie 2000). Many public libraries have taken up the task to teach their patrons information literacy, so they can work efficiently with the information offered (Hayes 2004).

In addition, public libraries are an important part of an informational city's creative infrastructure (Florida 2005; Landry 2000; Stock 2011). Beginning with the library's physical building as part of the "architainment" of the urban space (Stock 2011), it shapes the city's image (Skot-Hansen, Hvenegaard and Jochumsen 2013). Furthermore, a library offers leisure activities with the focus on cultural activities (Skot-Hansen et al. 2013). As a public space, it also provides meeting places and is able to transform the urban space into an attractive environment (Skot-Hansen et al. 2013), fostering the creativity of its patrons by providing courses and workshops for creative skills on the one hand, as well as offering creative rooms and technology on the other (Detez, Harvey, Irfan, Murphy and Savic, 2014).

11.4 Digital Space

The digital space is a significant part of the library's services and offers many opportunities for both its patrons and the library itself. As the digital space gains more and more importance, the classic physical space (i.e. bookshelves) becomes less significant. With digital services, it is no longer necessary to visit the library to receive information while at the same time offering more people the opportunity to access the library's materials (Michnick 2015). The staff have many more possibilities to reach out to patrons, but this can also result in more time-consuming work for librarians. Staff have to gather and eventually preprocess materials and information at the patron's request (Michnick 2015).

There are various definitions for digital libraries (Allard 2002; Borgman 1999; Levy 2000; Meyyappan, Chowdhury and Foo 2000), but for the most part they have two aspects in common: the first describes the digital library as a collection created on behalf of its users (Borgman 1999), while second sees it as an institution or service, created and run by librarians (Borgman 1999; Levy 2000). Beyond databases and retrieval systems, digital libraries hold richer content and more advanced functionalities (Thong, Hong and Tam 2004). As digital libraries are generally accessible over the internet (Arms 2000; Thong et al. 2004), users have a great amount of information at their disposal, which can be searched quickly (Arms 2000). This strengthens the library's value for a society (Arms 2000) and can even make the library *ubiquitous* if the only limiting factor for accessing materials is access to the internet (Li 2006). Furthermore, the maintenance of a digital collection is more inexpensive than storing the same amount of material in a physical space, because digital storage becomes ever cheaper while duplicating and sharing digital documents is easy (Arms 2000; Lesk 2005). The acquired physical storage can be repurposed to preserve the library's physical attractiveness (Mittrowann,2011).

11.5 Physical Space

Physical libraries inhabit a special role in informational world cities as a public space for the creative and knowledge society (Florida 2003; Landry 2000; Stock 2011), belonging to a city's "soft" location factors. Hence, its role within the city's infrastructure is difficult to be measured

by "hard" facts. The economic value, for instance, can, to some degree, be investigated by the willingness to pay for this service by its costumers (Aabø 2005; Hummel 1990; Ko, Shim, Pyo, Chang and Chung 2012). Furthermore, public libraries, if attractive, can act as "place maker" and help to (re)vitalize a neighborhood (Skot-Hansen et al. 2013). They may also (re)vitalize the community to engage with library or city projects or, nowadays, create something in so-called "maker spaces."

As main physical spaces, Mainka et al. (2013) have identified "children's spaces," "modular working spaces," "meeting spaces" and "learning spaces" as the most common versions, plus the offer of food and drinks as well as attractive spaces as magnet factors. Furthermore, the necessary technology should be implemented at those spaces to meet the needs of the community. As services of physical libraries in the 21st century, the use of RFID, possibility of interlibrary loans and access to free Wi-Fi have been mentioned. Not every citizen, however, is familiar with modern technology and knows how to find relevant and useful information. Here, the library's role as facilitator of information literacy skills, not only through physical infrastructure but also seminars and workshops, should be emphasized again (Julien and Hoffmann 2008). The rise of maker spaces needs to be incorporated also, often equipped with new technology such as 3D printers. However, libraries are not limited to merely providing technological tools, but are rather referred to as creative spaces which allow the users to create, use and share media (Noh 2016).

11.6 Maker Spaces

A relatively new service offered by an increasing number of libraries are the so-called maker spaces. Maker spaces are equipped with various materials, machines and technologies in order to enable creative activities (Noh 2016) which can foster creativity, collaboration and interactive learning among their patrons (Moorefield-Lang 2014). Maker spaces encourage their users to practice hands-on learning and peer-to-peer training (Britton, 2012) which allow patrons to also practice the creation of knowledge, in addition to the traditional sole mode of knowledge consumption (Fisher 2012). As creativity becomes a factor of growing importance in knowledge societies, libraries can support individual and national development by installing maker spaces for their patrons (Noh 2016). A recent study has shown that the regular use of

maker spaces can increase the overall creative thinking abilities of their users, as well as other related skills (Noh 2016). However, it is currently still difficult to identify common trends and needs with regard to the new modes of use of the physical library space, as well as determine what is truly important and should be adapted by libraries (Georgy 2012). Nevertheless, libraries are changing before our eyes to inhabit the role of being a space for face-to-face meeting instead of merely a book repository. Accordingly, in the following, we will investigate this development with reference to informational world cities and their public libraries.

11.7 Methods

In the following section, we describe the aspects of libraries in information cities under investigation. Our basic research questions are the following:

1. What services do public libraries in informational world cities offer and how did the range of services change in comparison to 2012?

2. How do public libraries adapt to the changing culture of creation and face-to-face activities?

3. Do public libraries promote information literacy among their patrons and what are current challenges in this area?

The research method combines literature review with empirical data gathered through online information on websites, field studies and interviews. Analogous to the distinction between the physical and digital spaces of libraries, we investigated the range of physical and digital services separately. Adding to the study conducted in 2012 (Mainka et al. 2013), we included maker spaces in our investigation. The final list of analyzed services is as follows:

1. Digital library

    - Presence of a website in the country's official language and English

    - Web OPAC

    - E-resources (e-books, e-journals, digital images, audio books, music, e-magazines, videos, newspapers, bibliographic databases and other e-resources)

    - Digitization of the library's physical material

    - Access to the e-resources free of charge for patrons

    - Guides to the digital library (video guides, seminars, text documents, FAQs)

    - Digital reference services (e-mail, SMS, web forms, Skype)

    - Use of social media (blogs, Facebook, Twitter/Sina Weibo, Flickr/Instagram, YouTube)

    - Apps

2. Physical library

    - Building as architectural landmark

    - Spaces for learning, working, meeting, creating and spaces for children

    - Wi-Fi

    - RFID

    - Possibility to return borrowed materials at any location

    - Courses for teaching information literacy

    - Food and beverages in the library building

    - Marketing measures

In order to gather information on the offered services, we analyzed the libraries' websites in the course of an intellectual content analysis. If there was information missing about certain aspects, we contacted the library via e-mail. After gathering information, we calculated the percentage of libraries which provide the respective services. We only counted the presence of a service, not the extent or usage of the service.

After this analysis, we assigned every library a score based on the services provided and ranked the libraries accordingly. The maximum achievable score for each library was 150 points in

total, 75 for both its digital and physical spaces. The possible score for each service represents its defined importance. A detailed overview of the scoring system can be found in Appendix I.

The investigation was conducted on 31 public libraries in specific informational world cities in the time period of June 15th to July 14th, 2015. The choice of cities is based on Mainka et al. (2013) with cities selected if mentioned firstly as a world city and secondly as a knowledge, creative, digital or smart city in the literature. A full list of the 31 cities is presented in Figure 2. In the following, the analyzed services are further described.

	World / Global City	Knowledge City	Creative City	Digital City	Smart City
1. Amsterdam (The Netherlands)	✓	✓	✓	✓	✓
2. Barcelona (Spain)	✓	✓	✓	✓	✓
3. Beijing (China)	✓	✓	✓	✓	✓
4. Berlin (Germany)	✓	✓	✓	✗	✓
5. Boston (U.S.A.)	✓	✓	✓	✓	✓
6. Chicago (U.S.A.)	✓	✓	✓	✓	✗
7. Dubai (U.A.E.)	✓	✓	✓	✓	✓
8. Frankfurt (Germany)	✓	✓	✗	✗	✓
9. Helsinki (Finland)	✓	✓	✓	✓	✓
10. Hong Kong (China, SAR)	✓	✓	✓	✓	✓
11. Kuala Lumpur (Malaysia)	✓	✓	✓	✗	✗
12. London (United Kingdom)	✓	✓	✓	✓	✗
13. Los Angeles (U.S.A.)	✓	✓	✓	✓	✗
14. Melbourne (Australia)	✓	✓	✓	✓	✓
15. Milan (Italy)	✓	✓	✓	✓	✗
16. Montreal (Canada)	✓	✓	✓	✓	✓
17. Munich (Germany)	✓	✓	✓	✗	✗
18. New York (U.S.A.)	✓	✓	✓	✓	✗
19. Paris (France)	✓	✓	✓	✗	✗
20. San Francisco (U.S.A.)	✓	✓	✓	✗	✓
21. Sao Paulo (Brazil)	✓	✓	✓	✗	✗
22. Seoul (South Korea)	✓	✓	✓	✓	✓
23. Shanghai (China)	✓	✓	✓	✓	✓
24. Shenzhen (China)	✓	✓	✗	✓	✗
25. Singapore	✓	✓	✓	✓	✓
26. Stockholm (Sweden)	✓	✓	✓	✗	✓
27. Sydney (Australia)	✓	✓	✓	✓	✓
28. Tokyo (Japan)	✓	✓	✗	✓	✗
29. Toronto (Canada)	✓	✗	✓	✓	✓
30. Vancouver (Canada)	✓	✓	✓	✗	✓
31. Vienna (Austria)	✓	✓	✓	✓	✓

Figure 2: Informational world cities (Checkmark stands for "applicable," cross for "not applicable") (Source: Mainka et al. 2013, p. 297).

11.8 Services in the digital library

A library needs a website to reach out to as many people as possible. The website should also be the access point for using the web OPAC and be available in the country's official language as well as English, as it is the global *lingua franca* (Mainka and Khveshchanka 2012; Mainka

et al. 2013). Through a web OPAC, the user has access to the various resources offered by the library. These resources are crucial for a digital library and at the core of what the users are looking for. Since different information needs are satisfied by different forms of resources (Arms 2000), the investigation included e-books, ejournals, digital images, audio books, music, e-magazines, videos, newspapers, bibliographic databases and, in some circumstances, other formats. Beyond that, we also investigated whether the library makes efforts to digitize its physical collection. Digitization is especially helpful as rare and valuable physical documents can be made available for many people. Another measure to increase the outreach of a library is to provide resources free of charge for the library's members, so we also investigated this aspect. To facilitate the use of the digital library services, guides should be made available to the users (Thong, Hong and Tam 2004). These guides may take various forms and we therefore looked for guides in the form of video guides, seminars, text documents, FAQs and other resources.

Reference services can facilitate finding relevant information further. Arms (2000) believes reference services are among the core services which should be provided by a digital library. Patrons using the digital library are possibly located far away from the library itself and cannot visit it, which makes digital reference services even more relevant (Lesk 2005; Mainka and Khveshchanka 2012). The digital reference services investigated were e-mail, SMS, web forms, chat or instant messaging and Skype. Skype was chosen instead of telephone services to emphasize the digital character of this service (Mainka et al., 2013); as a video conferencing tool Skype can also be seen as a more sophisticated medium of communication than the traditional phone, as gestures and facial expressions can be seen by all participants (Barnhart and Pierce 2011).

The use of social media and web 2.0 technologies provides libraries with a quick, informal and inexpensive way to communicate with its patrons (Anttiroiko and Savolainen 2011; Harris and Lessick 2007). A library can use such channels to publish information about opening hours, news and events as well as immediately reach out to its patrons (Parkes and Walton 2010). It was therefore investigated whether libraries use blogs, Facebook, Twitter (or Sina Weibo in China), Flickr, Instagram, YouTube or other social media channels.

The last aspect we investigated was the use of apps by the library. Apps are a valuable way to further reach out to the library's patrons, as mobile devices have become commonplace (Murray 2010). They can be used as mobile OPACs for searching or for user management and provide an immediate mode of communication. Another possible application of apps is to provide details and further information on physical documents by means of *augmented reality* (Barnhart and Pierce 2011).

By doing so, the physical and digital space can be combined and provide the patron with enriched information.

11.9   Services in the physical library

The physical library is used in various ways. People come here to learn, meet with other people and spend their leisure time (Aabø and Audunson 2012). To rate the physical library, we investigated different aspects of it, which will be described in the following section.

Firstly, a physical library should be functional and meet the users' needs, while the building itself should inspire and motivate people (McDonald 2006). It should fascinate its visitors and be a part of the city's overall architainment (Mainka et al. 2013). In accordance with the variety of users and their needs, the range of provided spaces should also be diverse (McDonald 2006). A library should provide quiet learning and working spaces as well as meeting spaces for collaboration among the patrons (Detez et al. 2014). Another important space is that for children in order to introduce them to and familiarize them with using a library (Franz 2011). For the purpose of fostering creativity among patrons, a physical library should also provide the aforementioned maker spaces.

In terms of technological infrastructure, we analyzed whether wireless internet access is provided, as a growing number of people prefer to use their own devices rather than computers provided by libraries. Therefore, Wi-Fi can greatly improve the experience of those users (Detez et al. 2014), who should also be able to return their borrowed materials at any branch in the city (Mainka et al. 2013). RFID can be used for that purpose, as well as for automatically sorting and protecting the materials against theft, for instance (Singh, Brar and Fong 2006), which was therefore also investigated.

As the demand for highly qualified knowledge workers grows (Hayes 2004), information literacy becomes an increasingly vital skill. The need for knowledge of how to efficiently use information in times of ever-growing amounts of such adds to the demand for information literacy (Homann 2003). As a consequence, we analyzed whether libraries offer relevant courses, for instance to promote information literacy. The quality of the patrons' stay and library's overall attraction can be further improved by providing a place within the site to purchase food and beverages (Cannell 2007; Franz 2011; Mittrowann 2011); accordingly, this aspect was also added to the investigation. The final aspect of the physical space is the library's marketing, for example special events and initiatives to attract people.

11.10 Interviews and field study

For the interviews, we chose to conduct expert interviews, which are recommended to get an orientation in a new field (Flick 2009). The interviews were related to the question whether libraries are places for face-to-face meetings and if they offer maker spaces. This field of investigation can be considered as rather new as at present only a small number of examples refer to libraries having a vibrant community which interacts in their buildings. The common interpretation of libraries is as a quiet space of learning and reading. In the 21st century the needs of the community have changed, with libraries hence following suit to meet the needs of their users (Hyysalo 2014). Their strategies to meet these needs were investigated through the expert interviews. The approach was to arrange an interview in each of the 31 cities personally or by phone. Unfortunately, a personal interview could not be arranged in all cities and not all could be visited, with Appendix II providing a list of the public libraries that were investigated and their respective cities. Further listed is whether we arranged a personal interview with a librarian and were able to gain first-hand experience by visiting the library ourselves.

First-hand experience can provide further insights, especially about the physical library. This method is based on field studies in ethnography and anthropology (Lichtman 2013). It includes mainly the observation and participation of a given research field (Malinowski 1922). Ethnographical field studies are further used to investigate smaller communities such as a neighborhood or employees of a specific company (Fischer 2003). The field research may

show the topic of investigation from different points of view, e.g. communities or authorities (Geertz 1983). In our case, we focused on the authority perspective – librarians and chief librarians are the experts that were interviewed. By visiting the libraries, we were also able to consider additional aspects which are difficult or impossible to determine merely by inspecting a website, for instance the atmosphere, attractiveness of spaces and access to technology.

Another round of interviews was undertaken to specifically investigate information literacy and education in libraries. Again, librarians were interviewed personally, but this time anonymously and with the goal of gaining further insight into current practices of information literacy instruction in public and academic libraries. The general questions of the interviews were connected to librarians' expectations regarding information literacy instruction as well as current developments and challenges. Semi-structured interviews were conducted with the help of a questionnaire and some results will be presented here to gain further insight with regard to the services of libraries in informational world cities. More information on the questionnaire and its results were published separately (Henkel 2015; Henkel and Stock 2016). Up until now, this type of interview has been conducted in informational world cities of Canada, Montréal, Toronto and Vancouver, as well as in those recognized in the United States of America, Boston, Chicago, Los Angeles, New York and San Francisco. It should be noted that a personal interview could not be arranged in the public library of all cities; Appendix II provides a list of the public and academic libraries which were investigated.

Furthermore, we spoke to instruction librarians and groups of up to six librarians in charge of education and training.

In total, 54 libraries around the globe were investigated. For the service investigation, the main or largest central library was chosen. In some cases, a central or main library could not be identified and instead the public library closest to or located in the city center was used (in most cases the main public library is located there also). For example, in Beijing, São Paulo and Seoul two libraries located in the city center were chosen as a sample; Appendix II provides a detailed list of the names and web references of these libraries. We interviewed 29 librarians or chief librarians from 21 diverse public libraries and respectively diverse cities, while also

personally visited 31 public libraries. In addition, personal visits and interviews were conducted in 13 academic libraries in North America.

11.11 Limitations

The results presented in this investigation are subject to several limitations. First and foremost, the chosen libraries are located in informational World Cities, meaning that possible best practice examples located in other regions were not considered. The presented case studies and examples of projects are limited to those which have been mentioned by the interviewed experts, identified through own experience or described in other publications. The investigation of a library's digital and physical services was limited to information available on websites, the response by librarians through email or personal interviews and experience of the authors. Therefore, services added after the personal visit of the authors which have not been published online were not counted. As such, the results are only able to present a snapshot of the current library landscape.

It should be noted that no website was available for the Shenzhen public library, meaning that we only analyzed the remaining 30 libraries' websites. Finally, upon recommendation, we decided to remove the data for the London Library from our analysis, since it is not considered to be a public library and might not be comparable to other libraries we visited.

11.12 Results and Discussion

In the following section, we will present our results and a ranking based on the assigned points as well as changes in the ranking compared to investigated libraries in 2012. First of all, no investigated library narrowed its range of services in comparison to 2013.

11.13 Digital public library

All online accessible libraries have a web OPAC and website, of which 83% are also offered in English in addition to the official local language, which represents a slight increase compared to the value in 2012. The range of e-resources is depicted in Figure 3, with e-books the most widely adopted resource with 93% of the libraries offering such, followed by e-journals with a 79% adoption rate. In contrast, videos with 52% and digital images with 55% still are the

least provided resources. 79% of the libraries do not charge their patrons for use of the digital library, a total increase of one library compared to 2012, while about 72% digitize parts of their collections, three more than 2012. It is notable that all investigated North American public libraries provide their patrons with all of the mentioned eresources. Furthermore, some also provide additional resources such as online courses, while also worth mentioning is the public library of Melbourne, *Melbourne Library Service*, which has expanded their range of provided e-resources since the last study and now covers 100% of the resources listed.

The number of guides is still low compared to the amount of e-resources provided, shown in Figure 4. Compared to 2012, they have remained largely the same, except for the number of FAQs, which has risen from five to 14; with this increase, FAQs superseded text documents as the most adopted form of guides, while 79% of the libraries offer at least one guide to the digital library. Worth mentioning is the *Los Angeles Public Library*, where one can make an appointment with a librarian who then explains and facilitates the use of the digital library.
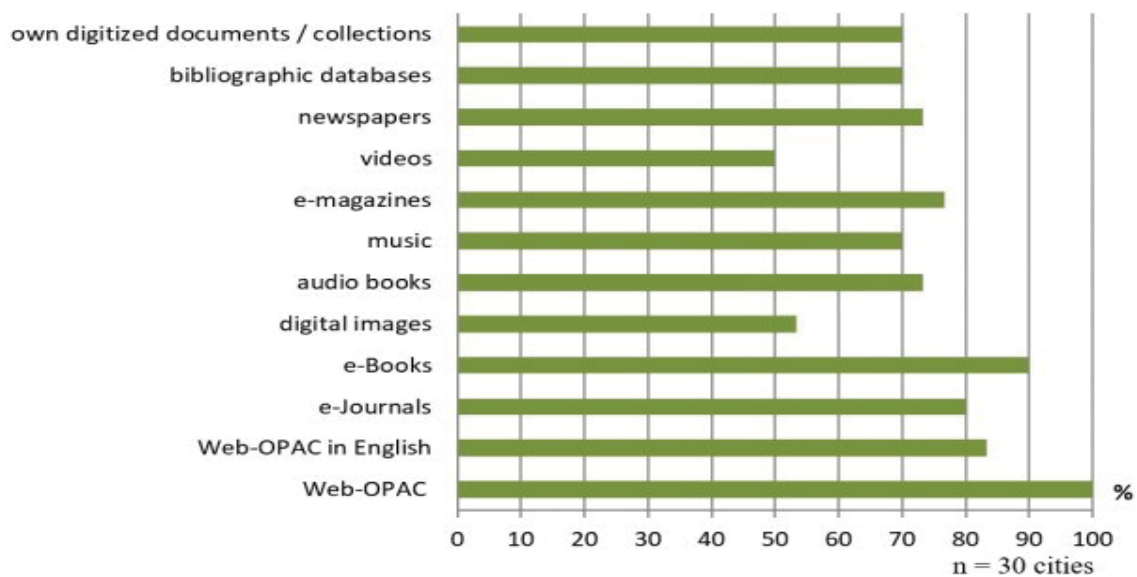
Figure 3: E-resources in informational world cities' public libraries.

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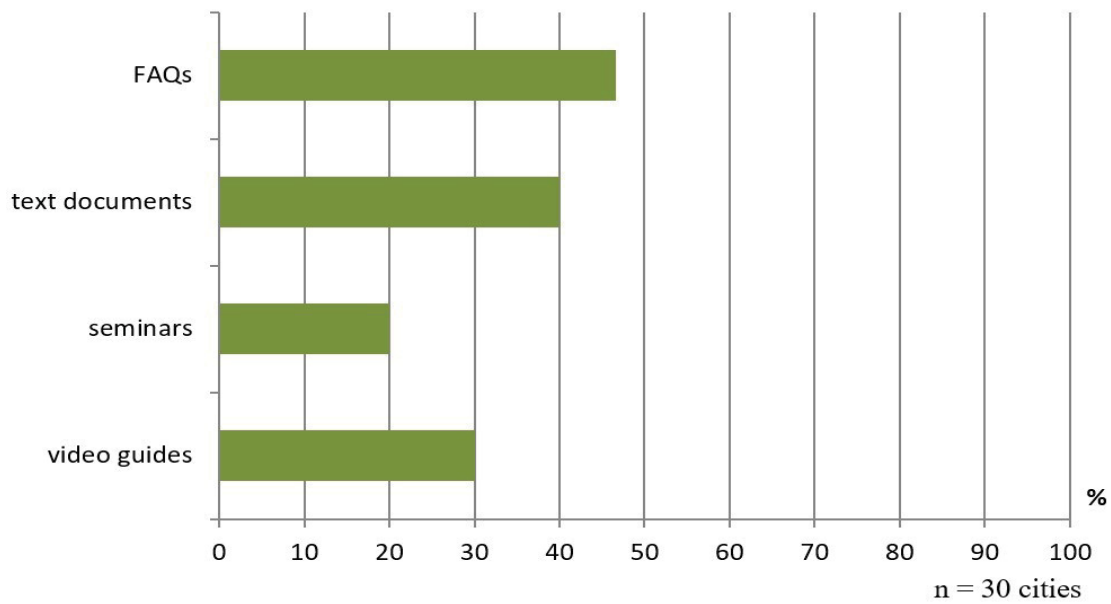
Figure 4: Guides in informational world cities' public libraries.

Figure 5 shows the number of supplied forms of reference services across all libraries. All surveyed libraries collectively offered at least one digital reference service, but Skype is still nowhere to be found among the range of reference services. Reference by e-mail still represents the most popular form, offered by 86% of the libraries, followed by web forms with 69%, instant messaging with 31% and reference via SMS with 14%. The *Los Angeles Public Library* and the *New York Public Library* are worth mentioning in this context as both offer all of the investigated reference services, except for Skype.

Nowadays, software using artificial intelligence is conceivable as another form of reference service (Rubin, Chen & Thorimbert, 2010). Therefore, libraries may also be able to offer reference services via chatbots instead of personal online communication in the near future. The example of Skype is showing that video chatting may become obsolete as a reference service.
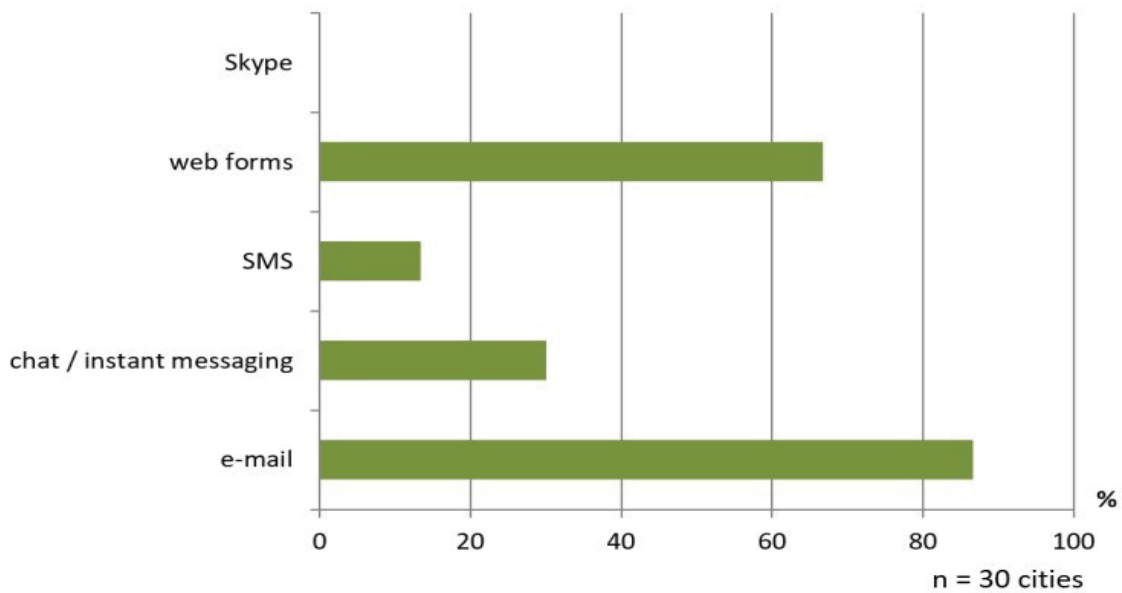
Figure 5: Digital reference services in informational world cities' public libraries.

Every investigated library uses social media for various purposes, seen with the numbers in Figure 6. The most widespread social media channel is Facebook, used by 93% of libraries, closely followed by Twitter or Sina Weibo, respectively, with 83%. An overall strong increase can be noted in the sector of social media; compared to 2013, the number of libraries using YouTube has almost doubled to 62%, while Facebook is used by an additional six libraries since 2012. Only the spread of Flickr remains low, it being the least used channel, only by a third of the libraries, which may be due to the declining visits of the photo sharing platform overall. Currently, the competitor Instagram is more popular; according to the top 500 registered domains, Instagram is ranked 7th and Flickr 27th in March 2017 (Moz n.d.). A slightly higher number of libraries are using Instagram to share photos and connect with their patrons, resulting in 52% of all libraries using one or both for the distribution of images. The biggest leap in social media usage was made by the *Los Angeles Public Library*, which in 2012 did not use a single social media channel. Since then, it has added all services under consideration except for Flickr to its repertoire; the library instead provides an Instagram channel. The usage of apps in all libraries remained mostly the same, with one additional library offering an app. Overall, half of the libraries provide apps, which are mostly used for user management and searching the OPAC.

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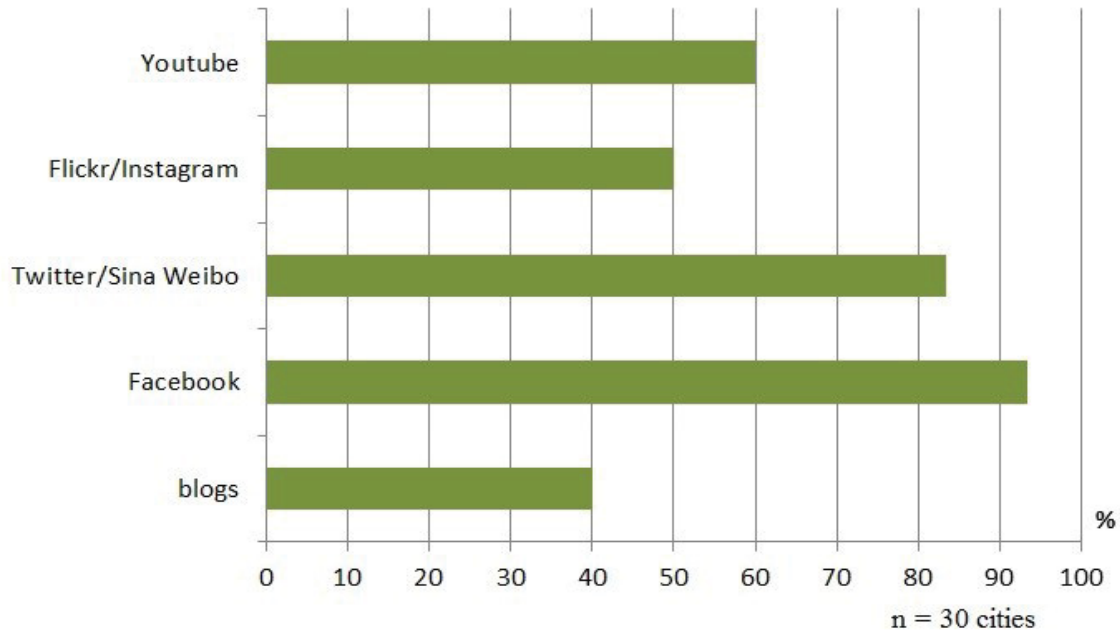
Figure 6: Applications of social media in informational world cities' public libraries.

11.14 Physical library

The number of library buildings deemed an architectural landmark remains high with 97%. The *Vancouver Public Library* should be emphasized at this point, as it also illustrates the aspect of a smart city by planting greenery on its roof (Figure 7).

Figure 7: Building of the Vancouver Public Library (Photo: Agnes Mainka).

In terms of provided spaces, a high number of libraries offer spaces for children (97%), with the complete numbers seen in Figure 8. The number of modular workspaces increased by three, though they remain the least adopted spaces. The numbers of the other spaces also slightly increased, such as more than half of the libraries which offer a cafeteria selling food and beverages. Libraries providing all mentioned spaces are the *Openbare Bibliotheek Amsterdam*, the *Capital Library Beijing*, the *Hong Kong Public Library* and the *Bibliothèques publiques de Montréal*.

The previously mentioned maker spaces are provided by 41% of the libraries. An honorable mention in this context should go to the *Helsinki City Library*; apart from computers with a variety of creative software, they also supply their patrons with 3D printers, camcorders, instruments and recording studios. This supply is further extended by staff specifically supporting the patrons in using the materials and technologies. In North American libraries the presence of maker spaces is also frequent, where they are often reserved for children and

teenagers who can spend their leisure time here and receive support, such as in doing their homework.
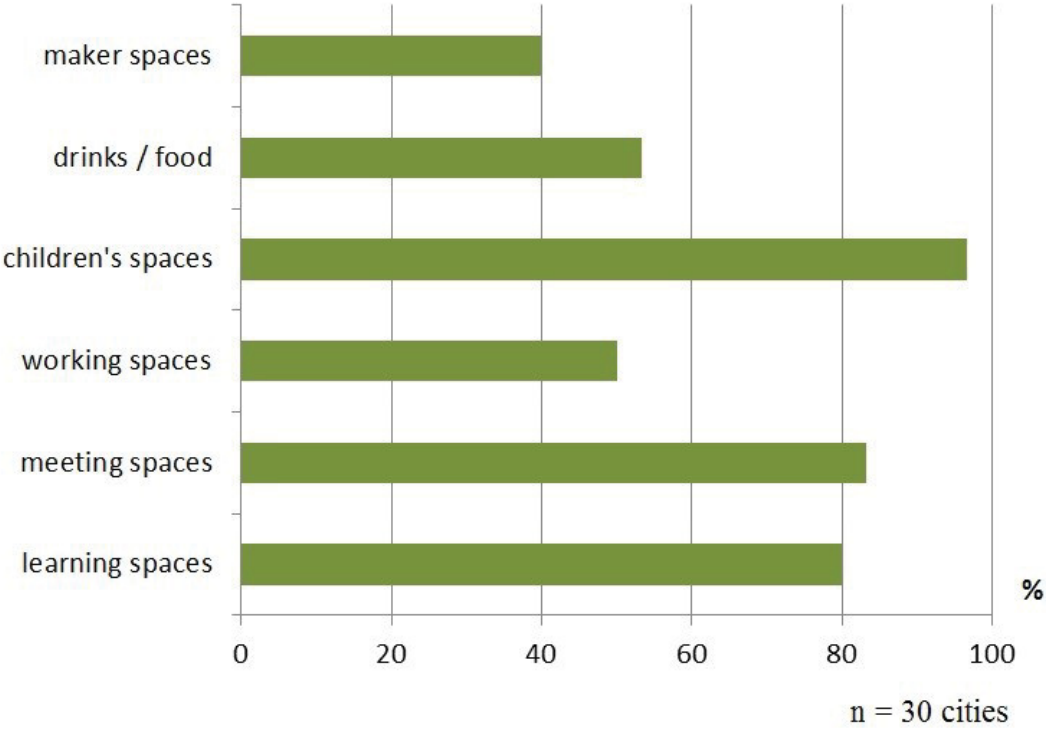
Figure 8: Physical spaces in informational world cities' public libraries.

Figure 9 shows additional services in the physical library. Wi-Fi is widely spread almost all libraries offering it. Taking into account that Singapore provides Wi-Fi throughout the whole city and the library therefore does not provide this service itself, it can still be stated that Wi-Fi is available in 100% of the libraries. RFID is used by 17 out of 29 libraries, a number which did not change in comparison to 2012. The number of libraries offering a return of borrowed materials in all branches increased by one library to a total of 22.

In the realm of marketing, we found a large variety of ways in which libraries advertise their services, of which we want to mention a few. Social inclusion still plays a crucial role within library services and hence a good example of "bringing the library to the people" can be observed at the *Münchener Stadtbibliothek*, which operates buses that roam the city and function as mobile libraries. Another example is the library of Vienna, which visits people at home who cannot come to the library and provides them with library services.

Technology is also in the scope of additional services and marketing. The *New York Public Library*, for example, lends portable Wi-Fi hotspots so patrons with limited internet access can use the internet from their home, free of charge.
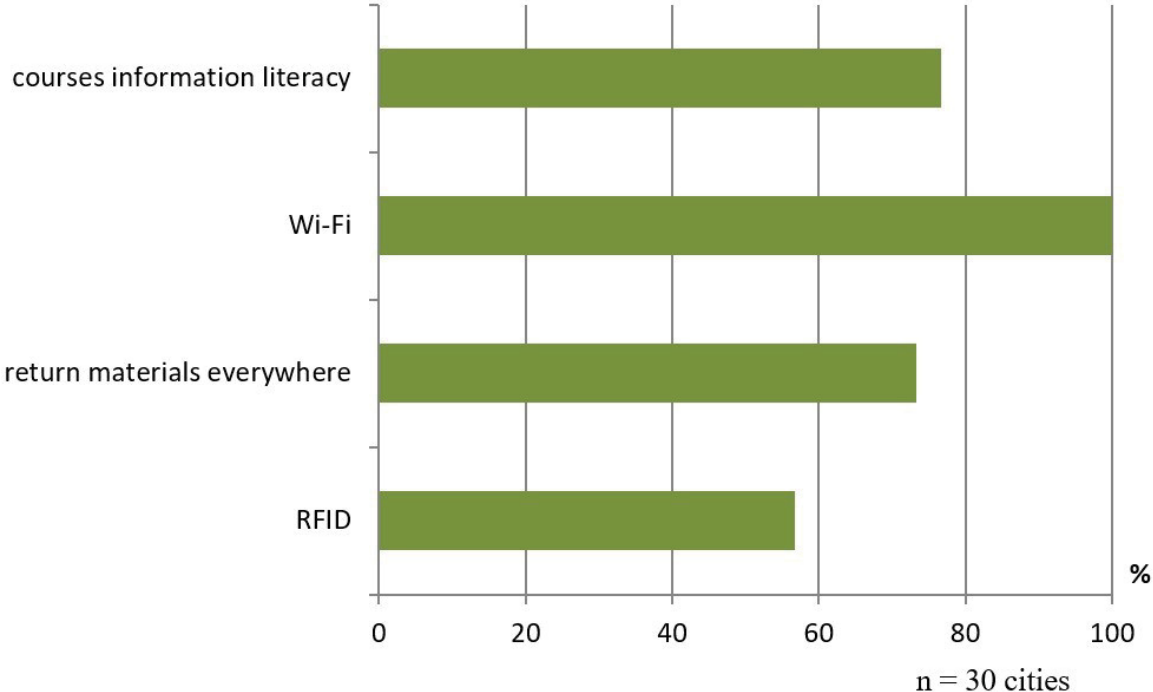
Figure 9: Additional services of informational world cities' public libraries.

11.15 Ranking

In this section we will show our ranking based on the assigned points and changes in the ranking compared to the investigated libraries in 2012 by Mainka et al. (2013). Figure 10 displays the ranking and points every library scored for the physical and digital library aspects respectively.
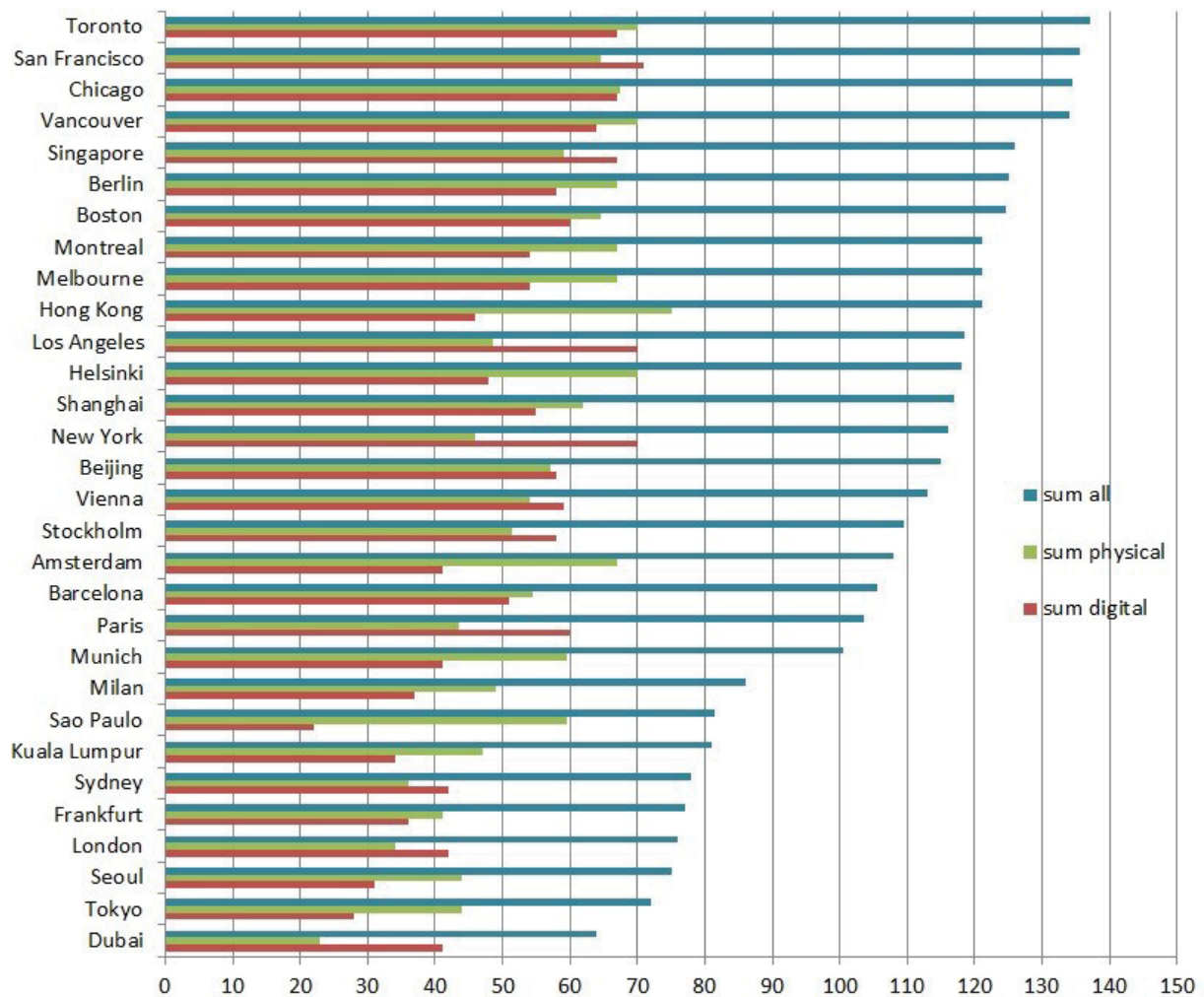
Figure 10: Ranking of public libraries in informational world cities with regard to the core services.

The first four ranks are taken by North American libraries, Toronto (1st), San Francisco (2nd), Chicago (3rd) and Vancouver (4th). Their scores are also quite close together, while the difference between the fourth and the fifth rank is significantly larger.

Table 1 shows the changes in rank compared to the ranking by Mainka et al. (2013). The biggest positive change in the ranking is enjoyed by the *Zentral- und Landesbibliothek Berlin*, which climbed up 12 ranks and is now at position six. Dubai stays at the bottom of this ranking, due to it lacking a culture of introducing public libraries.

Table 1: Changes in the public library ranking

Rank	City	Change 2013 - 2016
1	Toronto	+5
2	San Francisco	+2
3	Chicago	0
4	Vancouver	-3
5	Singapore	+2
6	Berlin	+12
7	Boston	+3
8	Montreal	-5
9	Melbourne	+10
10	Hong Kong	+7
11	Helsinki	+4
12	Los Angeles	+4
13	Shanghai	-9
14	New York	-4
15	Beijing	-2
16	Vienna	-8
17	Stockholm	+5
18	Amsterdam	+2
19	Barcelona	-7
20	Paris	-6
21	Munich	0
22	Milan	+2
23	Sao Paulo	0
24	Kuala Lumpur	0
25	Sydney	+4
26	Frankfurt	+2
27	London	+4
28	Seoul	-2
29	Tokyo	-2
30	Dubai	0

11.16 Maker Spaces and Face-to-Face Activities

In addition to the binary investigation concerning the existence of certain public library

services, we also conducted interviews on the use of physical libraries as space for community

activities. This focused on the question of whether we can identify a real trend, on a global scale, towards a more engaging use of the physical library space.

As already demonstrated in Figure 8, the physical space is not only dedicated to learning and reading. For example, the building of the public library in Amsterdam offers space for diverse activities. In Figure 11 from left to right, we can see the open learning and working spaces, music floor and inhouse radio station. The chief librarian Hans van Velzen (personal communication, January 22 2014) from the Amsterdam public library explained the benefits of using the library space to host the local radio station as follows:

> "During the day we have the local radio and during the evening … national radio. It is also interesting for us. So we give them the floor and they rent it … They organize the programs and the programs are also interesting for us because they [invite] politicians, artists, and authors. And everything is connected to the library for our purposes, with the content of the library. So we can combine it. And all of the visitors of the library can go to the radio. So there is everyday something happening in the library. … I cannot organize everything. So it is good to work together with other people."

Figure 11: Amsterdam public library physical space (Photos: Agnes Mainka).

Opening up the space for other users to host their own projects was also the intention behind the maker space at the Chicago Public Library. Start-ups and talented people from the community are invited to rent cheap office space at the library building and, in return, they have to give something back to the community, such as classes on how to use 3D printers. Figure 12 shows how the maker space at the Chicago Public Library has been used for 3D printing courses.

Figure 12: Maker space at Chicago public library (photos: Agnes Mainka).

Another library using new technologies and also offering courses by experts is the Toronto Public Library (Elizabeth Glass, personal communication, March 10 2014): it encourages, among other projects, users to write and illustrate their own books. Elsewhere, the San Francisco Public Library is even planning to open a new space for youngsters to record music in the main building (Cathy Danelo, personal communication, September 17 2013). Face-to-face activities and creation at libraries are not only restricted to new technology, as interactive learning and creation can be embedded in diverse manners. Libraries are also used as open space for community interaction such as debates and readings by authors, during which members of society can get in touch with artists and scientists personally (Sabine Homilius, personal communication, November 4 2013; Anke Büttner and Peter Becker, personal communication, April 28 2014). Elsewhere, public libraries are also used as community space in which citizens may meet for activities such as knitting, as in the case of the Los Angeles Public Library (Linda Rudell-Bets, personal communication, September 9 2013).

Furthermore, library space may be used to foster entrepreneurs in the city. One example is the Vancouver Public Library which, according to chief librarian Sandra Sing (personal communication, April 28 2014), will offer library space for diverse purposes:

> "We will be creating an 'inspiration lab' or 'digital media lab' that will also be flexible to allow for different types of entrepreneurial activity within the creative sector. For example, if there is a local resident with an idea and wants to pitch it to someone remotely then we will have the room and the infrastructure that they can go in and engage in a Skype session in a closed quiet space."

As libraries are public institutions, they often have to struggle with funding. In Vienna, for example, the public libraries additionally struggle with a scarcity of physical space. Their library branches are not able to actively reach all citizens (Markus Feigl, personal communication, January 29 2014) and they are therefore concentrating on attracting diverse user groups, for instance early readers (children at school up to the age of 10) and pupils in their final years of school (16 to 18 years).

Another topic librarians were questioned on was whether their libraries are reducing the number of books physically present on their shelves. In Vienna, for example, this has been the stated goal of the chief librarian, but the introduction of this new vision of a library that offers more space for the community and less for printed materials needs to be communicated with caution (Markus Feigl, personal communication, January 29 2014). There are many people who have a very strong emotional connection with books as a physical medium and cutting down the number of books in the library can therefore result in protests by the community if citizens feel overlooked. In many Chinese cities such as Shanghai, Shenzhen, Hong Kong or Beijing, printed books appear to enjoy continued importance for the population. Libraries are therefore used foremost by students to prepare their homework or learn for exams quietly, while bookstores are frequently used by Chinese citizens to read books at the store instead of buying them.

All interviewed librarians stress that it is important to, at the very least, enable access to information through technological equipment and Wi-Fi. For example, in Los Angeles the Wi-Fi access in front of the library building is available even when the library is closed (Linda Rudell-Bets, personal communication, September 9 2013). Nowadays, no library is built for quiet working and reading only, if indeed it ever was. From the librarians' perspective, the library should be a place that encourages users to exchange ideas and discuss topics, even about topics as diverse as poetry or politics: "More people are recognizing the potential of the library as public space beyond study and beyond kind of recreational uses" (Sandra Sing, personal communication, April 28 2014). Nevertheless, public libraries are a public service not only tailored to the needs of the knowledge society but also assisting people who cannot afford

technology or do not know how to use it. The library is an important place to mediate information literacy skills within society at large.

Of course, the location of a library is important. As mentioned in the literature, libraries are sometimes used to revitalize urban space (Skot-Hansen et al. 2013), but they may also be placed within an already vital space to reach more citizens. For example, shopping malls have been built in Singapore branches of public libraries, such as the Serangoon Public Libraryor the Library@Orchard. Proximity to a shopping mall was also mentioned by Vienna's chief librarian as a positive effect while a branch library was established at the top of a shopping center in Berlin. However, in contrast to the other examples, this library was not easy to access, with visitors required to enter the parking deck to reach its entrance.

Creativity, engagement and co-creation may also impact the development process of library services. To introduce an innovation process that allows users to participate in decision-making is referred to as open innovation. The term open innovation (sometimes also called design thinking) describes the free flow of information and innovative ideas between different stakeholders, information flowing from inside to outside of a firm and vice versa (Chesbrough 2003). In particular, the main change from closed to open innovation is that external ideas become as important as those internal. If we compare the model of open innovation with the development of modern libraries, a similar change in behavior can be observed in some cases. Innovation in public libraries was traditionally limited to the input of library leadership (Georgy 2012) whereas nowadays libraries are making efforts to be more open to the voices and ideas of their customers (Mainka et al. 2016). Public libraries as part of informational world cities are inheriting their smart character, involving all stakeholders in the city in decision-making processes (Schaffers et al. 2011) and becoming "collaborative innovation platforms" (Tukiainen, Leminen and Westerlund 2015). The development of cities towards being platforms of open innovation is focused on open government initiatives (Harrison, Burke, Cook, Cresswell and Hrdinová,2011) and may also include libraries as public service. Open innovation on the city level has, for the most part to date, been introduced as a case study or in another experimental context (Mainka et al. 2016); accordingly, these implementations are referred to as living laboratories (living labs) (Tukiainen et al., 2015). Due to the fluid nature

of the field, it is important to highlight best practice examples and enable benchmarks of open innovation within the context of public libraries. This will enhance the implementation of further frameworks and cases and may help open innovation to become the standard development process of public libraries. Open innovation should therefore not be limited to the collaborative decision process in terms of building a new library. It can also be used as an agile tool in library service development.

Following on from the work of Delica and Elbeshausen (2013), public libraries do not have to overcome high obstacles in introducing open innovation. As a public service the library necessarily has to adjust its service to the community needs, by design. In addition, public libraries are used by customers with diverse backgrounds which may positively influence the innovation process of the community (Georgy 2012). The problem is that in many cases librarians, especially in small or medium size libraries, are only marginally versed in innovation management, while larger libraries are more likely to adapt open innovation. However, Henkel, Ilhan, Mainka and Stock (2018) show that open innovation has already been utilized in not only large-scale but also small projects at some libraries, such as to modify existing library services. According to Georgy (2012), the following advantages and risks have to be considered while introducing open innovation in public libraries:

Advantages	Risks
Using the experience and knowledge of the customers	High coordination effort by the library
Increase market acceptance of new products / services	Ignorance (knowledge) of the external innovators
Improving the image	Innovations of the external innovators based on their own benefit only
More personalized service	Lack of involvement of the external innovators (quantitative)
Early awareness of new market trends	Lack of engagement of the external innovators
Increase consumption of the entire range of services	Lack of project and time management of the external innovators
Increase customer loyalty	Loss of know-how, for example for competitors
Reduction of development costs	
Reduction of acquisition costs	

11.17 Information literacy, the digital library, and the physical library

During the interviews, we found that all librarians understood the value of information literacy and information literacy instruction. Most librarians put their highest expectations into assisting patrons in locating and using the required information. Some interviewees indicated, however, that catering to people's everyday needs, such as helping them how to use a mobile phone or computer, has to sometimes be prioritized over formal information literacy instruction. Even though academic libraries work on promoting information literacy skills among students and staff, public librarians have to be aware of their responsibility towards the rest of the community:

"People who do not attend postsecondary educational institutions, which typically are mandated to provide at least a minimum level of IL skills training for students, have few places to turn for training in this increasingly important skill set. If citizens are to

> participate fully in the digital age, in order to efficiently access, effectively evaluate, and appropriately use information to inform their decision making in all aspects of their lives, then these citizens require training in IL skills." (Julien and Hoffman 2008, p. 39)

In the knowledge society, all citizens require information literacy skills to participate. That is why all public libraries have to recognize their duty to teach information literacy skills to those who are not being provided any information literacy instruction or assistance otherwise.

There are many ways for a library to assist patrons and promote information literacy among citizens of the knowledge society. In the digital library, subject guides, online courses, educational materials and other resources will not only promote information literacy but also teach patrons many other competencies and skills. By offering and enabling e-learning, librarians "offer more choices that suit learners' flexibility, provide stimulus, reinforcement and instant feedback, foster interaction, and stimulate understanding and the recall of information" (Wang and Hwang 2004, p. 408). This allows libraries to extend their services and adapt to the developments of the digital age.

In the interviews, the trend of e-learning in libraries was described as a growing area and an important instructional tool of the future. Interviewees mostly highlighted the advantages of online services, such as the possibility to learn at one's own pace and at home. Librarians felt that they were able to offer more content online as there is no limit due to space, time or personnel while in the digital library patrons not willing or able to visit the physical library can be reached. Apart from the "cost effectiveness" of new media and technologies, Reeves (1998, 4) also praised their "many other advantages in terms of repeatability, transportability, and increased equity of access". Many libraries were already offering e-learning courses or online materials, for example electronic subject guides, online (video) tutorials, subject courses, webinars or even online programs to earn a high school diploma. Online elements were also used to support other instruction services, get feedback or as a backup. Some libraries stated that they include information about external online sources on their websites for patrons looking for particular content the library is not offering. Other libraries reported currently moving in that direction or having just started with e-learning. Some who had not made the transition to e-services yet felt "behind the curve" or "behind the time" and were planning to

do this in the future, while others preferred to stay cautious and see how it works at other libraries, so as to then adopt successful implementations.

Julien and Genuis (2011, 108) also found that "the focus, tools and methods of teaching [in libraries]" are being influenced by "the impact of changing technology." While library instruction is heading in the direction of e-learning and new technology, librarians are not only blessed by the advantages of new technologies but also feel challenged by high expectations and "the sheer size of the information universe and its complexity" (Julien and Genuis 2011, 108). New technologies are placing "increased demands on teachers' own information literacy skills, their ability to facilitate learning, their capacity to teach critical thinking and inquiry, their determination to empower students to be responsible for their own learning, and their own technological skills" (Goldfarb 1999, 114). The readiness to embrace technological change and continuous learning will be of great benefit for the modern librarian, for information literacy instruction online and offline, as well as assistance at the reference desk. Nevertheless, patrons need to acquire at least basic computer literacy skills to be able to access the desired contents. Public librarians claimed to spend a lot of their time on offering courses for or assisting with tablets, e-books, using e-mail and similar. More recently, patrons also want to learn how to use their camera or manage apps on tablets, while many libraries lend out devices as well. For some librarians, information technology can be a way to promote the resources of the library (e.g. promotion of e-books instead of just e-readers). While some librarians told us they wanted to give more tech support in the future to enable patrons to use their e-content, others wanted to focus on tools and content more than on the devices itself.

On the other side, the physical library was considered to be very important and described as the space where information literacy is still taught most frequently. It is here that face-to-face instruction in the form of workshops and classes as well as assistance at the reference desk take place. The "human aspect" is still highly valued at libraries as nowadays public libraries are seen as a place to network and where people come to talk to someone in person. Librarians value the opportunity to form a relationship with the patrons and show them they are welcome at their library. Public librarians stated that senior citizens and children especially need such face-to-face interaction, in courses or activities such as "story time" in the physical library. On

the one hand, librarians from public libraries felt that senior citizens in particular, who may not have any or much experience with the use of a computer and the internet, could visit the library to learn how to use a mouse and set up an email account. Furthermore, while there are many other possibilities for citizens who know how to use a computer and access the internet, there is nowhere else to go for rudimentary computer knowledge and training. On the other hand, when it comes to younger patrons, public libraries also aim to address young citizens and show them what a public library can offer: "We want to create a space for children, where they feel at home, where they want to spend their time in a creative and productive and positive way" (librarian, personal communication, July 2015). It was mentioned that children who come to the library to play might grow into citizens who rely on its services throughout their lives.

To teach information literacy, librarians need rooms for classes and space for patrons to read and work. When asked about the infrastructure of the physical library, librarians told us they need flexible classroom and workspace; software has to be up-to-date and, most importantly, reliable, while Wi-Fi and enough power outlets are needed for patrons to work. Librarians reminded us that in some countries, providing free internet access in libraries is of high importance due to internet access for private households being "very expensive."

Places to work, study or just "hang out" were highly in demand. Teaching classrooms were said to be scarce, as almost all participants complained about the lack of modern equipment and space. Some libraries had no or only one classroom at the time of our visit. "It's never enough, and not what we want" sums up what many librarians told us, with "Financial issues" and "budget cuts" given as reasons for this condition. A Canadian national survey in 2005 found that only a "minority of respondents" from public libraries had "physical space dedicated to [information literacy] training" available in their institutions (Julien and Breu 2005, 295). Although the number of institutions with this problem seems to have declined (Julien, Tan and Merillat 2013), it is nevertheless still an issue, as indicated by participants of the interviews. Not only is space for instruction necessary in a modern library, but also for recreational activities, social gatherings and other purposes (Weise 2004). Some librarians, however,

responded that "communication and other skills of the librarian are more important than technical infrastructure" or that "technology is not everything."

Two of the positive examples we had the opportunity to visit during our survey were the Bibliothèque Marc-Favreau in Montréal, Canada, and the Boston Public Library in Boston, MA, United States. The Marc-Favreau Public Library is a state-of-the-art library building with modern, light-filled and comfortable spaces as well as multi-medial facilities. It was designed along the key themes of "family vocation, new technologies, design, and sustainable development" (Bibliothèques Montréal 2016) for library users of all ages; this sets a good example for the physical aspects that a library of the knowledge society should have. The Johnson building of the central library in Boston was currently being renovated at the time of our visit, with the goals being, among others, to "revitalize program spaces," "improve user services" and "create an inviting first impression" (Boston Public Library 2013). The City of Boston invited library staff as well as the whole library community to share ideas and create a new library place with comfortable, inviting rooms for patrons to read, learn, play and work in.

11.18 Conclusion

In this paper, we discussed the importance of libraries in the knowledge society. We asked for the core services of public libraries in informational world cities and how the range of those services has changed in comparison with 2012. In conclusion, the development can be described as positive, as an increase of offered library services was observed. All the investigated public libraries use at least one social media channel to communicate with their patrons, Wi-Fi is available in each of the libraries and digital reference services are available mostly through e-mail and web forms. However, just a few libraries offer their own mobile applications, which could be of advantage considering the increasing use of mobile devices. In addition, the number of available guides is limited, as most public libraries only offer FAQs; instead, the library's service should include a variety of different guides that help their patrons to access the library. Looking at the physical library space, more modular working spaces should be implemented in the library buildings to be able to adjust the space according to the community's needs. This would help the library to be flexible and able to adapt to future demands.

Looking at the overall ranking of public library services, libraries located in the US or Canada are positioned at the top end of the 30 informational world cities, defending their top-ranked status from 2012. They are able to reach the highest scores according to the indicators investigated in this study, indicating that they offer the widest variety of services for their patrons. A very positive development can, however, also be identified for Dubai where in 2012 the digital service was rudimentary at best. By the time of our survey, a web OPAC in the national language as well as in English was available for Dubai Public Library members and online reference services were accessible through email and web form.

The role of the physical library has been a focus of interest in this investigation. With the rise of digital information services, a library building is no longer limited to hosting all kinds of printed materials. To explore this development, we asked librarians in interviews how public libraries adapt to the changing culture of creation and face-to-face activities in their buildings. Many librarians have confirmed a new understanding of the role of public library space as public space used for diverse community activities which serves the needs of individuals to learn, work and, in particular, access information and technology. A public library is a place for cultural activity and exchange, possibly even encouraging creation and entrepreneurship. Accordingly, a very famous example is the Chicago Public Library, which supports start-ups with the necessary infrastructure and, in exchange, sees entrepreneurs give back to the community by offering courses within their field of expertise, such as 3D modelling, to library patrons (personal communication, September 4 2013).

In the 21st century, the knowledge society is confronted with diverse challenges in providing access to information. The amount of information available is so vast and the level of technology required to retrieve information changing so quickly that it is becoming increasingly difficult to teach and maintain a high degree of information literacy. Accordingly, we investigated further if public libraries promote information literacy among their patrons and what are current challenges in this area. The findings have been compared to information literacy at academic libraries and only investigated in North American cities, these libraries being ranked at the top in a global comparison and therefore serving a special role as best practice examples. In conclusion, all interviewed librarians are aware of the value of

information literacy. However, in public libraries the basic need is not reference services, but rather related to everyday needs such as being able to use a mobile phone and mobile applications. Information literacy is trained in classes in the buildings, on request by the patrons and increasingly through e-learning. Through the latter, libraries are able to reach patrons that do not or cannot come to the library in person and the courses are not subject to spatial or scheduling constraints. Nevertheless, librarians are challenged because of the fast-changing technology. They are promoting electronic devices and e-content, but the face-to-face contact is still of great importance, especially for seniors and children.

Comparing the current result with the investigation of Mainka et al. (2013), public libraries have increased their role as part of the digital, smart, knowledge and creative infrastructure in informational world cities as well as their major role as a soft location factor. In future work, it would be interesting to investigate how the role of public libraries vis-à-vis the digital and physical space will develop and how libraries on a global scale will transfer information literacy skills to their patrons.

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Appendix

	Group	Indicator	Weight (Indicator)	Weight (Group)
DIGITAL LIBRARY	Web-OPAC	Web-OPAC	8	13
		Web-OPAC in English	5	
	e-documents	e-journals	1	10
		e-books	1	
		digital images	1	
		audio books	1	
		music	1	
		e-magazines	1	
		videos	1	
		newspapers	1	
		bibliographic databases	1	
		other e-resources	1	
	databases with access to full papers	databases with access to full papers - free of charge?	10	10
	guides	video guide	1	6
		podcast guide	1	
		seminars	1	
		text documents	1	
		FAQ	1	
		other guides	1	
	international access	website in English	10	10
	digital reference services	e-mail	2	10
		chat / instant messaging	2	
		sms	2	
		web form	2	
		skype	2	
	social media	blogs	1	6
		facebook	1	
		twitter	1	
		flickr	1	
		youtube	1	
		other social media	1	
	apps	apps	5	5
	own digitizations	own digitized documents / collections	5	5
PHYSICAL LIBRARY	spaces	learning spaces		8
		meeting spaces		8
		working spaces		8
		children's spaces		8
		maker spaces		8
	use of technology	RFID	2.5	10
		interlibrary loans (borrow anywhere and return anywhere)	2.5	
		wifi	5	
	architectural landmark	architectural landmark		10
	attractiveness of spaces	drinks / food	5	10
		attractiveness of spaces	5	
	information literacy	seminars on information literacy		5
		SUM DIGITAL LIBRARY		75
		SUM PHYSICAL LIBRARY		75
		SUM ALL		150

12 Open Innovation in Libraries

12.1 Introduction

Open innovation considers both, importing external ideas into an institution's knowledge and innovation processes as well as exporting its experiences to others. Chesbrough was the first who introduced open innovation into research [4,6,24]. One of his most important findings is: "equal importance given to external knowledge, in comparison to internal knowledge" [7, p. 11]. Open innovation means the participation of an institution's multiple stakeholders (customers, suppliers, competitors, etc.) in its innovation planning as well as the dissemination of internal ideas to others. The majority of open innovation approaches can be identified in large high-tech [5] and—later—in other companies in different industries [8]; however, there are some projects in government and public administration as well [17,37,37]. The use of open innovation can deploy pathways outside an institution's current businesses and evoke new products or even new markets [5].

There are two important aspects in open innovation projects, namely the stakeholder (especially user) involvement and the creation of a supporting eco-system. "The users are in the spotlight: an invention becomes an innovation only if users become a part of the value creation process. … Creating a well-functioning eco-system that allows co-creation becomes essential for Open Innovation. In this eco-system stakeholders are collaborating along and across industry and sector-specific value chains to co-create solutions to socio-economic and business challenges" [16, p. 13]. As a basic principle, "open" is a quasi-synonym for "user-centric," whereby "users" are both actual users as well as potential users, including former, possibly dissatisfied users.

A perfect example for public sector innovation [13,30] and a user-centric institution that benefits from open innovation is the (digital as well as physical) library [58]. It already was an ever changing and evolving institution [50] in the past, which now, more than ever, has "to keep pace with the needs of a modern information society" [36, p. 3]. Libraries use knowledge management to improve services, performance and also future prospects [46]. Open innovation

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gives them a chance to achieve those goals while steadily growing together with the environment, with technology, with their users and in doing so, becoming more relevant to them.

There are already many innovation projects in libraries [22,48]; in this article, however, we focus on *open* innovation, which is a relatively new phenomenon in libraries and not as extensively covered. Concerning libraries [25,26,39,40,42,51,52], open innovation integrates the views of users and non-users (as actual and potential customers), publishing houses, information services, software houses, design companies, etc. (as suppliers) as well as other libraries or further institutions (as competitors) into the development strategy of a library. Library knowledge and innovation processes include information inflows (application of external knowledge in the innovating library) and information outflows (dissemination of internal knowledge for reuse in other institutions). We prefer the terms "information inflow" and "information outflow" over "knowledge inflow and outflow" (often mentioned in the literature) because in information science knowledge is considered as static, while information is dynamic and able to flow [60, p. 24].

Innovation happens both on a large scale (for instance, planning new library buildings) as well as on a small scale (e.g., slightly modifying an existing library service). Of course, open innovation is applicable to all kinds of innovation [62], including

- New library services (services of the physical as well of the digital library [43]),
- New services outside "traditional" library services, which are needed in the present or future knowledge society,
- New library processes (processes to offer an established service), and
- New infrastructures (e.g., new library buildings).

Open innovation in libraries has strong connections to co-creation of library facilities and services [23,34] as well as to user-participation or the "participatory library" [31,47, 48, pp. 105 ff.], insofar knowledge management or innovation are concerned. Sometimes, processes of open innovation are called "design-thinking," especially in Aarhus [33,48, p. 82]. The

governance is always distributed; library staff, users and other stakeholders work together as co-producers of innovative processes, leading to "networked governance" [30, p. 28].
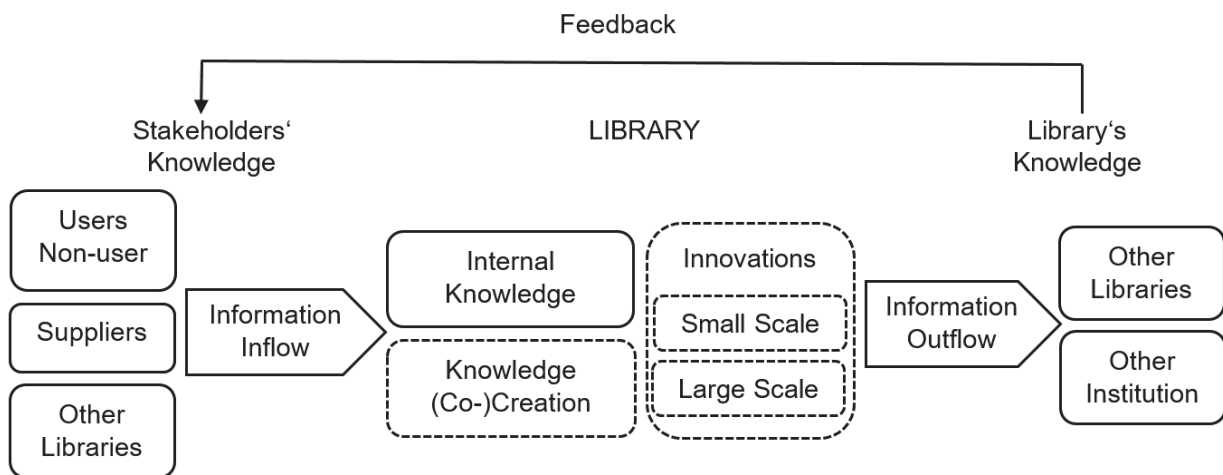
Figure 1: Theoretical model of open innovation in libraries

Since the advent of open innovation in research dates back more than a decade and first (however, very rare) projects in libraries started shortly after this, it is about time to study the success (or failure) of such projects. Our model of open innovation in libraries is depicted in Figure 1. Based on this theoretical model, our research questions (RQs) are:

RQ1: If a library applies open innovation, what are its sources, means and tools of information inflow?

RQ2: What concrete innovations do result from the open innovation process?

RQ3: If a library successfully applied open innovation, what are the addressees of information outflows in order to reuse the innovation?

By asking these questions we aim to add to the presented definition and model of open innovation in libraries examples from practice. To get a better understanding of information flows and the whole process, we first had to identify libraries which were already involved in open innovation. Information on their respective projects, strategies and results support further research and also function as examples for other libraries and organizations.

In the following, we will describe used methods and the questionnaire we created to gather information on circumstances, information inflow, outflow and concrete innovation outcomes of all case study libraries. All responses to the questionnaire will be summarized. After a report on each individual libraries' projects results are being discussed and concluded.

12.2 Methods

Besides literature review and content analysis of libraries' websites, our method is strongly related to case study research [14]. While analyzing literature and websites we were able to identify six libraries (four public libraries, one of them combined with a national library, one academic library, and one special library), which reported on open innovation projects conducted in their institutions (Table 1). As Eisenhardt [14, p. 545] recommends a sample size of four to ten cases, we decided to include all six cases in our study.

Table 1: Case studies of open innovation in libraries

Case	Country	Library Type
Chicago Public Library	USA	Public
Dokk1, Aarhus	Denmark	Public
Helsinki Public Library	Finland	Public
National Library Board	Singapore	National & Public
Roskilde Univ. Library	Denmark	Academic
ZBW, Kiel	Germany	Special

In order to gather empirical data on open innovation projects in libraries, we created a questionnaire and sent it to all our case study libraries. If there was published literature on our case, we integrated it into our analysis. The questionnaire included 14 questions:

1. What does open innovation mean for your library? Please describe! (open);
2. When did you apply open innovation? Starting year (1 date);
3. What is the actual state since the starting year? (closed: we continued / we terminated);
4. Why did you apply open innovation? What were your motives? Were there any triggers? (open);
5. What means did you prefer to cooperate with external partners? (closed, 11 multiple answer options);
6. Who was involved in the information inflow activities? (closed, 12 multiple answer options);
7. What kind of innovation did you create? (closed, 5 multiple answer options);

8. Please, summarize in a few statements the innovations you created! (open);

9. How did you motivate your external partners to cooperate with your library and to co-create innovations? (open);

10. Have you shared your experience through one of the following channels after the open innovation process? (closed, 5 multiple answer options);

11. Related to question no. 10, please specify! (open);

12. Can you, please, estimate the success (or failure) of the open innovation project(s)? (open);

13. Please, estimate the importance of community, empowerment and experiences as critical success factors for open innovation projects! (3 questions with estimations on a 7-point Likert scale);

14. Would you recommend open innovation to other libraries? (closed: yes / no / not sure).

12.3 Results

In this paragraph, we describe the results of our online questionnaire as well as details of our case studies. Six libraries (100%) filled in the questionnaire, but not all answered every question. Therefore, our N varies from question to question.

12.3.1 Online Questionnaire

What does "open innovation" mean for our participants? All libraries stress the roles of users and other partners. "Open Innovation provides a precious possibility to develop innovations with (potential) users or with external people with valuable knowledge" (P1). "We believe the best way to develop new or enhanced services for our city's residents is to develop and test ideas through a process that engages our entire organization, external thought partners, and our users" (P3). "Open innovation for us means that we involve users and partners in the project and initiatives that we do. … It means that we share ideas and thoughts instead of keeping them inside the library" (P4). Or, in short, "input from customers and users" (P5). While P5 emphasizes only information inflow, especially P4 also mentions information outflow.

Why did the libraries apply open innovation? "Because of the rapid pace of change in the world, in the communities our library serves, and the way in which knowledge is created and shared, we realize that our traditional methods for designing services, spaces and programs were no longer sufficient," P3 told. A more rigorous answer came from P4: "we … knew that the library couldn't survive if we didn't involve partners and users in developing services." P4's library "established an open Transformation Lab right in the middle of the library space to invite everyone to be part of designing the library."

One project of open innovation started as early as 2004; however, most activities began in 2010 or later. All participants who mentioned a starting year (N = 4) told us that they continued this process afterwards. All participants, who answered the question of recommendation (N = 3), would recommend open innovation to other libraries.

In a grounded-theory study, Nguyen [47] found out that three categories play important roles as critical success factors for open innovation projects in libraries:

Community, i.e. involvement of external partners in the project,

Empowerment, i.e. giving external partners power and status, and

Experience, i.e. the importance of knowledge and ideas of external partners.

For our participants, all three categories are generally important, but there is a clear ranking. With a mean value of 6.7 (on a scale between 1/unimportant and 7/very important) community involvement is essential. Empowerment is estimated in average with 6.0, and experience of the external partners with 5.3 (N = 3).

As we know that the participation of an institution's stakeholder is important, the deciding question is: What are the sources of the information inflows or rather how did the libraries cooperate with them and with whom (RQ1)? Figure 2 shows that the preferred methods to cooperate with others are workshops, followed by competitions, the library itself as a living lab and addressing of stakeholders. Half of our participants apply the establishment of a position for open innovation in their library, create an open innovation platform, use social media channels, organize city hall meetings and actively visit stakeholders.
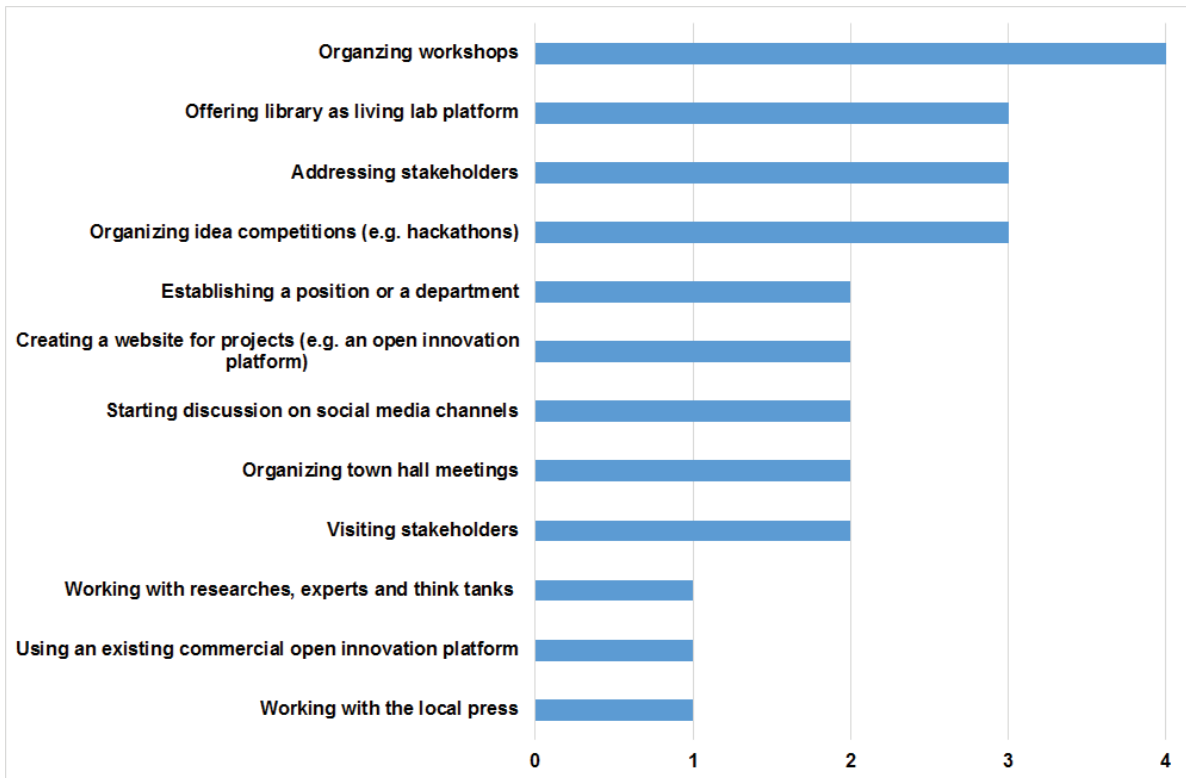
Figure 2: Means for information inflow (N = 4)

Our participants confirm that shareholders' knowledge, i.e. the knowledge of users, non-users, and non-active users, is important as the shareholders are involved in the information inflow activities such as competitions or workshops. As Bernier, Males and Rickman [3, p. 165] state, "it is silly to hide your most active patrons."

For all four participants to integrate the own library staff is important, too. Suppliers, such as software houses, design companies and IT hardware suppliers are not the main addressing shareholders. With one exception, librarians of other libraries were also involved in the information inflow activities. Publishing houses, booksellers, and information services are not at all involved in the information inflow activities (Figure 3).

RQ2 asks about the type of innovation. Based on our participants' answers, there are three different innovation types, which are resulting from open innovation processes. By using the shareholders' knowledge, the most popular innovation types being created by open innovation are both, new library services (N = 3) as well as new processes in the library (N = 3). Innovations include, for instance, the redesigning of services (answering questions and check-out

transactions), designing tools to support the findability of titles, improving computer skills and the development of interior spaces.

Furthermore, the third innovation type is a new library building (N = 2; Dokk1 and Helsinki Public Library), where the people are the main focus and not the books, as there are places for events such as listening clubs, maker activities, homework cafés and so on. Besides the two Scandinavian libraries, there seems to be a further example of open innovation concerning library buildings in Halifax [28]; however, Halifax Central Library refused to answer our questionnaire. So, two of our participating libraries realized an innovation on a large scale, while the other libraries preferred to start with open innovations rather on a small scale.
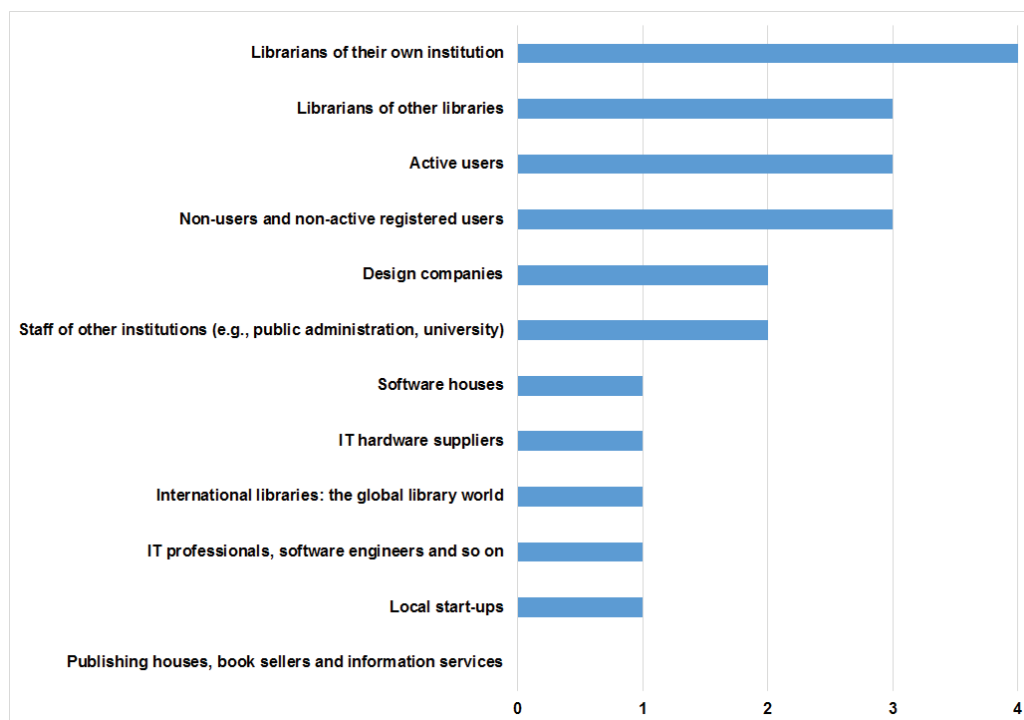
Figure 3: Shareholders involved in the information inflow activities (N = 4)

If a library successfully applied open innovation, what are the addressees of information outflows (RQ3)? There are two sub-questions. Were the projects indeed successful? How did the libraries organize information outflows? Concerning success or failure, two respondents told us that the success is difficult to estimate. For one other library, "open innovation projects were generally speaking a success" (P1). P3 reports on successful projects, but also on problems. "Perhaps a third of our projects we've launched have failed to achieve some level of success. The remaining two thirds have led to improvements in our services. Most of these

service improvements remain small in scale compared with the size of our, very large, library system. Very few projects, perhaps three or four, have resulted in large scale changes to our services." Even in their failures, P3's library identified success, because "the innovation model allows to test and prototype quickly. This allows us to discover quickly if an idea is worth exploring further, saving staff time and resources from being dedicated to projects that do not resonate with our patrons."

Who were the addressees of information outflows? All libraries answering this question (N = 3) addresses the library and information science community, other libraries as well as other institutions in order to reuse the experiences. Only two of our participants communicated their experiences via the local press.

In summary, the participants recognize that not only the knowledge of internal librarians is important to improve existent services or to create new services, but the knowledge of external stakeholders is important, too. For example, one participant describes the library space not only as "an ongoing innovation lab for the public but also for [them]—a space where [they] can experiment together."

Why is it important for libraries to create and improve services and to change or to extend the libraries' functions? Libraries need to collaborate and network with internal and external stakeholders to gain new ideas and knowledge in order to create future services that are concentrated on the users' needs. The easiest way to satisfy users and to get the maximum community benefit is to involve the users and other community members in the innovation process.

12.3.2 Case Studies

Chicago Public Library

The Chicago Public Library has been serving the people of Chicago, IL, United States of America, since 1873. With its 80 locations, it is aiming to provide "the innovative library services, technologies and tools Chicagoans need to reach their goals and to establish [their] city as a competitive force in the global marketplace" [9, para 2]. To truly achieve the goal of being an innovative library, Chicago Public Library has been continuously inviting not only

library users and staff but also external partners to share their ideas or expertise with them. One example is their cooperation with Aarhus Public Libraries in Denmark and design company IDEO to "create a new model for innovation, experimentation and decision-making within libraries" [27, para 1]. This cooperation was made possible by a grant from the Bill & Melinda Gates Foundation and resulted in "Design Thinking for Libraries," a toolkit to inspire and help with "design thinking" (Figure 4) or "human-centered design" as means to "envision new products, services, spaces, and experiences" [33, para. 1].

Brian Bannon, commissioner of the Chicago Public Library since 2012, relies a lot on design thinking himself—not only while creating new services for the library in its own Innovations Lab, but also when it comes to the "internal structure of the library" (i.e. staff selection; [53, para. 6]).

With the help of experts from inside and outside the library, projects as, for example, the city's first Maker Lab were made possible and successful. In this case, by "utilizing the expertise of the Museum of Science and Industry and creating an advisory board of university, library and museum staff as well as leaders of the making community in Chicago" [48, p. 90]. During the last years, Chicago Public Library implemented projects such as the YOUmedia digital learning spaces [10] by seeking the help of experts and users alike to promote creativity and innovation in their own libraries and constantly collecting feedback to keep improving. And furthermore, acts as a role model for other institutions by sharing knowledge and experiences via different channels, for example web blogs, conferences, workshops and the "Design Thinking for Libraries" toolkit published by IDEO [33].

Figure 4: Design thinking for libraries *Source:* http://designthinkingforlibraries.com/
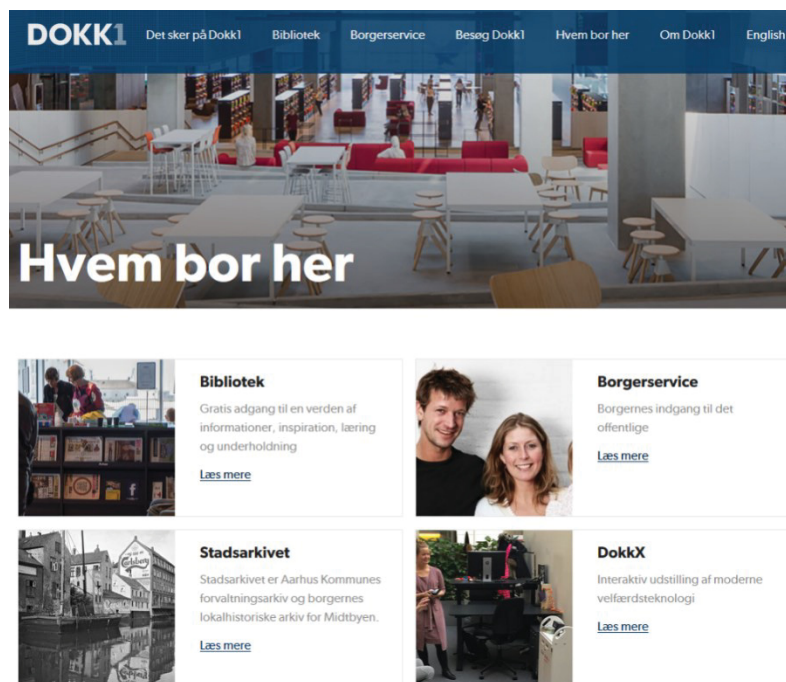
Figure 5: Dokk1 in Aarhus. Integration of library and citizen services. *Source:* https://dokk1.dk/hvem-bor-her.

Dokk1

The new Public Library in Aarhus, Denmark, opened its doors in June 2015 in a newly built media centre at the waterfront, integrating library, citizen services and other public services

into one building called Dokk1 (Figure 5) [1,29]. "Dokk1 … represents a new generation of modern hybrid libraries. This new library is a library for people—and not for books" [2, p. 92]. The development of Dokk1 is a best practice example of how to involve citizens in urban planning. In cooperation with the Chicago Public Library, IDEO, and the Gates Foundation a pilot project was established with the aim to create a tool for public libraries of how to fit the needs of the community in the current informational landscape.

An essential factor of the co-creation was the transformation lab that was established in the old main library. This was a space for "prototypes, tests, workshops, meetings, interviews and focus groups" [2, p. 92]. In this pilot project, three phases of design thinking were introduced [1, p. 442]

"Inspiration: learn something about the world.

Ideation: analyze what you have learnt and get ideas.

Iteration: build prototypes and learn more about your users."

The process of learning in phase three was not referred to asking the users what they want but by observing the user's experience of library services [15]. Open innovation is institutionalized in Aarhus; there is a job position called "Library Transformer."

Helsinki Public Library

The Public Library in Helsinki is going to open the doors of the new constructed main library in 2018. For the development process they involved the citizens in planning and decision-making. The main approach was to establish an involvement process that has a direct impact on the services, functions and organization [49]. At the Helsinki City Library, a participatory planner has helped to engage the citizens and partners in the development of the future library. The future library is (not only) designed *for* users, but *with* users [44].
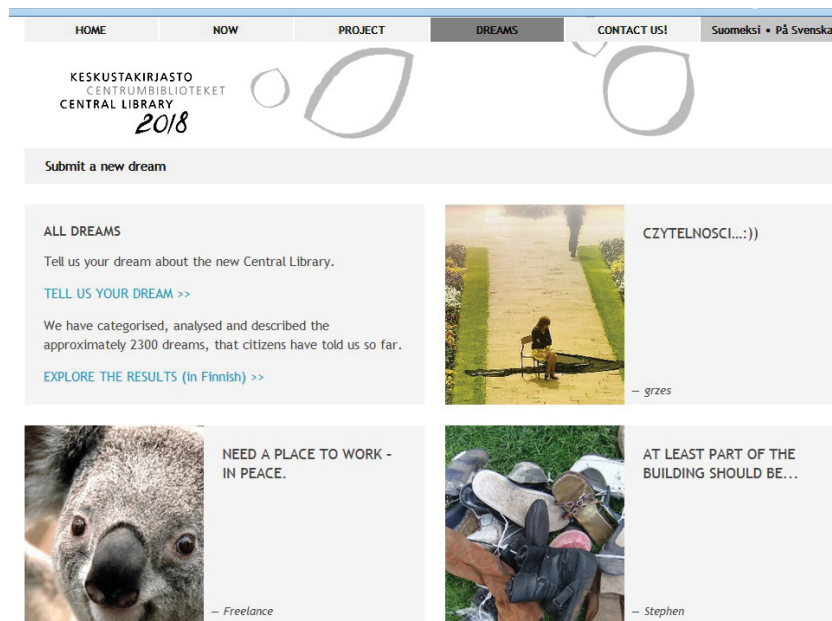
Figure 6: Helsinki Central Library: Submit a dream! *Source*: http://keskustakirjasto.fi/en/all-dreams/

For this purpose, the library planners have started the "dream on!" campaign (Figure 6). Accordingly, the citizens have been invited to submit their thoughts how they think the future library should look like [45]. Submission was possible online and physically at diverse city events. Based on these "dreams" and further workshops with citizens' involvement four projects have been identified to be implemented in 2013 by participatory budgeting. In the participatory budgeting users have been involved in the decision on how to spend 100,000 € for the library. Furthermore, a developer community was founded in 2014, called the Central Library's Friends ("CeLi Friends"). Citizens had to apply to join this participatory design project. To lead participatory projects, the library staff has been educated in applying co-design methods. Hence, the staff can better adjust projects to be integrated in the everyday routine instead of external agencies [45]. Finally, the CeLi Friends have helped to produce solutions and services concepts to posed questions by the library planners and architects within a collaborative process [32].

National Library Board Singapore

The National Library Board (NLB) Singapore runs a national library, 25 public libraries, the national archives, and 15 special libraries in the city-state Singapore [11]. For Nicholson [48,

pp. 70sq.] the National Library Board has transformed the public libraries in Singapore into one of the most innovative library services in the world. "Most of our innovations are done in partnerships" Ngian Lek Choh, former Deputy Chief Executive and Director of the National Library, states (personal communication, March 19, 2017). For Choh [11, p. 7], the users do not only demand more services, "they also want to be part of the library's development and processes." User participation is welcomed; however, the quality of the users' contributions differs from person to person. For Choh [11, p. 8], it is a task for librarians, to find ways "to engage them meaningfully and also to use the content that they contribute meaningfully." Engaging users to cooperate, anywhere and anytime as well as in the way the users prefer to be engaged, is a new skill of librarians.

NLB has established an open innovation platform (Figure 7). It works for information inflow (e.g., uploading of tagged photos for the Singapore Memory Project) as well as for information outflow (e.g., the use of NLB content for partners to reuse it for their services and programs [12, p. 155].

One example for successful information inflow is the Singapore Memory Project, which aims to capture, and document precious moments and memories related to Singapore. It involves partners (academic, research and library institutions, heritage agencies, public agencies, private entities and community organizations). The portal allows every Singaporean to own a memory account to deposit their memories. A "memory" includes texts, photos and videos; nowadays, more than 1 million documents, uploaded by Singaporean people, are collected (as of April 2017). Another example reports on successful information outflow. NLB offers data and services for open access, enabling external parties to create innovative applications and mash-ups. This service was first conceptualized based on feedback and interest expressed by information service providers. For Web developers, data are accessible via API. NLB designs open innovation projects for a win-situation for all partners, including the NLB itself, organizational partners and citizens. It is essential for NLB's libraries to ensure "that stakeholders support the library" [12, p. 156].
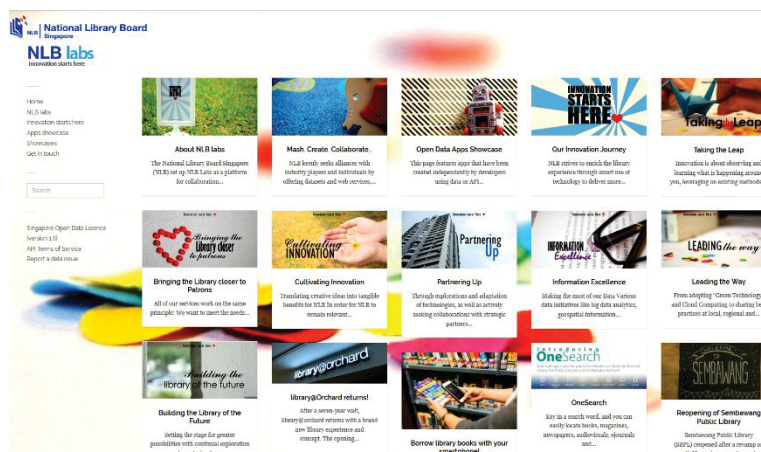
Figure 7: Open innovation platform of the National Library Board Singapore.
*Source:*www.nlb.gov.sg/labs/

Roskilde University Library

Roskilde University Library (RUB) in Roskilde, Denmark, is about 35 kilometers away from the capital city Copenhagen and is an academic library for students and staff of the Roskilde University [54,55,56,58]. RUB offers different electronic services which are based on different sources, but a "lot of projects are based on ideas coming from people employed at RUB such as librarians, management, the director and the IT department" [54, p. 210]. According to Scupola and Nicolajsen [57, p. 32], the "most ideas come from top management, collaboration with external partners and competitors but also, even though to a lesser extent, from employees." RUB offers its user the forwarding of complaints by having a customer-complaint box or the e-mail function [54, p. 210] and traditional user satisfaction surveys and online chats [57, p. 32]. According to Scupola [54, p. 210], the received emails of users are being screened and RUB could use them for step-by-step innovations. Additionally, RUB wants to give the user an understanding of "how to use the e-services and self-services" [54, p. 211]. They are trying to achieve this aim by collaborating with teachers and instructors. Further, they also want to share their experiences with other libraries and small and medium companies. In cooperation with the two researchers (Scupola and Nicolajsen) RUB tried to identify the needs and opinions of their users by the blog *RUbminds* on the RUB website, which was an initiated pilot experiment by both mentioned researchers. This experiment results from the fact, that until then the RUB users were not directly integrated into the innovation process. The results of the experiment show that "the blog was considered by the library management as a useful tool to

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communicate with the users and to generate a manageable amount of useful ideas" [57, p. 28]. The experiment *RUbminds* enables the first direct involvement of the RUB users in the innovation process related to the RUB services [57]. *RUbminds* includes four topics; based on these topics the RUB should get users' feedback:

"1) Do we comply with your wishes?

2) If you should furnish the library ….?

3) Is RUB your favorite library?

4) The future of the library—give us your suggestions" [57, p. 31]

The blog shows that users, for example, need facilities such as a silent room with computers, small rooms for group work and lounge areas [57, p. 33]. According to Scupola and Nicolajsen [57, p. 33], "all the suggested ideas have been implemented by RUB." *RUbminds* should not only collect the feedback but the library employees "had the possibility to comment and respond to the users' postings", too [57, p. 32]. As the blog experiment was successful, the RUB decided to use it further [57, p. 34]. At least one example for the information outflow is given by using "Denmark's Electronic Research Library" (DEFF). As it should act as a network of electronic research libraries, it should provide "electronic and other information resources [of the integrated libraries] in a coherent and simply way" [54, p. 208]. DEFF includes feedback (positive as well as negative experiences) shared by the libraries. Such collected transparent experiences could support the idea generation. "For example, each library might be in charge of testing an IT solution, then they share experiences and finally they decide to choose and adopt a system" [54, p. 210]. There are noticeable first beginnings of open innovation, but there is obviously some room for more user-centered project improvements in Roskilde.

ZBW / German National Library of Economics

The German National Library of Economics, located in Kiel on the waterfront of the Baltic Sea, is the biggest special library for economics on a global scale. Around 2010, the ZBW started idea contests to create better library services [18,19,20,21,39,40,62].

The first open innovation project was the "EconBiz Challenge," starting in 2010. In 2012, the challenge "Economy library looks for: Your ideas for a better service" followed [19, p. 349]. For the EconBiz challenge, 105 participants contributed their ideas; for the "Economy library looks for" challenge the library collected 52 ideas. Both challenges applied an open innovation platform ("Neurovation;" Figure 8); they were designed following the standards of the ZBW Web pages. Winner of the first challenge was an idea to create an Online Call Organizer, i.e. a calendar with calls for papers of economic conferences.

Additionally, ZBW organized a lead user workshop. Aim of the workshop was to discuss the winning idea with winners of the challenge, ZBW's staff and students of service design in order to find a "life cycle" of a call [39, p. 12].
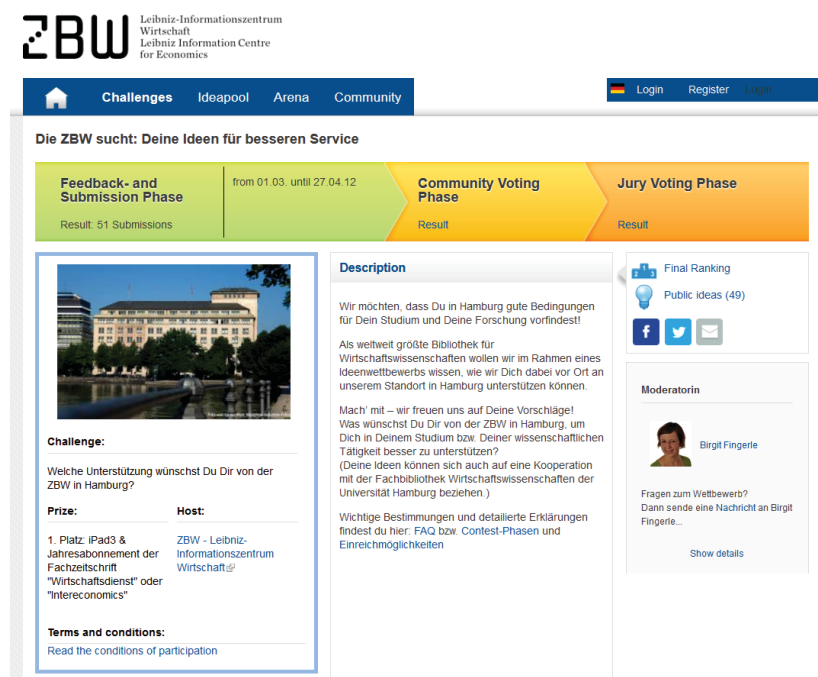
Figure 8: Open innovation at the German National Library of Economics: Ideas for better library services *Source:*zbw.neurovation.net/

ZBW's idea challenges led only to low-level innovations, in this case to innovative library services. However, for Fingerle [19, p. 352] open innovation—also on upper levels—should be part of a systematic library innovation management. ZBW established an executive department for library innovation management.

12.4 Discussion

Six case studies have been presented in this work of which four were public libraries. Knowing that not all types of libraries are (equally) represented, we want to emphasize that this study is not representative, and the goal is not generalization of results but to gain a deeper understanding of theory and practice while providing examples for future open innovation projects and research. Furthermore, while we were not able to find many studies on open innovation in the academic library context, Islam et al. [35, p. 48] found that most librarians from university libraries deemed service innovation as "critical to the continuing success" of their institutions. Open innovation is indeed one possible way of knowledge creation and management to achieve this. To introduce open innovation, however, is a major cultural shift within public sector services in general as well as within the library in particular and needs to be managed carefully [45]. Few libraries introduce pilot projects that are using open innovation experimentally. Whenever a library includes other stakeholders in a library's planning or development process, an information inflow is supported. Thus, knowledge is created in a shared learning process. Shanhong [59] defines the goal of knowledge management in libraries as promoting knowledge innovation needed in the knowledge society. This applies to both public and academic institutions. Open innovation, to us, means "applying open and collaborative knowledge management strategies to raise innovation capability by utilizing the wisdom of" not only "the team" [59, p. 90] but the whole community. Referring to the investigated libraries, the sources of information inflow have been foremost the users and, in some cases, non-users. In particular, in the development process of new library buildings, citizens who are non-library users may help to improve the library service by adding ideas for a modern and more attractive library. Non-users could be reached, for example, at city events. The information inflow from users and citizens is mostly related to the gathering of new ideas. Furthermore, libraries are cooperating with teachers, researchers, academic and museum staff, programmers, suppliers, other libraries and local companies.

Based on the information inflow, small and large-scale innovations evolved. A process of knowledge creation is happening through different methods. In the questionnaire, the participating librarians mentioned that workshops, competitions and living labs are the

preferred means. Furthermore, online tools are preferred to involve citizens and users. Foremost, the libraries are implementing their own platforms instead of using social media channels. Hence, knowledge creation is not only referred to user cooperation. Further, knowledge creation can as well happen within the library by teaching the staff. For example, the library staff in Aarhus has been trained in design thinking.

The innovations that we identified are happening on different levels. Some are related to improving particular library services and others to the development of a completely new library building. Digital services that have been implemented are, for example, the call organizer (a calendar with calls for papers of economic conferences) at the ZBW and the Singapore Memory Project that allows different stakeholders to upload own content. Both are small-scale innovations, whereas the development of the Helsinki Public Library and Dokk1 in Aarhus are large-scale innovations. The user involvement has led to a new understanding of the library as public space for the community.

Finally, referring to the model of open innovation in libraries, an information outflow is considered to happen after the innovation process. This has occurred in the libraries by different means. Thus, the Chicago Public Library and Dokk1 in Aarhus have published a design thinking toolkit for libraries and in addition, the cooperating firm IDEO has published a report to be reused by other libraries. In other cases, papers and reports are published that refer to the library's experience. A good tool was also established in Denmark, where library staff may gather positive and negative feedback on a national online platform to share it with other institutions and libraries. Hence, all participating libraries in this study are sharing their experience on request.

There are expected to be many more library projects that use open innovation than we presented in this study—especially projects that use information inflow. Maybe libraries practice open innovation, but do not use this term. Those projects should be published and fed into the common library knowledge pool to be reused in the future. Therefore, we call on libraries to enhance their information outflow on knowledge and innovation projects.

12.5 Conclusion

In this study, we investigated the information flows within open innovation in libraries. Open innovation was first introduced in high-tech industries to identify new pathways of information flow. In business, open innovation results in new products which may enter new markets. Currently, libraries are adapting the idea and allow information inflows from diverse stakeholders. The investigated case studies reveal that the involvement is on different levels and result in small and large-scale innovations. Small-scale innovations refer to additional services that have been introduced through co-creation activities. In contrast, large-scale innovations evolve a change in the library like the definition of a library as public space for the community. In the investigated libraries, new products have been developed together with users, suppliers, other libraries and companies. Hence, we can confirm that an information inflow may result in small as well as in large-scale innovations in libraries.

After the innovation, an information outflow is expected to share the "library's knowledge." According to the investigated libraries, different means of information outflows are identified. The libraries that we have investigated publish their experience. Hence, this is the reason why we were able to identify these libraries to be examples of open innovation. However, there is no cumulating platform. Such a platform could help other libraries to learn from the experience that some libraries have made with open innovation. Like in the case of the Helsinki Public Library, management staff first identifies the state of the art according to library services and methods that are used to introduce new services. Then they are going to introduce them in their library. In the case of the projects introduced in Aarhus and Chicago, a toolkit for other libraries has been developed to assist the libraries to adopt open innovation in their business model. Thus, we can further confirm that there exists an information outflow. According to our questionnaire, we can as well approve a feedback in particular between librarians. Hence, the participating libraries have admitted that they work together with other librarians to receive information inflow.

Summing up, open innovation in libraries is changing the culture of how libraries develop and how knowledge management is done. Through the open processes, libraries can be adjusted according to the needs of their users or even reach new users. With patron-driven information

inflow, open innovation and the participation of citizens in library knowledge and innovation projects, Abraham Lincoln's famous statement on government from his Gettysburg Address (1863) [41] comes into reality for libraries: Libraries of the people, by the people, for the people.

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13 Conclusion

The core of the research program presented in this dissertation is the role of information literacy in our society's information age. Additionally, special attention is given to the library institution, its transformation and its role as catalyst for information literacy education in the information and knowledge society. While each chapter (2-12) presented in this dissertation is a full research paper with its own research question(s), results, discussion and conclusion respectively, we now conclude the whole research program, at its current stage. Following Lakatos (1976), this is the point where we look back and corroborate our findings to evaluate which steps were content-increasing and which lead to a degenerative shift in the positive heuristic. This step is essential in directing further steps of the research program, therefore we will formulate future research goals in this chapter as well.

13.1 Information literacy as a meta-competence of the knowledge society

As our society is transitioning and in response to the cultural, social and economic developments brought by the advancement of technology, certain abilities have become imperative for us to reach our personal and professional goals. While there may be different terms for the blend of abilities needed for our everyday lives in the information age, the concept is roughly the same: To be able to participate in everyday life, society, and self-development in a knowledge society we need to have the necessary skills. We need information literacy. This has been the hard core, the negative heuristic of the present work since the beginning – and it still is.

Information literacy is a growing research topic (Chapter 2), even outside of library communities. In Chapter 3, we identified two main research areas: (1) information literacy assessment and (2) Information literacy education.

13.2 Information literacy assessment

The task of assessing individual's information literacy skills in a holistic way has proven to be a challenge. Investigating the use of information and media through observation and interviews focuses on opinions, attitudes or behavior of the subjects rather than measurable values.

Advantage of these methods is clearly the close contact with the subjects – here, issues can arise which were not even considered before, and additional information can be conveyed, compared to other methods. The study presented in Chapter 5 is considered a breakthrough in information literacy research, as it was one of the first to explore media and information behavior of very young children (aged 3 to 6). In itself a proof of concept, as children of this age were not considered a viable target group for media and information literacy in several areas of research, it provided valuable insight into the digital media practices in families with young children and in kindergarten and represents an extensive progressive step for the research program. It laid the foundation stone for further, crucial information science research in this area, proving what Generation Z's parents already knew to be true: Even the youngest members of the information society are already participating in digital practices. Therefore, they cannot be exempt from research and practice, if only for the sake of prevention. In this era of ongoing digital transformation, each generation grows up in a world more digitalized than the other. Further research in this area is of high importance, as there are no representative results yet on which recommendations and education policy could be based on. Studies of this kind, however, require a particularly large amount of resources, especially if they ought to yield representative results. Not only the workload of preparing and conducting interviews and observational experiments is to be considered but also the evaluation of collected data. Despite these restrictions, it will be necessary to carry out similar studies on a larger scale. Exceedingly helpful in this regard was a highly innovative method utilized in the execution of our study. Turning the object of research itself, a self-developed app, into a tool for experimentation and observation, proved to be a viable method for the interviews with very young children and contributes to the corpus of innovative information science research methods.

In Chapters 4 and 6, the focus lies on another method of information literacy assessment. Questionnaires allow for a concrete, measurable and therefore comparable review of information literacy skills through knowledge and performance tests. Here, a distinction is usually made between right and wrong answers or actions. They are often utilized to evaluate the effectiveness of education programs as, for example, at university (Chapter 4) and in libraries (Chapters 7 & 8). Questionnaires can have a high degree of objectivity but usually

only measure factual knowledge, which means that not all areas of information literacy competence can be assessed, which is also one of their major limitations. Especially when considering that methodical skills seem to become more and more important, we have to be careful what exactly we measure and be aware of what we cannot measure when conducting surveys. In this context limitations are being recognized in the attempt of a cross-cultural comparison by means of an online questionnaire developed in our department (Chapter 6). While there were efforts to minimize bias by translating the survey instrument by native speakers and having it reviewed by experts from both countries, in hindsight, validity of the test results is questioned as they are presumably nevertheless subject to test bias, more specifically, construct bias (van de Vijver & Tanzer, 2004), the construct being information literacy itself. This bias in favor of the tool-creating entity or culture can be observed in similar studies, for example by Rust, Schlögl and DongBack (2016), as well. The Programme for International Student Assessment (PISA) has been assessing students' use of ICT worldwide (OECD, 2015), however, their test is restricted to access and familiarity and therefore does not assess information literacy. While test bias is a research topic and challenge for all cross-cultural assessment methods – even programs like PISA (van de Vijver & He, 2016) – the cross-cultural assessment of information literacy skills has not yet been (properly) researched. Therefore, while this is initially judged as a degenerating shift of the research program, a new field of interest for information literacy assessment research emerges.

13.3 We are not information literate enough

Reporting on assessment results, studies of this research program (see, for example, Chapter 2, Chapter 3, and Chapter 6) have confirmed previous research: We are not information literate enough. Measured information literacy levels were relatively low – even among university students. Furthermore, it is a misconception that the younger generations, so called "Digital Natives" grow up to be information literate just because they grow up using digital media. Studies show that the self-confident use of new media does not equal information literacy (Bartlett & Miller, 2011; Mahmood, 2016; Ng, 2012; Orszullok, 2012).

In the meantime, digital skills are increasingly required in private life and at work. The International Telecommunication Union (ITU) of the United Nations predicts a talent gap for

professionals with digital skills for 2020, leaving half a million positions unfilled in Europe alone (International Telecommunication Union, 2018). But where are we at as a society when it comes to proper information literacy education? And what is the role libraries play in this regard?

13.4 Information literacy education

In an era of ongoing digital transformation, information science research plays a crucial role in observing but also facilitating the shifts in educational practice – from kindergarten to far beyond general education. This also means that research must not be limited to the academic context as it has been practiced for the greater part in the past. In many countries, educational institutions and policy makers have only just begun to think about including digital skills in their education systems' curricula. Therefore, the research presented in this dissertation is timely and of high importance. In our work of the recent years, we recognize three factors that hinder the establishment of organized information literacy education: (1) the lack of awareness, (2) limited resources, and (3) education for educators. Content created through research in these areas may help overcome them and is worth investigating further.

Kindergarten children have been an overseen target group for media and information literacy education which is an awareness issue that we and other researchers, as well as parents and educators, have been tackling for years. During these years, other studies emerged, supporting our call for media and information literacy education in pre-school contexts. Finland is one of the pioneers of information literacy education in kindergarten worth being mentioned. This year in February, the whole country celebrated Media Literacy Week, an educational theme week with the goal to promote media literacy (Tossavainen, 2019). The National Audiovisual Institute of the Ministry of Education and Culture is the "Finnish media educational authority, with a legal task to promote media education" (National Audiovisual Institute, n.d., p. 6). Media and information literacy education is promoted by national policies, for example the Finnish curriculum for pre-primary education, which includes ICT and media literacy (Pääjärvi & Mertala, 2015). The importance here is that there need to be efforts to develop information and media literacy competences not only among citizens of all ages but first and foremost

among educators, as research in this work has shown among others (see, for example, Chapters 5 & 7).

In Chapter 2, we discuss ways to include information literacy education in the German education system. While there are several possible strategies, it is imperative that teacher training has to include information literacy education for them to take effect. At the present time, however, most teachers are not adequately trained in information literacy. Ader, Orszullok and Stock (2013) suggest the training of information literacy teachers supported by school librarians. In some countries, as for example in Qatar (Chapter 9), the majority of schools already has a library as it is considered part of the school. However, if there are no professional librarians working in these, if the staff is not trained for information literacy education and if they are seen as providers of access to information exclusively (e.g., lending out books) instead of providers of education, this is not possible. In this case, the cooperation with a local public or academic library could be a compensatory solution. In Chapter 2 we imagine central infrastructure facilities for the subject of information literacy as well as for the use of digital media in other school subjects which could take over the role of school libraries. In any case, however, it has to be stressed that an expensive ICT infrastructure is not the key and not even necessary in preparing students for life and work in the knowledge society, as the focus lies on information skills, not familiarity with technology.

Finally, information literacy education at the university level should be mentioned. In the past decades, the majority of scientific publications focused on information literacy in institutions of higher education (Rader, 2002; Tewell, 2015). This is also due to academic librarians developing materials and courses for information literacy instruction (Rader, 2002). In our meta-analysis in Chapter 3, however, we report on information literacy deficiencies on *all* levels, including university students. Again, we conclude a need for increased information literacy training activities. A suitable approach for providing such courses in an online format are, for example, Massive Open Online Courses (MOOCs; Chapter 3).

While information literacy training in higher education is well researched, it is restricted to a very limited audience – university students. And although information literacy has become a

core competence for all citizens in the information society, most people today never had any formal information literacy education. Here, libraries come into play.

13.5 Libraries are key players in information literacy education

Libraries are, next to kindergartens, schools and universities, important institutions for information literacy instruction. Public libraries play a supporting and supplementary role during general education but become much more important in later stages of life, especially for people who do not attend any of these educational institutions anymore. Many offer programs for today's silver surfers to promote ITC skills and information literacy among seniors so that they too can be engaged in digital activities. While senior citizens are often mentioned in discussions around the digital divide or digital inclusion, digital literacy and inclusion programs should be available for anyone, regardless of age, education, ability, or employment status. This aligns with the mission of the library (International Federation of Library Associations and Institutions, 2003).

However, promoting digital and information skills through classes has not always been a main objective of libraries – especially in public libraries, formal information literacy instruction came along with transitioning in order to reposition the library as institution of the 21st century (Julien & Pecoskie, 2009; Woodard, 2003). The objective of the present research program is to investigate how far and well this transition has progressed, both in public and academic libraries. In Chapters 7 and 8 an extensive study on the current practices and challenges of information literacy instruction in North American libraries is described. Establishing these libraries as active promoters of information literacy is an important progressive shift for the present research program and a contribution to the current state of library and information science research. Several facets of information literacy instruction were investigated, among them professional development, infrastructure, focus and methods of instruction. The results show library instruction trends as well as deficits and challenges in informational cities of Canada and the United States of America. An important contribution is the comparison between public and academic institutions, particularly concerning the assessment of the specific competence areas of information literacy. Most and foremost they have implications for practice and policy, as we identified obstacles that stand in the way of the libraries' mission

to educate citizens of the knowledge society. At the same time, we confirmed that librarians from both public and academic institutions saw it as their responsibility to actively promote information literacy among their patrons.

But what happens to libraries which do not evolve? By the definition given and used in this work, institutions that simply store books are archives and nothing more. The library of the 21st century is far away from a collection of bookshelves. It offers not only access to information and education services but also the digital and physical spaces needed for the foundation, encounter and development of different communities. It supports lifelong learning, innovation and sustainable development. After establishing information literacy education as an important mission of the library institution in Part I of this work, in Part II the focus lies on the transformation of libraries and how they are utilized to transform societies.

13.6 Transformation of nations

In Chapters 9 and 10 two case studies are presented, one being Qatar National Library (Chapter 9), the other Singapore's National Library Board (Chapter 10). Both studies investigate how governments utilize libraries or library systems to drive the transition towards a knowledge society or smart nation, however, the two cases are in completely different stages of development. Singapore's National Library Board poses as inspiring example from which we can learn, as the current infrastructure and range of services offered is result of a four-decade long development. In the case of Qatar's National Library, we are able to study the transition towards a knowledge society and the role of libraries in this development from the start. Here, the role of librarianships is in a transition itself and it is of importance to keep observing how it evolves. These studies contribute by investigating the role of the library in different stages of information and knowledge societies and by formulating strategies to ensure the full potential of the library institution is fulfilled.

13.7 Transformation of libraries

To a large extent, one can identify the transformation of libraries by the services they offer. In Chapter 11 the core services of public libraries in informational world cities are explored. In this study, we document the change and progress in the development of modern libraries

around the world by ranking them. It is already the second iteration of this ranking process, comparing the result of 2012 with our results of 2015. We observed a positive development, as physical and digital services offered by the libraries were increased. This increase strengthens their role as part of the digital, smart, knowledge and creative infrastructure in the knowledge society. As libraries located in North America are still positioned at the top of the ranking, they continue to be relevant case studies for library and information science research. Additionally, a positive development was also observed for library services in other countries. As this is an ongoing investigation, future iterations of this research will continue to be relevant and interesting for research as well as practice. Another aspect related to *what* services are being offered by modern libraries, is *how* they could implement these services. In the last chapter (Chapter 12) open innovation is explored as way for libraries to transform and to offer new services to their patrons. Open innovation has the potential of changing the culture of how libraries evolve and innovate. It is an approach to knowledge management utilizing open processes in order to create and adjust services according to the needs of their patrons. With open innovation it is also common to include non-users and therefore reach new users for the library. We explored this method by surveying libraries who had already conducted open innovation on a small or large scale in their institutions and we encourage other libraries to use our results and follow their example. As open innovation is a knowledge management model applicable to various kinds of institutions and projects, the study's insights represent not only a progressive and content-increasing step of the research presented in this dissertation but also apply to other areas of practice.

13.8 Outlook

Definitions of information literacy, the transformation of libraries and other educational institutions in our society, technology in our daily lives: They all have changed and will continue to change. The present is already entirely different from what we imagined in the past when the first computer, the first mobile phone or the internet was introduced. We are confronted with diverse challenges and opportunities.

Yet the transformation has only just begun. Researchers prognose that new technologies such as "artificial intelligence, nanotechnology, 3D printing, and other technologies will usher in a

new era that will radically alter patterns of consumption, production, and employment" (International Telecommunication Union, 2018, p. xi). It will surely continue to disrupt and transform our world. All we can do is adapt – at school, at work, in research and practice and in our private lives. Information literacy is our human right and our privilege, allowing us to develop as empowered and autonomous individuals of the knowledge society. Information literacy education is crucial to fight misinformation and level the playing field to give everyone the opportunity to do so as well. As information literate being it may be hard to imagine something like the digital divide, one of the challenges of the 21st centuries. Nevertheless, it is important to realize one's own privilege and the gap between oneself and others who do not have the access or ability to turn the available information into their advantage. Today, we go back to our smartphones, our emails and our laptops. But who knows how our daily lives will look like in the future? The present research program, along with other information science research, is a possibility to support policy makers, educators and individuals in shaping an information age of inclusion and sustainability.

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