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### Aims and Scope

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# Privacy literacy instruction practices in academic libraries: Past, present, and possibilities

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## Abstract

This article explores the past, present, and possibilities of privacy and privacy literacy (PL) instruction in academic libraries. It surveys the scholarship on privacy and privacy literacy from the domains of philosophy, anthropology, history, law, education, and LIS. A privacy conceptual model is proposed demonstrating the zones of informational agency that privacy preserves, and a timeline of privacy and libraries documents key developments in privacy culture in the US. Findings from an original exploratory survey of privacy literacy instruction practices in academic libraries are discussed. The survey identifies the rationales, topics, contexts, methods, and assessments academic librarians use in delivering privacy literacy instruction, as well as barriers against privacy literacy that they encounter. The article concludes with a case study explicating the authors' own privacy literacy instruction experiences, and specific recommendations for overcoming the barriers to delivering privacy literacy instruction in academic libraries identified in the survey findings.

## Keywords

Academic libraries, critical perspectives on LIS, information literacy and instruction, libraries and society/culture, principles of library and information science, privacy, privacy literacy, services to user populations, types of libraries and information providers

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## Introduction

Recent polls find that, while technology use is nearly ubiquitous, many people attribute a decline in personal well-being, civility, trust, and social cohesion to the digitization of daily life (Anderson and Rainie, 2018; Birth, 2015; CAPS, 2017; Hoofnagle et al., 2010; Rainie, 2018; Shannon-Missal, 2015). Individuals are understandably anxious about loss of control over personal information, online bullying and doxing, manipulation of information, implications for political processes, and wear and tear on the social fabric. Taken together, these are symptoms of an underlying condition – a radical shift in privacy culture. Since the spread of computerization in the 1970s and accelerating with the advent of personal

computing, mobile technologies, and machine learning, the values, behaviors, and social contracts compromising the claim of the individual to autonomy in her identity, reputation, and relationships are fundamentally disrupted. The disruption of privacy culture further implicates the foundational units of society, from personhood, to intimate partnerships and families, to civic organizations, faith-based communities, political and commercial activities, and more. To the extent that people can shape privacy culture, they

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should do so in full consideration of the impact and scope of the outcomes. This requires privacy literacy (PL) – but, tellingly, a 2014 Pew poll found that half of Americans do not understand the function of a privacy policy (Smith, 2014).

A suite of knowledge, behaviors, and critical dispositions regarding the information constructs of selfhood, expressive activities, and relationships, PL is related to information literacy, and addresses many of the metaphysical and social dynamics of information. Libraries are natural venues for the cultivation of PL, owing to the centrality of privacy to library practice, the agility of libraries in responding to pressing informational needs in society, the expertise librarians share as teachers, and the respect librarians demonstrate for a plurality of patron identities and values. Libraries can serve as sites for contesting privacy disruption because they are trusted social institutions, and because librarians are entrusted to act in their publics' interests (Geiger, 2017).

This article serves as a roadmap to the past, present, and possibilities of privacy and PL instruction in academic libraries, placing theory and practice in conversation. The section *Privacy in Context* surveys the scholarship on privacy and PL from the domains of philosophy, anthropology, history, law, education, and library and information science (LIS). A privacy conceptual model is proposed to demonstrate the zones of informational agency that privacy preserves, and a timeline documents key developments in privacy culture in libraries and the US. *Privacy literacy instruction in academic libraries: Current practices* presents an original exploratory survey that asked academic librarians about the rationales, topics, contexts, methods, and assessments they use in delivering PL instruction, as well as the barriers against PL that they encounter. The article concludes with *Privacy literacy possibilities: Case study and call to action*, explicating the authors' own PL instruction experiences, and offering specific recommendations for overcoming barriers identified in the survey findings. Librarians should work to deliver information, ethical reasoning strategies, discussion venues, and models for the renewal of privacy norms that underpin the individual and associational rights essential to free societies.

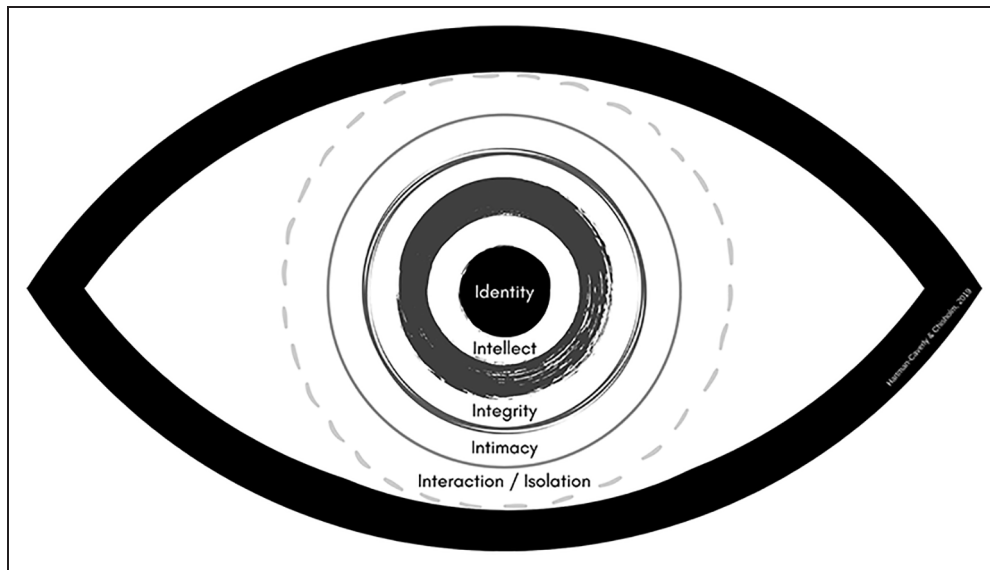
## Privacy in context

### Defining privacy

Privacy scholarship is a site of robust investigation, theorizing, and debate about the nature of privacy in the human experience. Far from settled science, clear themes nevertheless coalesce in the literature, which

situates privacy in the self, personal information, intimate relationships, associational autonomy, and withdrawal into solitude. Benn (1971) and Reiman (1984) each claim that privacy is a precondition of personhood, providing what Cohen (2000: 1424) describes as a “zone of relative insulation” in which to exercise Warren and Brandeis's (1890: 211) “right to an inviolate personality.” Schoeman (1984a: 413, 416) observes that privacy guards a “private sphere of moral valuation” where one creates meaning independent from social validation, allowing people the “freedom to define ourselves” (Fried, 1984: 212) and to experience an essential “incomputable self” (Hildebrandt, 2019: 84). Prosser (1984) articulates a mental interest in being free from unwarranted public attention, which Bloustein expands to a protection for “individuality and human dignity” (Bloustein, 1984: 163; Wasserstrom, 1984). Privacy further protects intellectual processes, including inquiry, skepticism, belief formation, creativity, and entrepreneurship, and confers ownership of intellectual property resulting from these activities (Cohen, 2000, 2013; Keizer, 2012; Richards, 2015; Solove, 2013; Westin, 1967). Integrity, both in a physical and metaphysical sense, is safeguarded by privacy, whereby one exerts a right to bodily integrity (Reiman, 1984; Warren and Brandeis, 1890) and engages the information norms that comprise Nissenbaum's (2004: 124, 139–40) theory of “contextual integrity.” Individuals have an interest in controlling what is known about them; such contextual integrity is preventive of context collapse and provides the informational distance necessary to participate freely in a broad range of relationships (boyd, 2008; Cohen, 2000; Fried, 1984; Prosser, 1984; Keizer, 2012; Schoeman, 1984a; Solove, 2008).

Voluntary association and the freedom from relational coercion are established through privacy in social, civic, and commercial contexts (Karst, 1980; Mooradian, 2009; Rachels, 1975; Wasserstrom, 1984). The choice to relinquish individual privacy and to establish shared privacy underpins the “intimate associations” identified by Karst (1980: 629, 634). Extending Karst's analysis, Reiman (1984) asserts that the willingness to share formative experiences are a precondition for intimate caring – a state which requires relational autonomy, and therefore privacy. Confidants, confidences, and candor all require confidentiality, or shared privacy (Fried, 1984; Karst, 1980; Keizer, 2012; Posner, 1984; Richards, 2015; Schoeman, 1984a). Privacy enables individuals to determine with whom they will interact, and under what conditions, as well as the right to withdraw into voluntary seclusion (Posner, 1984; Prosser, 1984; Reiman, 1984; Warren and Brandeis, 1890; Westin,



**Figure 1.** The Six Private I's Privacy Conceptual Model depicts concentric zones of agency over one's presence in the world, from identity, to intellect, to bodily and contextual integrity, to intimacy, to autonomous interaction with and isolation from others.

1967). Ultimately, the writer Keizer (2012: 20) asserts, privacy constitutes a “resistance to being used against one’s will.” Privacy must be purposeful, not merely circumstantial; it is instrumental to both individual wellbeing and to social cohesion (Cohen, 2000; Moore, 1984; Posner, 1984; Solove, 2008). Privacy can be imagined as concentric zones of agency over one’s presence in the world, emanating from the essential individual self, through the activities of the mind, to the ability to permit and prevent the access and influence of others in one’s lived experience, as depicted in the Six Private I’s Privacy Conceptual Model (Figure 1).

### *Privacy and its discontents*

Privacy is a universal human value, the expression of which is as diverse as the individuals, communities, and cultures comprising the totality of humankind. While theorist Westin (1967) observes privacy’s origins in the territorial behaviors of other animal species, privacy practices among homo sapiens are shaped by complex sociocultural dynamics (Keizer, 2012; Moore, 1984; Solove, 2008; Westin, 1967). Among these, class, power, roles, and social standing influence an individual’s claim to and practice of privacy in any given context. Combined with the capabilities of automation and data profiling, these factors also render some people more vulnerable to privacy intrusions, an effect called disparate impact (Barocas and Selbst, 2016; Gandy, 1993; Keizer, 2012; Nissenbaum, 2004; Solove, 2008; Strahilevitz, 2013). Criticisms of privacy commonly stem from

these disproportionate harms (Cohen, 2000; Richards, 2015; Schoeman, 1984b; Solove, 2008; Wasserstrom, 1984). Historically, however, common law privacy doctrine in the US is shaped by an 1881 finding in favor of a woman plaintiff, and lack of privacy is cited as a contributing factor in the failure of many 19th-century utopian communities (Keizer, 2012; Prosser, 1984; Westin, 1967). Privacy further enables freedom from conformity to majoritarian social norms, favors transparency and accountability from powerful data holders, and preserves the possibility for individual transformation and social change (Bloustein, 1984; Cohen, 2000, 2013, 2019; Hildebrandt, 2019; Karst, 1980; Richards, 2013; Schoeman, 1984b; Solove, 2008; United Nations, 1948; Westin, 1967). Privacy is pluralistic – universally recognized and contextually realized.

Rapid developments in networked technologies pose an intellectual freedom conundrum: that as technology provides users with increasing access to ideas and affordances for extended cognition, it simultaneously renders their internal mental processes subject to observation and influence (Cohen, 1996; Gandy, 1993; Hildebrandt, 2019; Richards, 2015). A cascade of privacy regulations, prompted by concerns about government surveillance following the Watergate scandal and widening computerization of agencies in the 1970s, applies fair information practices to a broad range of services (Gorman, 2015). Solove (2008) asserts that surveillance is a more intrusive form of compelled information disclosure than interrogation or search by nature of the fact that

surveillance is comparatively unlimited (see also Richards, 2013; Westin, 1967). Furthermore, the very possibility of surveillance exerts a chilling effect on the broad behavioral category of speech, which includes information seeking and idea formation as prerequisites to expression (Benn, 1984; Cohen, 1996, 2000; Richards, 2013; Schauer, 1978; Solove, 2008; Wasserstrom, 1984). Properties of web data implicate privacy at an unprecedented breadth and scale (boyd, 2008; Mooradian, 2009), but the disproportionate energy directed to securing personal data obscures privacy's broader purpose. It is no benefit to the subject for her personal data to be secure if the very conditions of data collection distort her thoughts, decisions, or relationships (Cohen, 1996; Ho, 2015; Solove, 2008; Wasserstrom, 1984). Privacy means being free from potential or actual monitoring, not merely that access to the records resulting from such monitoring be controlled.

Despite privacy's universality, skeptics rightfully observe that people's actual behaviors often contradict their stated privacy values, a phenomenon called the privacy paradox. Privacy scholars attribute this value-behavior gap to cognitive, structural, and personal factors which affect individuals' abilities to act in alignment with their privacy preferences (Buschman, 2016; Cohen, 2000; Gerber et al., 2018; Solove, 2013; Sovern, 1999). Cognitive factors include information asymmetries between system or service provider and the user, user knowledge of system design as it pertains to data flows, and the technical and legal literacy needed by the user to read and act on privacy-related terms of service (Cohen, 2000; Cohen, 2019; Solove, 2013; Sovern, 1999). System defaults which disfavor privacy, data aggregation and brokerage, increased transaction costs for opting into privacy protections, and the social salience of personal disclosure are examples of structural factors (Cohen, 2013; Gerber et al., 2018; Solove, 2013; Sovern, 1999). Personal factors comprise the ability to invest time and attention in privacy decision-making, and the ensuing opportunity costs (Sovern, 1999). The privacy paradox is one dimension of a broader autonomy paradox – that the exercise of autonomous choice is itself a learned behavior (Cohen, 2000). With a focus on behavioral consciousness rather than behavioral change, librarians can deliver learning opportunities that enable individuals to realize their autonomy, take informed action on privacy preferences, and advocate for privacy policies and design affordances.

### *Privacy and librarianship*

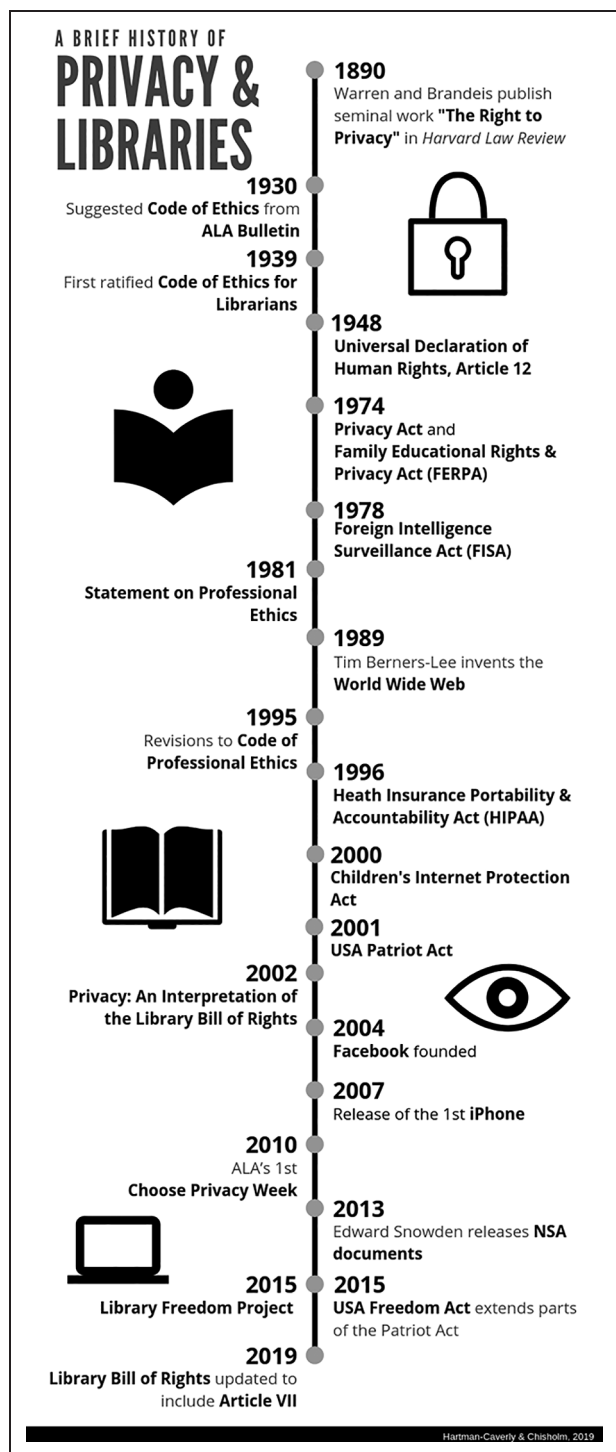
Privacy is a central tenant of modern librarianship in the US. Early discussions feature in the 1886 volume

of *Library Journal*, in which members of the New York Library Club Dewey, Poole, and Coe debate the merits of privacy and confidentiality for reporting book thieves and bibliomutilators (Nelson, 1886). In that same year, Woodruff of Cornell University Library published a paper in the American Library Association (ALA) proceedings admonishing excessive mechanization and scientific management in libraries, and extolling integrated library instruction and “private research” (Woodruff, 1886: 24) for cultivating “mental activity,” inquiry, and lifelong learning in undergraduate students (pp. 22–23). A half-century hence, the first Code of Ethics for Librarians adopted by the ALA in 1939 articulates the obligation to maintain the confidentiality of patrons' private information (Ludington et al., 1939). The Library Bill of Rights was also adopted in 1939, and while intellectual freedom was always an organizing principle, it is not until 2001–2002 that the ALA recognized an official interpretation specifically regarding privacy (Magi and Garner, 2015a).<sup>1</sup>

Academic librarians likewise codified privacy values in the “Intellectual Freedom Principles for Academic Libraries: An Interpretation of the Library Bill of Rights,” adopted in 2000; however, privacy was not a consideration in the information literacy (IL) objectives and competency standards approved in 2001, and did not formally factor into academic library instruction practices until the adoption of the *Framework* in 2016 (ACRL, 2000; ACRL, 2001; ACRL, 2016a). Other notable initiatives include ALA's Choose Privacy Every Day, an expansion of Choose Privacy Week which began in 2010, and the independent Library Freedom Project started in 2015 (Caldwell-Stone, 2018; Macrina, 2015; OIF Staff, 2010). These efforts culminated most recently in a 2019 amendment to the Library Bill of Rights – the new article VII recognizes a universal right to patron privacy and confidentiality, and calls on libraries to “advocate for, educate about, and protect people's privacy” (ALA, 2019). It is for these and many other reasons that privacy scholar Richards (2015) celebrates librarians and the ALA Professional Code of Ethics as a model for preserving intellectual privacy and intellectual freedom.

### *Privacy in the LIS literature*

With privacy as a core value of the library profession, it has been written about extensively in the LIS literature. Since the USA Patriot Act in 2001, the rise of social media in the early-2000s, and the release of NSA documents from Edward Snowden in 2013, among other societal developments as outlined in



**Figure 2.** A Brief History of Privacy & Libraries highlights key privacy developments in librarianship and civic affairs, with a primary focus on the US.

Figure 2, librarians have experienced renewed commitments to protect patron privacy in their capacity as information providers.

There is a surplus of literature serving as privacy primers and refresher pieces for library professionals. This is an obvious attempt to bring those in the profession up to date on current issues, obfuscation tools,

privacy-friendly online practices, and to make the overarching case that librarians should remain committed to our values even as privacy is repeatedly declared dead. As Magi (2011: 188) states, "If librarians are to remain among society's guardians of privacy, it will be valuable to have a broader and deeper understanding of what is at stake – of the many and varied ways in which privacy contributes to the well-being of both individuals and society." Her excellent piece serves to educate librarians on the privacy scholarship from a wide variety of disciplinary perspectives and to make a case for why privacy still matters to society (Magi, 2011). Entire books have been written as guides to privacy fundamentals for information professionals (Connolly, 2018; Givens, 2015). Both titles include sections pertaining to PL and outreach, as well as practical information to supplement any knowledge gaps. Lambertson (2015) also contributed a curated bibliography for *Library Journal* to help librarians get up to date on surveillance technologies.

Critiques of professional practices based on core values and ethics make up a large component of the LIS literature coverage of privacy advocacy. Serious criticisms have been raised about many practices, including libraries' enthusiastic adoption of social media (Lilburn, 2012); contracts with database vendors which conflict with core values and policies (Salo and Kharfen, 2016); academic libraries' complicity and participation in the learning analytics practices of their home institutions (Hartman-Caverly, 2018; Jones and Salo, 2018; Prindle and Loos, 2017); and the adoption of personalization library systems, such as OCLC's Wise (Fister, 2018) to name a few.

Zimmer's (2013) review on patron privacy considerations in library literature serves as a seminal piece on how libraries have embraced and adopted Library 2.0 tools with insufficient attention paid to privacy-related concerns. He observes that there is negligible scrutiny of how pervasive implementation of these technologies will impact patron privacy and even less analysis of how to address potential privacy concerns; he cautions that this could lead to a policy vacuum and ends with a call for increased education and outreach to library professionals about privacy issues related to the proliferation of cutting-edge technology adoption (Zimmer, 2013).

While patron privacy is discussed in detail, practical applications of PL remain lacking. The need for PL has only increased with current events: the public's erosion of trust in large tech companies – including Facebook, Amazon, and Google – and the increasingly pervasive presence of surveillance technologies in our everyday activities, both online and offline, have made the discussion of privacy all the

more relevant. New and shocking examples of how individual citizens are being monitored are plentiful and increasing at a dizzyingly rapid rate (*New York Times*, 2019).

Despite this, IL – particularly in higher education – has not answered the call for increased privacy awareness. An ALA survey on librarians' attitudes regarding information and Internet privacy showed that “while over 75[%] of the respondents feel that libraries should play a role in educating the general public about privacy issues . . . only 13[%] indicate that their library has hosted or organized information sessions, lectures, or other public events related to privacy and surveillance over the past five years” (Zimmer, 2014: 138). A similar survey of academic librarians in Canada conducted by Tummon and McKinnon (2018) showed that while many respondents had attended professional development events related to privacy, 55%, not many worked at a library that hosted these opportunities for patrons, 19%.

Although the literature features abundant possibilities for librarians to educate their patrons about privacy, most of these papers are theoretical or opinion pieces. Few articles describe applied approaches to PL. Many pieces in the trade literature contain calls to action for the profession (Janes, 2014; Johnson, 2018; Kim, 2016). Several include specific recommendations for educating patrons (Cirella, 2012; Magnuson, 2011; Salo, 2013). It is worth note, that the focus of many of these articles is on patron privacy within the library context. This is an essential responsibility since the library, as an institution, cannot stand on any ethical ground without first upholding its core values and professional commitments. However, it seems that librarians are more comfortable with outreach that pertains to library-specific policies and actions, as opposed to the admittedly daunting task of PL and all that it entails. Furthermore, and of particular interest to the authors, many of these pieces are specific to public libraries (Maceli, 2018; Rundle, 2014) and K-12 institutions (Cirella, 2012; Maycock, 2010), rather than within higher education. In fact, several training and educational programs are available through public libraries (NYC Digital Safety, n.d.; San Jose Public Library, n.d.), and are documented in case studies within the K-12 context (Ballard, 2017; Seroff, 2017; Stephens, 2017).

Of articles that contain specific PL case studies, the majority focus on digital presence and online reputation management (Cirella, 2012; Magnuson, 2011; Maycock, 2010). This is understandable as it allows for concrete training of step-by-step tips people can follow to maintain a certain level of privacy. These workshops can even follow a model similar to the conventional

point-and-click demonstration and have tangible outcomes for attendees. This approach, however, simply scratches the surface of PL by addressing only front-end features that people can easily control. It is the mechanisms on the back-end – algorithmic and artificial intelligence (AI)-based data modeling – that can have major, and often invisible, impact on individuals. This PL conundrum is highlighted by Hagendorff (2018: 137):

Even if media users' level of literacy or knowledge about protective skills is very high or even professional, those skills are highly limited due to the fact that users cannot influence the internal rules of data analysis and data sharing of platforms, institutions, and services.

In the academic library context, PL topics seem to be addressed instructionally on a small scale as a part of a larger course or topic. Within a credit-bearing course, Witek and Grettano (2014) used the metaliteracy framework to discuss privacy topics in the context of social media. Tewell (2016) makes the call for related topics such as algorithmic bias to be covered under the lens of critical librarianship. IL initiatives specifically focused on PL as the main goal are shockingly absent with the notable exception of Wisinger's (2017) work developing a PL framework in the healthcare science IL context.

Despite the deficiency of IL case studies, there are increased calls for PL to become a calculated responsibility of academic librarians' instruction and educational outreach. Lowe (2016) builds the case for privacy/security to be integrated as a part of IL. She notes that privacy issues are often addressed by technology branches of the ALA as opposed to teaching sections, posing these concerns as “technology-based” and not “information-related” (Lowe, 2016: 6). Fortier and Burkell (2015: 60) endorse the view that librarians have the responsibility to raise the “privacy-related digital literacy of patrons.” Through their piece they promote an educational approach to PL and librarian continuing education on the topic (Fortier and Burkell, 2016). Wharton (2018) frames the issue of privacy around the ALA's Core Values of Librarianship, specifically social responsibility. She draws the important distinction between academic librarians' role in teaching digital literacy from their role in protecting patron data, making calls for purposeful outreach and education to students (Wharton, 2018: 42).

### **Privacy literacy instruction in academic libraries: Current practices**

Recent publications propose theoretical frameworks for PL, present case studies of localized PL instruction efforts, and issue calls for librarians to include PL in



**Table 1.** Institutional demographics of survey respondents.

Institutional demographics						
<i>Institution Type</i>	Public	Private	For-profit	Total		
count	51	21	0	72		
<i>Student FTE</i>	Fewer than 1000	1000–2999	3000–9999	At least 10,000	Total	
count	4	16	24	37	81	
<i>Carnegie Classification</i>	Doctoral university	Master's college or university	Baccalaureate college	Associate's college	Special focus institution	Total
count	37	21	17	5	1	81

**Table 2.** Professional demographics of survey respondents.

Professional demographics									
<i>Library Instruction as Primary Responsibility</i>	Yes	No	Total						
count	65	15	80						
<i>Years of Academic Library Instruction Experience</i>	Less than 5	5–10 years	11–15 years	More than 15 years	Total				
count	29	29	10	12	80				
<i>Areas of Instructional Support</i>	Humanities	Social Sciences	STEM	Health Sciences	Business	General education	First-year experience	Co-curricular	Other
count	48	51	31	26	29	46	47	8	6

their instruction programs, but no published data exists to systematically document and study current PL instruction practices across academic librarianship. This exploratory survey seeks to address this gap in current knowledge by analyzing current PL instruction practices in academic libraries.

### *Privacy literacy instruction survey methods*

A survey instrument was developed to explore current practices of PL instruction in academic libraries (see Appendix A). Survey content and design was informed by similar work in the LIS and education literature (ALA, 2017; ACRL, 2016a; Campbell and Cowan, 2016; Cirella, 2012; Fisher et al., 2015; Guth et al., 2018; Harris et al., 2011; Hensley, 2015; Julien and Hoffman, 2008; Julien et al., 2018; Kaletski, 2017; Nathan et al., 2014; Pedley, 2016; Schulte and Knapp, 2017; Stockman et al., 2008). Designed in Qualtrics, the online survey was distributed via email listservs and accepted responses for six weeks from

Thursday, 28 February through Thursday, 11 April 2019. Four listservs were selected for their reach and scope: ILI-L, infolit, acrlframe, and dss-dil\_dg. Participation was sought from practicing academic librarians who have instructional duties as part of their professional roles. Participants were asked what privacy topics are taught, in what instructional contexts PL instruction occurs, what teaching and learning strategies are used in PL instruction, how PL instruction is assessed, and what factors influence PL instruction practices in academic libraries. The survey instrument was approved by Pennsylvania State University IRB as study number STUDY00011611; participants granted informed consent to participate.

### *Findings*

The online survey generated 118 unique submissions, with 82 completed to the end. Survey design considerations, including multiple response questions, conditional logic, and skip permission, produce a

**Table 3.** Privacy topics included in PL instruction.

Topic	Response count	% of respondents (n=80)
I do not include privacy topics in instruction.	28	35.00
<i>Data Profiling – category total</i>	155	n/a
Filter bubbles; echo chambers	37	46.25
Targeted advertising	33	41.25
Algorithmic/machine bias; data discrimination	26	32.50
Algorithms; modeled data	24	30.00
Recommender systems (ex. Facebook’s People You May Know)	17	21.25
Automatically monitored data (metadata)	11	13.75
Sentiment analysis/shaping	7	8.75
<i>Consumer Privacy – category total</i>	128	n/a
Account privacy; authentication	27	33.75
Social media; online identity management	25	31.25
Private web browsing	18	22.50
Reading Terms of Service/Use	15	18.75
Mobile devices; apps; location-based services	13	16.25
Streaming services; cloud computing	9	11.25
Educational privacy; FERPA; learning analytics	8	10.00
Health data; genetic analysis	7	8.75
Smart devices; Internet of Things	6	7.50
<i>Intellectual Freedom – category total</i>	88	n/a
Censorship	33	41.25
Right to privacy; civil liberties; social justice	28	35.00
Data ethics	17	21.25
Selfhood; identity formation; individual will	10	12.50
<i>Surveillance – category total</i>	54	n/a
Chilling effect; self-censorship	18	22.50
Corporate surveillance; surveillance capitalism	18	22.50
Government/law enforcement surveillance	13	16.25
Workplace monitoring	5	6.25
<i>Professional Applications – category total</i>	24	n/a
Privacy regulations (ex. HIPAA)	13	16.25
Privacy policymaking (data governance, privacy auditing, privacy impact assessment)	8	10.00
Data laundering	3	3.75
Other	2	2.50
<i>Total</i>	479	n/a

different number of respondents and responses for each question as noted in the data tables.

**Demographics.** Most respondents, 71%, worked in public institutions, with the remaining 29% working in private colleges. Nearly half, 46%, worked at institutions with at least 10,000 full time enrollment (FTE) students, followed by 29% with 3000–9999 FTE. Almost half of respondents, 46%, work at a doctoral university, with another quarter, 26%, working at a Master’s college or university (Table 1).

The vast majority of respondents, 81%, have library instruction as a primary job responsibility. In terms of academic library instruction experience, 36% of respondents have less than five years, an additional

36% have 5–10 years, 13% have 11–15, and 15% have more than 15 years. Lastly, the most common areas of instructional support of our respondents are general education, 16%, and first-year experience, 16%, with a wide distribution in other subject areas (Table 2). The overall demographic breakdowns of respondents are available in Table 1 (institutional demographics) and Table 2 (professional demographics).

**Privacy literacy practices.** Respondents reported addressing a wide variety of PL topics in their instruction, as seen in Table 3. The top three most frequently covered topics are (1) filter bubbles; echo chambers, (2) censorship, and (3) targeted advertising. Authors suspect that topics (1) and (3) are a result of the fake

**Table 4.** Pedagogical methods used for PL instruction.

Method	Response count	% of respondents (n=53)
Lecture or demonstration	34	64.15
Large group discussion	30	56.60
Small group discussion or think-pair-share	22	41.51
Personal reflection	21	39.62
Privacy topics used as examples in search demonstrations	18	33.96
Case study analysis	14	26.42
Hands-on/applied activities (ex. setting device privacy preferences)	12	22.64
Pro/Con debate	10	18.87
Other	3	5.66
<i>Total</i>	164	<i>n/a</i>

**Table 5.** Contexts in which PL instruction is delivered.

Context	Response count	% of respondents (n=53)
<i>Mediated</i>		
One-shot session	48	90.57
One-on-one consultation	24	45.28
Credit-bearing course	18	33.96
Standalone workshop	11	20.75
Embedded librarianship	8	15.09
Team-taught course with subject faculty	2	3.77
<i>Disintermediated</i>		
Resource guide (Ex.: LibGuides, list of sources)	16	30.19
Library displays or passive programming	14	26.42
Other	4	7.55
Independent learning activity (ex. handout or online module)	3	5.66
Social media	2	3.77
<i>Total</i>	150	<i>n/a</i>

news phenomenon and subsequent coverage in IL instruction. Survey free-text responses soliciting learning outcomes and learning objects support this theory. Of particular note is the fourth highest response, 35%, for *I do not include privacy topics in instruction*. The overall breakdown of privacy topics that academic librarians include in PL instruction (as categorized by the authors in the survey instrument) is available in Table 3. Participants are covering topics primarily in the areas of *Data profiling* and *Consumer privacy*.

**Table 6.** Rationale for engagement in PL instruction.

Rationale	Response count	% of respondents (n=53)
Core values of librarianship; professional code of ethics	36	67.92
ACRL Framework (Information has Value)	34	64.15
Student interest	22	41.51
Information literacy program outcome	13	24.53
Subject faculty request/collaboration	13	24.53
Not addressed by other co-/curricular units	11	20.75
Subject-based learning outcome (ex. HIPAA in health science)	6	11.32
Other	6	11.32
<i>Total</i>	141	<i>n/a</i>

**Table 7.** Methods used to assess PL instruction.

Assessment	Response count	% of respondents (n=52)
<i>Do not assess</i>	25	48.08
<i>Informal</i>		
Feedback from students	32	61.54
Self-reflection	20	38.46
Feedback from subject faculty	17	32.69
Feedback from librarian/peer	15	28.85
Formative assessment (ex. worksheets)	14	26.92
<i>Formal</i>		
Self-evaluation	18	34.62
Student evaluation of instruction	13	25.00
Summative assessment (ex. graded assignment)	10	19.23
Subject faculty evaluation of instruction session	6	11.54
Pre- and post-session test results	5	9.62
Peer observation/evaluation	5	9.62
Transactional statistics (ex. number of visits to a library guide)	4	7.69
Other	1	1.92
<i>Total</i>	185	<i>n/a</i>

The primary methods of instruction reported by participants are (1) lecture or demonstration, (2) large group discussion, and (3) small group discussion or think-pair-share. A full breakdown of pedagogical methods academic librarians use for PL instruction is available in Table 4.

**Table 8.** Distribution of professional satisfaction among librarians regarding PL instruction practices at their institutions.

Satisfaction level	Response count for respondents who do not include privacy topics in instruction	% of respondents (n=81)	Response count for all other respondents	% of respondents (n=81)
Extremely satisfied	0	0.00	2	2.47
Somewhat satisfied	1	1.23	4	4.94
Neither satisfied nor dissatisfied	11	13.58	19	23.46
Somewhat dissatisfied	10	12.35	22	27.16
Extremely dissatisfied	6	7.41	6	7.41
Total	28	n/a	53	n/a

In terms of PL instruction contexts, respondents overwhelmingly cover these topics in the one-shot session, 91%; one-on-one consultations were the second most common context, 45%, with credit-bearing courses at 34%. Table 5 gives a full breakdown of contexts in which academic librarians deliver PL instruction.

Respondents cited (1) core values of librarianship; professional code of ethics, 68%, (2) ACRL Framework (Information has Value), 64%, and (3) Student interest, 42%, as the top bases for PL in instruction. The overall breakdown of the rationale for academic librarians engaged in PL instruction is available in Table 6.

Respondents' top PL instruction assessment<sup>2</sup> methods were (1) feedback from students, 62%, (2) do not assess, 48%, and (3) self-reflection, 38%. Based on additional survey options with formal student feedback methods, the authors believe that the top assessment method is informal student feedback. Table 7 provides a full breakdown of methods used by academic librarians to assess PL instruction.

In response to professional satisfaction among academic librarians regarding PL instruction practices at their institution, 54% of participants reported being extremely dissatisfied or somewhat dissatisfied; 37% reported being neither satisfied nor dissatisfied; and only 9% reported being extremely satisfied or somewhat satisfied. A more granular breakdown of professional satisfaction based on librarians who do not include privacy topics and those who do include privacy topics in their instruction is included in Table 8.

When asked about factors influencing the lack of delivery, or dissatisfaction with, PL instruction, respondents most frequently responded with (1) I do not have enough instructional time to address privacy, 80%, (2) Privacy is not a priority learning outcome for IL sessions, 62%, (3) I do not have the expertise to teach about privacy, 40%, (4) Lack of subject faculty support, 40%, and (5) I do not have time to develop privacy learning activities/lesson plans, 29%. Of

**Table 9.** Barriers to satisfactory delivery of PL instruction.

Barrier	Response count	% of respondents (n=55)
I do not have enough instructional time to address privacy	44	80.00
Privacy is not a priority learning outcome for IL sessions	34	61.82
I do not have the expertise to teach about privacy	22	40.00
Lack of subject faculty support	22	40.00
I do not have time to develop privacy learning activities/lesson plans	16	29.09
Lack of library administration support	10	18.18
Other	6	10.91
I don't know	4	7.27
Lack of student interest	3	5.45
Privacy literacy falls outside of information literacy	2	3.64
Another campus department teaches about privacy	0	0.00
Total	163	n/a

significance to the authors was the time restriction cited by respondents, both in dedicated instructional time and in development of educational resources. Another interesting finding was that no respondent cited another campus department teaching privacy topics. A full breakdown of barriers to satisfactory delivery of PL instruction by academic librarians is available in Table 9.

### Discussion

From the survey results, it is evident that academic librarians are addressing PL-related topics using a variety of methods and in numerous contexts. The rate of dissatisfaction (Table 8), however, suggests that there is interest and motivation to cover these

topics, but the barriers of time – both time to prepare educational opportunities and dedicated instructional time – professional expertise, and support from administration (Table 9) hinder librarians' ability to execute PL initiatives. This might also explain librarians' reliance on didactic pedagogies, lecture and large group discussion (Table 4), which typically require less preparation and class time than more active learning modalities. The lack of reported campus departments covering these important issues (Table 9) makes it even more vital that academic librarians take on the responsibility to introduce PL to the curricula at their home institutions.

Under closer inspection, the authors suspect that many of the PL topics being addressed in IL contexts are not motivated from a privacy education or advocacy focus. Survey free-text responses soliciting learning outcomes and learning objects reveal that many of these topics are borne of fake news, critical librarianship, and diversity initiatives.<sup>3</sup> While these are valuable and vital contributions to IL instruction, the authors here are advocating for privacy-centric initiatives and programs that place the focus of instruction on PL.

Contrary to common critiques of privacy advocacy, students do care about privacy (Richards, 2014). Public polling data refutes this myth (Rainie, 2018), as does data from this survey. Not only did 42% of respondents cite student interest as a basis for PL (Table 6) but student feedback, 62%, was cited as the primary assessment method of instruction (Table 7). This validates the rationale that students do express care about privacy. The data from the authors' formal assessment of their privacy workshop, as discussed in the following section, also confirm this theory (Figure 3).

### Limitations

This survey aimed to establish a baseline of academic librarian interest and practice in the area of PL. The authors also hoped to advance scholarship on PL instruction in academic libraries by identifying avenues for further study and plan to develop a qualitative follow-up study of PL practices among academic librarians. This data includes only a small sample size, a total of 82 finished surveys, of academic librarians with teaching responsibilities; findings are exploratory and not assumed to be generalizable. Due to the email listserv recruitment method, self-selection bias and convenience/snowball sampling biases are limitations to the study design. Because no prior published data exists on the subject of PL instruction practices in academic libraries, this study aimed to establish a baseline of librarian interest and practice in this area, and even a

low response rate is itself an indicator of the status of PL instruction in academic libraries.

### Privacy literacy possibilities: Case study and call to action

At Penn State Berks, the first-year experience (FYE) program and the library have a close relationship which includes open house events, as well as a topical IL workshop series. The authors, having a shared view that PL is a neglected topic within IL instruction, embarked on a collaboration to leverage the library's FYE connections into a way to engage the campus community in this vital and emerging literacy.

Once it was decided that a digital privacy workshop was to be developed for a first-year student audience, the authors set out to find a theoretical framework to ground their pedagogy. Identifying one of the few case study examples in the academic library literature, Wissinger's (2017) article expands upon Rotman's (2009) PL theoretical framework, which posits that PL is a cognitive experience and aligns it with critical thinking. The authors used backward design to develop their Privacy Workshop (Chisholm and Hartman-Caverly, 2018) applying Wissinger's (2017) critical thinking alignment to the *Framework*; specifically, two knowledge practices in the Information has Value frame:

understand how the commodification of their personal information and online interactions affects the information they receive and the information they produce or disseminate online;

and

make informed choices regarding their online actions in full awareness of issues related to privacy and the commodification of personal information (ACRL, 2016a).

Also relevant is the Information has Value disposition of students "examin[ing] their own information privilege" – or, as is often the case with respect to privacy, the potential lack thereof (ACRL, 2016a).

The authors sought to illuminate the invisible forces behind online data collection and facilitate a shift in students' conceptual understanding of privacy. Recognizing that PL practices archetypally only comprise knowledge practices to enact protection through privacy enhancing tools without addressing the complex, systematic surveillance practices of corporations and government which can lead to a detrimental sense of control (Hagendorff, 2018: 139), the authors aimed to dig deeper. As a result of these aspirations, the following learning outcomes were developed:

Students will be able to:

1. recognize how their personal data and meta-data are collected, along with the potential implications of such data collection;
2. assess how their data is shared and make informed, intentional choices to safeguard their privacy;
3. identify privacy issues facing our society;
4. describe the positive case for privacy as a human right fundamental to individual well-being.

In lieu of a prescriptive approach, a variety of active learning activities are implemented with ample opportunity for formal and informal assessment (Hartman-Caverly and Chisholm, 2018). The workshop is sequenced based on the three types of data – consciously given, automatically monitored, and modeled – laid out by Ip (2018). Students warm up by visiting stations to reflect on their privacy practices and values. They are then asked to independently use a list of interactive websites to explore data tracking and their personal advertisement behavioral profiling in real time, to unveil backend algorithmic processes that are typically invisible to users. To connect these processes beyond narrow individual experiences, small groups analyze case studies to observe how online behaviors impact real-world opportunities for individuals and society. Each activity is followed by large group discussion where students have the option to share thoughts and librarians can contextualize issues and answer questions. The workshop culminates in a personal reflection on the benefits and risks

of technology use to develop purposeful online behaviors and habits that align with their individual values in the form of a personal data plan. Activities and examples of student responses can be viewed on the Privacy Workshop guide (Chisholm and Hartman-Caverly, 2019).

Overall, the workshop espouses a proactive rather than reactive approach and presents a spectrum of privacy preferences across a range of contexts. The authors seek to respect students' autonomy and agency in personal technology use by developing their knowledge practices regarding privacy and the commodification of personal information while also embodying the core library value of intellectual freedom.

### Assessing privacy literacy instruction

The authors developed a webform assessment instrument comprised of four statements with Likert-scale responses and a free text response field to measure the impact of the Privacy Workshop (see Appendix B). In the academic library context, the Information has Value frame can serve as a guide to PL instruction and assessment. Three statements assess the impact of PL instruction on students' privacy-related knowledge practices. The first statement evaluates whether students learned something new about the real-world impacts of personal data, while the second statement assesses whether students feel equipped with new strategies to develop and act on individual privacy preferences. The third statement asks whether students developed "a new way to think about privacy" generally, and is intended to bridge between privacy

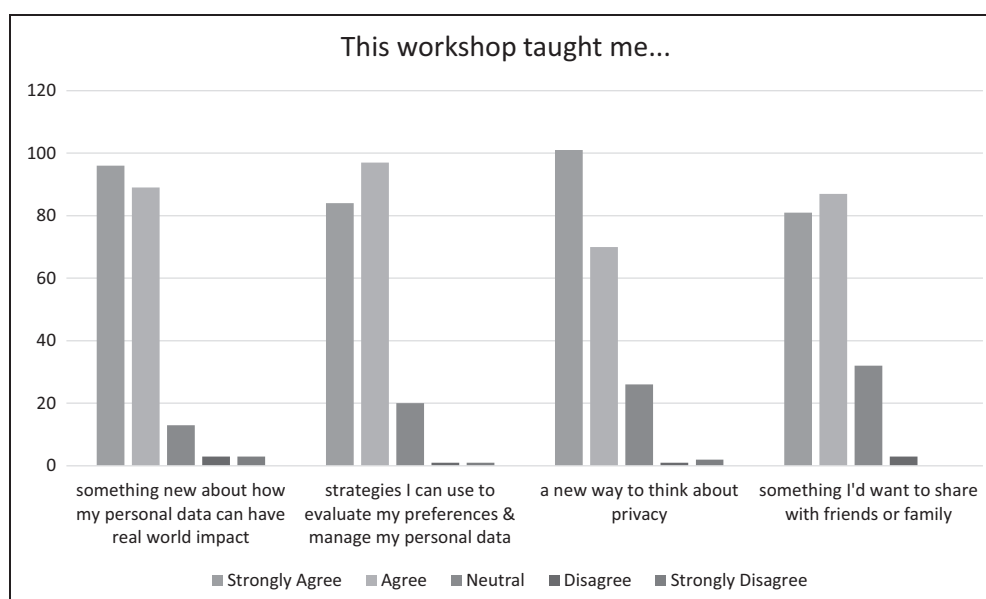


Figure 3. Distribution of student responses from Privacy Workshop feedback form.

literate knowledge practices and dispositions. The final statement addresses the disposition of information privilege that comes with greater PL by asking whether students are motivated to share something they learned about privacy with a loved one.

The Privacy Workshop Feedback form was completed by 200 participants between 26 September 2018 and 5 November 2019. Of these, 185 respondents agreed or strongly agreed that they learned something new about the real-world impact of personal data (93%), 181 respondents agreed or strongly agreed that they developed new strategies to evaluate privacy preferences and to manage personal data accordingly (91%), 171 respondents agreed or strongly agreed that they learned a new way to think about privacy (86%), and 168 agreed or strongly agreed that they would share something they learned with a friend or family member (84%) (Figure 3). A purposive sample from the 64 free-text comments further illustrates what first-year college students valued about the Privacy Workshop learning experience:

People collect more about me online than I thought, and use the information in different ways than I thought.

Browsers collect information without you even knowing. They can even sell it to other companies if you give them permission without even realizing it. I mean, no one reads the terms and conditions but maybe we should start.

I really appreciated the resources provided at the end that help interpret the legal jargon that comes with privacy protection.

The Data Privacy Check-List that I should look towards whenever I get an app or make a profile can be very useful.

Making me be aware of the importance of protecting my privacy, which i [sic] never thought before. I did not know there are so many ways to steal my data and i [sic] will pay attention in the future.

Interactive activities helped much in understanding how and why me as a person can be effected [sic] by technology and why these companies and people collect it.

Privacy in the modern world is not what I thought it was.

Based on this quantitative and qualitative data, the Privacy Workshop is both impactful and meaningful for undergraduate students, and the authors recognize PL instruction and programming as a growth area for our library and campus community.

#### *Future possibilities in privacy literacy instruction*

Disruptive technology has, among other things, disrupted privacy culture. The disruption of privacy

culture has broad implications for individuals, information, and society. PL enables individuals and groups to recognize, analyze, and act on shifts in privacy culture in intentional and considered ways. This article introduces the history of PL in a broad survey of privacy theory and practice, situates PL in the domain of library instruction, and documents the present state of PL initiatives in academic libraries, demonstrating a gap between the delivery of PL learning opportunities and the needs of the communities we serve.

PL needs to be about more than social networking site privacy preferences and online reputation management. To flatten this emerging literacy into these types of simplistic solutions does real harm by imbuing students with a false sense of security and control (Brandimarte et al., 2012) and unintentionally normalizing the growing social justice issues related to algorithmic bias (O'Neil, 2016). Privacy is a value system before it is a technology, and academic librarians work with students who are the future of these technologies. They will be both the consumers and adopters, as well as designers, programmers, marketers, investors, and administrators who make decisions on how and whether to execute these systems. Why would academic librarians not equip them with the knowledge and ethical framework to engage with these complex issues? Librarians are well placed as information professionals with solid ethical values to take on this responsibility and lead the effort in higher education toward an intentional integration of PL into curricula. Realistically, however, surveillance technologies are evolving at a pace that is daunting to maintain, and academic librarians often lack time, knowledge, resources, and support to develop new initiatives like a PL program.

The survey presented here, which identified barriers to PL practices, showed that academic librarian colleagues are already doing amazing and impressive work in this area. Despite this evidence, when the authors deposited their Privacy Workshop into the ACRL Sandbox (ACRL, 2016b) and Project CORA (Loyola Marymount University Library, 2019), they were the first to create and use the “privacy” and “digital privacy” tags. At the time of writing, only one other activity has been indexed with one of these tags. Librarians must begin developing, assessing, and sharing their PL work, if for no other reason than to help colleagues who are less equipped – as the survey revealed – to develop these lesson plans and initiatives. The authors invite academic librarians to make available open educational resources for PL, publish and present on PL initiatives, and host workshops and training sessions to cultivate self-efficacy in fellow

librarians to undertake this work. Current events show that this very well may be the moral imperative of our time. And in higher education, the authors wonder, “If not now, when? If not us [librarians], who?” (George Romney as quoted in Nathan et al., 2014: 112).

The authors appreciate the very real constraints on academic librarians’ time, both within and outside the classroom, which preempts investment in professional education, developing instructional materials, and delivering PL learning experiences. First, the authors encourage librarians to prioritize professional development on privacy as it intersects with their professional activities, be it in direct service to patrons, administration of library services or technology, resource description or preservation, or delivery of information services. Volumes of trade literature, webinars, workshops, and more are available on these subjects, and many are free or low-cost. Then, the authors advocate for librarians to share what they know, in what ways they can. In the context of academic library instruction, survey findings point to low-hanging fruit learning opportunities that pose few or flexible demands on time and effort, including selecting privacy topics for search demonstrations, developing library displays or other passive programming, or sharing content on library-branded social media. Committing to these activities has a multiplier effect in that the librarian learns more about privacy while developing these learning opportunities for others, thus cultivating professional self-efficacy to pursue more time- and resource-intensive PL initiatives. Finally, the authors encourage critical self-reflection on the convictions that students and faculty do not value privacy or PL. The privacy paradox notwithstanding, these claims are not supported by public polling data, civic sentiment, or the survey findings and workshop assessment data presented here. Librarians’ special obligation to intellectual freedom includes not only the stewardship and delivery of information, but also promoting a robust privacy culture (ALA, 2008; 2019). Privacy is always “a collective work in progress” (Keizer, 2002: 65), and given the current state of privacy culture, we need all hands on deck – including, and especially, librarians.

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### Notes

1. Discussion of a privacy interpretation of the Library Bill of Rights commenced at the Intellectual Freedom Committee’s spring 2001 meeting and was inspired by work done in 2000 by the ALA Task Force on Privacy and Confidentiality in the Electronic Environment; full development and ratification coincided with, but was not caused by, the October 2001 USA PATRIOT Act and its Section 215 ‘library records provision’ (Magi and Garnar, 2015a: 56; Wiegand, 2016).
2. Assessment refers to the act of evaluating a library’s impact on its user community, including student learning, as described in (de Jager, 2017) and (ISO, 2014).
3. Due to the identifiable nature of the free-text responses, authors are unable to provide full-text examples from the survey respondents.

### References

- American Library Association (ALA) (2008) Professional ethics. Available at: [www.ala.org/tools/ethics](http://www.ala.org/tools/ethics) (accessed 26 June 2019).
- American Library Association (ALA) (2017) Privacy. Available at: [www.ala.org/advocacy/privacy](http://www.ala.org/advocacy/privacy) (accessed 25 June 2019).
- American Library Association (ALA) (2019) Library Bill of Rights. Available at: [www.ala.org/advocacy/intfreedom/librarybill](http://www.ala.org/advocacy/intfreedom/librarybill) (accessed 21 June 2019).
- Anderson J and Rainie L (2018) The future of well-being in a tech-saturated world. Available at: [www.pewinternet.org/2018/04/17/the-future-of-well-being-in-a-tech-saturated-world/](http://www.pewinternet.org/2018/04/17/the-future-of-well-being-in-a-tech-saturated-world/) (accessed 26 June 2019).
- Association of College & Research Libraries (ACRL) (2000) Intellectual freedom principles for academic libraries: An interpretation of the Library Bill of Rights. Available at: [www.ala.org/acrl/publications/whitepapers/intellectual](http://www.ala.org/acrl/publications/whitepapers/intellectual) (accessed 21 June 2019).
- Association of College & Research Libraries (ACRL) (2001) Objectives for information literacy instruction: A model statement for academic librarians. Available at: [www.ala.org/acrl/standards/objectivesinformation](http://www.ala.org/acrl/standards/objectivesinformation) (accessed 21 June 2019).
- Association of College & Research Libraries (ACRL) (2016a) Framework for Information Literacy for Higher Education. Available at: [www.ala.org/acrl/standards/ilframework](http://www.ala.org/acrl/standards/ilframework) (accessed 21 June 2019).
- Association of College & Research Libraries (ACRL) (2016b) ACRL Framework for Information Literacy sandbox. Available at: [sandbox.acrl.org](http://sandbox.acrl.org) (accessed 26 June 2019).
- Ballard SG (2017) The right to obscurity vs. the digital Eye of Sauron. In: Fontichiaro K, Lennex A, Hoff T, et al. (eds) *Data Literacy in the Real World: Conversations & Case Studies*, 20–21 July 2017. Ann Arbor, MI: Michigan Publishing, pp. 62–64. Available at: <http://datalit.org>



- sites.uofmhosting.net/wp-content/uploads/2017/08/data\_literacy\_in\_the\_real\_world.pdf (accessed 11 December 2019).
- Barocas S and Selbst AD (2016) Big data's disparate impact. *California Law Review* 104(3): 671–732.
- Benn SI (1984) Privacy, freedom, and respect for persons. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 223–244.
- Birth A (2015) Increasing percentages of Americans have had positive outcomes from social media. Available at: [theharrispoll.com/in-todays-world-social-media-usage-appears-to-run-rampant-at-times-aside-from-just-keeping-in-touch-with-friends-and-family-social-media-has-a-plethora-of-other-uses-but-while-more-americans-are/](http://theharrispoll.com/in-todays-world-social-media-usage-appears-to-run-rampant-at-times-aside-from-just-keeping-in-touch-with-friends-and-family-social-media-has-a-plethora-of-other-uses-but-while-more-americans-are/) (accessed 26 June 2019).
- Bloustein EJ (1984) Privacy as an aspect of human dignity: An answer to Dean Prosser. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 156–202.
- boyd dm (2008) *Taken out of context: American teen sociality in networked publics*. PhD Thesis, University of California Berkeley, USA. Available at: [www.danah.org/papers/TakenOutOfContext.pdf](http://www.danah.org/papers/TakenOutOfContext.pdf) (accessed 21 June 2019).
- Brandimarte L, Acquisti A and Loewenstein G (2012) Mislplaced confidences: Privacy and the control paradox. *Social Psychological and Personality Science* 4(3): 340–347.
- Buschman J (2016) The structural irrelevance of privacy: A provocation. *Library Quarterly: Information, Community, Policy* 86(4): 419–433.
- Caldwell-Stone D (2018) More than a week – ‘Choose Privacy’ is now an everyday choice. In: *ALA Member News*. Available from: [www.ala.org/news/member-news/2018/06/more-week-choose-privacy-now-every-day-choice](http://www.ala.org/news/member-news/2018/06/more-week-choose-privacy-now-every-day-choice) (accessed 21 June 2019).
- Campbell DG and Cowan SR (2016) The paradox of privacy: Revisiting a core library value in an age of big data and linked data. *Library Trends* 64(3):492–511.
- Center for American Politics (CAPS), Harvard University (2017) CAPS-Harris poll on technology and science. Available at: [caps.gov.harvard.edu/news/caps-harris-poll-technology-and-science](http://caps.gov.harvard.edu/news/caps-harris-poll-technology-and-science) (accessed 26 June 2019).
- Chisholm A and Hartman-Caverly S (2018) Privacy workshop. In: *ACRL Framework for Information Literacy Sandbox*. Available at: [sandbox.acrl.org/](http://sandbox.acrl.org/) (accessed 24 June 2019).
- Chisholm A and Hartman-Caverly S (2019) Privacy workshop. Available at: [guides.libraries.psu.edu/berks/privacy](http://guides.libraries.psu.edu/berks/privacy) (accessed 4 November 2019).
- Cirella D (2012) Beyond traditional literacy instruction: Toward an account-based literacy training curriculum in libraries. *Computers in Libraries* 32(10): 5–8.
- Cohen JE (1996) A right to read anonymously: A closer look at ‘copyright management’ in cyberspace. *Georgetown Law Faculty Publications and Other Works* 814: 1–77.
- Cohen JE (2000) Examined lives: Informational privacy and the subject as object. *Stanford Law Review* 52(5): 1373–1438.
- Cohen JE (2013) What privacy is for. *Harvard Law Review* 126(7): 1904–1933.
- Cohen JE (2019) Turning privacy inside out. *Theoretical Inquiries into Law* 20(1): 1–31.
- de Jager K (2017) Approaches to impact evaluation in academic libraries: A review of a new ISO standard. *IFLA Journal* 43(3): 282–287.
- Connolly M (2018) *User Privacy: A practical Guide for Librarians*. New York: Roman & Littlefield.
- Fisher CM, Price JH, Telljohann SK, et al. (2015) A national assessment of colleges and university school health education methods courses. *Journal of School Health* 85(4): 223–230.
- Fister B (2018) Lessons from the Facebook fiasco. In: *Library Babel Fish*. Available at: [www.insidehighered.com/blogs/library-babel-fish/](http://www.insidehighered.com/blogs/library-babel-fish/) (accessed 20 April 2019).
- Fortier A and Burkell J (2015) Hidden online surveillance: What librarians should know to protect their privacy and that of their patrons. *Information Technology and Libraries* 32(3): 59–72.
- Fried C (1984) Privacy [a moral analysis]. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 203–222.
- Gandy OH (1993) *The Panoptic Sort: A Political Economy of Personal Information*. Boulder, CO: Westview.
- Geiger AW (2017) Most Americans – especially Millennials – say libraries can help them find reliable, trustworthy information. Available at: [www.pewresearch.org/fact-tank/2017/08/30/most-americans-especially-millennials-say-libraries-can-help-them-find-reliable-trustworthy-information/](http://www.pewresearch.org/fact-tank/2017/08/30/most-americans-especially-millennials-say-libraries-can-help-them-find-reliable-trustworthy-information/) (accessed 26 June 2019).
- Gerber N, Gerber P and Volkamer M (2018) Explaining the privacy paradox: A systematic review of literature investigating privacy attitude and behavior. *Computers & Security* 77: 226–261.
- Givens CL (2015) *Information Privacy Fundamentals for Librarians and Information Professionals*. New York: Roman & Littlefield.
- Gorman M (2015) Privacy. In: *Our Enduring Values Revisited: Librarianship in an Ever-Changing World*. Chicago: American Library Association, pp. 175–93. Available from: ProQuest Ebook Central.
- Guth LF, Arnold JM, Bielat VE, et al. (2018) Faculty voices on the Framework: Implications for instruction and dialogue. *portal: Libraries and the Academy* 18(4): 693–718.
- Hagendorff T (2018) Privacy literacy and its problems. *Journal of Information* 27(2): 127–145.
- Harris AL, Lang M, Yates D, et al. (2011) Incorporating ethics and social responsibility in IS education. *Journal of Information Systems Education* 22(3): 183–189.
- Hartman-Caverly S (2018) Our ‘special obligation’: Library assessment, learning analytics, and intellectual

- freedom. In: Britto M and Kinsley K (eds) *Academic Libraries and the Academy: Strategies and Approaches to Demonstrate Your Value, Impact, and Return on Investment*. Vol. 1. Chicago, IL: Association of College and Research Libraries, pp. 47–73.
- Hartman-Caverly S and Chisholm A (2018) Privacy instruction from theory to practice. In: *Session reports for the fall 2018 program: Librarians as advocates: Leading activism on your campus and beyond* (M Donnelly), Philadelphia, USA, 26 October 2018. Philadelphia: Association of College & Research Libraries, Delaware Valley Chapter. Available at: <http://www.acrldvc.org/news/2018/11/09/session-reports-for-the-fall-2018-program/> (accessed 27 June 2019).
- Hensley MK (2015) A survey of instructional support for undergraduate research programs. *portal: Libraries and the Academy* 15(4): 719–762.
- Hildebrandt M (2019) Privacy as protection of the incomputable self: From agnostic to agonistic machine learning. *Theoretical Inquiries in Law* 20(1): 83–121.
- Ho L (2015) Privacy vs. privacy. *EDUCAUSE Review*, 25 February. Available at: [er.educause.edu/blogs/2015/2/privacy-vs-privacy](http://er.educause.edu/blogs/2015/2/privacy-vs-privacy) (accessed 21 June 2019).
- Hoofnagle C, King J, Li S, et al. (2010) *How Different are Young Adults from Older Adults when it Comes to Information Privacy Attitudes & Policies?* Rochester, NY: SSRN.
- International Organization for Standardization (ISO) (2014) Information and documentation – Methods and procedures for assessing the impact of libraries (ISO standard no. 16439:2014). Available at: <https://www.iso.org/standard/56756.html> (accessed 3 November 2019).
- Ip C (2018) Who controls your data? *Engadget*, 4 September. Available at: [www.engadget.com/2018/09/04/who-controls-your-data/](http://www.engadget.com/2018/09/04/who-controls-your-data/) (accessed 27 June 2019).
- Janes J (2014) None of your beeswax. *American Libraries* 45(5): 18.
- Johnson B (2018) Libraries in the age of artificial intelligence. *Computers in Libraries* 38(1): 14–16.
- Jones KML and Salo D (2018) Learning analytics and the academic library: Professional ethics commitments at a crossroads. *College & Research Libraries* 79(3): 304–323.
- Julien H and Hoffman C (2008) Information literacy training in Canada's public libraries. *Library Quarterly* 78(1): 19–41.
- Julien H, Gross M and Latham D (2018) Survey of information literacy instructional practices in US academic libraries. *College & Research Libraries* 79(2): 179–199.
- Kaletski G (2017) Faculty perceptions of the Framework for Information Literacy for Higher Education. Endnotes: *Journal of the New Members Round Table* 8(1): 26–35.
- Karst KL (1980) The freedom of intimate association. *Yale Law Journal* 89(4): 624–92.
- Keizer G (2012) *Privacy*. New York: Picador.
- Kim B (2016) Cybersecurity and digital surveillance versus usability and privacy: Why libraries need to advocate for online privacy. *College & Research Libraries News* 77(9): 442–451.
- Lambertson JA (2015) Careful you're being watched. *Library Journal* 140(13): 41.
- Lilburn J (2012) Commercial social media and the erosion of the commons: Implications for academic libraries. *portal: Libraries and the Academy* 12(2): 139–153.
- Lowe M (2016) Editor's column: Information literacy & privacy/security. *Codex: The Journal of the Louisiana Chapter of the ACRL* 4(4): 1–8.
- Loyola Marymount University Library (2019) Community of Online Research Assignments. Available at: [www.projectcora.org](http://www.projectcora.org) (accessed 26 June 2019).
- Ludington F, Cleavinger JS, Coolidge C, et al. (1939) Midwinter council minutes: Code of ethics for librarians. *American Library Association Bulletin* 33(2): 128–130.
- Maceli MG (2018) Encouraging patron adoption of privacy-protection technologies: Challenges for public libraries. *IFLA Journal* 44(3): 195–202.
- Macrina A (2015) An introduction. Available at: [librarityfreedomproject.org/favorite/](http://librarityfreedomproject.org/favorite/) (accessed 23 June 2019).
- Magi T and Garnar M (2015a) Library Bill of Rights. In: *History of ALA Policy on Intellectual Freedom: A Supplement to the Intellectual Freedom Manual*. Chicago, IL: American Library Association, pp. 43–57.
- Magi TJ (2011) Fourteen reasons privacy matters: A multidisciplinary review of scholarly literature. *Library Quarterly: Information, Community, Policy* 81(2): 187–209.
- Magnuson L (2011) Promoting privacy: Online and reputation management as an information literacy skill. *College & Research Libraries News* 72(3): 137–140.
- Maycock A (2010) Choose privacy week and school libraries. *Knowledge Quest* 39(1): 69–72.
- Mooradian N (2009) The importance of privacy revisited. *Ethics and Information Technology* 11(3): 163–174.
- Moore B (1984) *Privacy: Studies in Social and Cultural History*. New York: ME Sharpe.
- Nathan LP, MacGougan A and Shaffer E (2014) If not us, who? Social media policy and the iSchool classroom. *Journal of Education for Library & Information Science* 55(2): 112–132.
- Nelson A (1886) New York Library Club. *Library Journal* 11: 24–27.
- New York Times (2019) The privacy project. Available at: [www.nytimes.com/interactive/2019/opinion/internet-privacy-project.html](http://www.nytimes.com/interactive/2019/opinion/internet-privacy-project.html) (accessed 25 June 2019).
- Nissenbaum H (2004) Symposium: Technology, values, and the justice system: Privacy as contextual integrity. *Washington Law Review* 79: 119–157.
- NYC Digital Safety (n.d.) *Digital privacy & security in the library*. Available at: [nycdigitalsafety.org](http://nycdigitalsafety.org) (accessed 24 June 2019).
- Office of Intellectual Freedom (OIF) Staff (2010) Privacy at ALA 2010 annual conference. In: *Choose privacy*

- every day blog. Available at: [chooseprivacyeveryday.org/privacy-at-ala-2010-annual-conference/](http://chooseprivacyeveryday.org/privacy-at-ala-2010-annual-conference/) (accessed 23 June 2019).
- O'Neil C (2016) *Weapons of Math Destruction*. New York: Broadway Books.
- Pedley P (2016) *Privacy and the library user*. In: *CILIP Update*. Available at: [archive.cilip.org.uk/blog/privacy-library-user](http://archive.cilip.org.uk/blog/privacy-library-user) (accessed 25 June 2019).
- Posner RA (1984) An economic theory of privacy. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 333–345.
- Prindle S and Loos A (2017) Information ethics and academic libraries: Data privacy in the era of Big Data. *Journal of Information Ethics* 26(2): 22–33.
- Prosser WL (1984) Privacy [a legal analysis]. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 104–155.
- Rachels J (1975) Why privacy is important. *Philosophy & Public Affairs* 4(4): 323–333.
- Rainie L (2018) Americans' complicated feelings about social media in an era of privacy concerns. Available at: [www.pewresearch.org/fact-tank/2018/03/27/americans-complicated-feelings-about-social-media-in-an-era-of-privacy-concerns/](http://www.pewresearch.org/fact-tank/2018/03/27/americans-complicated-feelings-about-social-media-in-an-era-of-privacy-concerns/) (accessed 26 June 2019).
- Reiman JH (1984) Privacy, intimacy, and personhood. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 300–316.
- Richards N (2015) *Intellectual Privacy: Rethinking Civil Liberties in the Digital Age*. Oxford: Oxford University Press.
- Richards NM (2014) Four privacy myths. In: Sarat A (ed.) *A World Without Privacy: What Law Can and Should Do?* Cambridge: Cambridge University Press.
- Richards NM (2013) The dangers of surveillance. *Harvard Law Review* 126(7): 1934–1965.
- Rotman D (2009) Are you looking at me? Social media and privacy literacy. In: *iConference*, Chapel Hill, NC, USA, 8–11 February 2009.
- Rundle H (2014) Who are you empowering? *In the Library with the Lead Pipe*. Available at: [www.inthelibrarywiththeleadpipe.org/2014/who-are-you-empowering/?format=pdf](http://www.inthelibrarywiththeleadpipe.org/2014/who-are-you-empowering/?format=pdf).
- Salo D (2013) Breaking the panopticon. *Library Journal* 138(9): 14.
- Salo D and Kharfen S (2016) Ain't nobody's business if I do (read serials). *The Serials Librarian* 70(1/4): 55–61.
- San Jose Public Library (n.d.) Virtual privacy lab. Available at: [www.sjpl.org/privacy](http://www.sjpl.org/privacy) (accessed 24 June 2019).
- Schauer F (1978) Fear, risk and the First Amendment: Unraveling the chilling effect. *Boston University Law Review* 58: 685–782.
- Schoeman F (1984a) Privacy and intimate information. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 403–418.
- Schoeman F (1984b) Privacy: Philosophical dimensions of the literature. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 1–33.
- Schulte S and Knapp M (2017) Awareness, adoption, and application of the Association of College & Research Libraries (ACRL) Framework for Information Literacy in health sciences libraries. *Journal of the Medical Library Association* 105(4): 347–354.
- Seroff J (2017) Big Data and you: Normalizing the practices of privacy. In: Fontichiaro K, Lennex A, Hoff T, et al. (eds) *Data Literacy in the Real World: Conversations & Case Studies*, 20–21 July 2017. Ann Arbor, MI: Michigan Publishing, pp. 58–61. Available at: [http://datalit.sites.uofmhosting.net/wp-content/uploads/2017/08/data\\_literacy\\_in\\_the\\_real\\_world.pdf](http://datalit.sites.uofmhosting.net/wp-content/uploads/2017/08/data_literacy_in_the_real_world.pdf) (accessed 11 December 2019).
- Shannon-Missal L (2015) Wearable tech familiarity and consideration on the rise. Available at: [theharrispoll.com/in-comparison-to-two-years-ago-americans-are-increasingly-likely-to-have-at-least-heard-of-wearable-tech-83-vs-63-in-2013-and-to-say-theyre-either-very-or-somewhat-familiar-with-the-cate/](http://theharrispoll.com/in-comparison-to-two-years-ago-americans-are-increasingly-likely-to-have-at-least-heard-of-wearable-tech-83-vs-63-in-2013-and-to-say-theyre-either-very-or-somewhat-familiar-with-the-cate/) (accessed 26 June 2019).
- Smith A (2014) Half of online Americans don't understand what a privacy policy is. Available at: [www.pewresearch.org/fact-tank/2014/12/04/half-of-americans-dont-know-what-a-privacy-policy-is/](http://www.pewresearch.org/fact-tank/2014/12/04/half-of-americans-dont-know-what-a-privacy-policy-is/) (accessed 26 June 2019).
- Solove DJ (2008) *Understanding Privacy*. Cambridge, MA: Harvard University Press.
- Solove DJ (2013) Introduction: Privacy self-management and the consent dilemma. *Harvard Law Review* 136(7): 1880–1903.
- Sovern J (1999) Opting in, opting out, or no options at all: The fight for control of personal information. *Washington Law Review* 74(4): 1033–1118.
- Stephens WS (2017) Tools for preserving your personal and intellectual privacy. In: Fontichiaro K, Lennex A, Hoff T, et al. (eds) *Data Literacy in the Real World: Conversations & Case Studies*, 20–21 July 2017. Ann Arbor, MI: Michigan Publishing, pp. 55–57. Available at: [http://datalit.sites.uofmhosting.net/wp-content/uploads/2017/08/data\\_literacy\\_in\\_the\\_real\\_world.pdf](http://datalit.sites.uofmhosting.net/wp-content/uploads/2017/08/data_literacy_in_the_real_world.pdf) (accessed 11 December 2019).
- Stockman IJ, Boulton J and Robinson GC (2008) Multicultural/multilingual instruction in educational programs: A survey of perceived faculty practices and outcomes. *American Journal of Speech-Language Pathology* 17(3): 241–64.
- Strahilevitz LJ (2013) Toward a positive theory of privacy law. *Harvard Law Review* 126(7): 2010–2042.
- Tewell E (2016) Toward the resistant reading of information: Google, resistant spectatorship, and critical information literacy. *portal: Libraries and the Academy* 16(2): 289–310.

- Tummon N and McKinnon D (2018) Attitudes and practices of Canadian academic librarians regarding library and online privacy: A national study. *Library and Information Science Research* 40(2): 86–97.
- United Nations (1948) Universal Declaration of Human Rights. Available at: [www.un.org/en/universal-declaration-human-rights/](http://www.un.org/en/universal-declaration-human-rights/) (accessed 26 June 2019).
- Warren SD and Brandeis LD (1890) The right to privacy. *Harvard Law Review* 4(5): 193–220.
- Wasserstrom RA (1984) Privacy: Some arguments and assumptions. In: Schoeman FD (ed.) *Philosophical Dimensions of Privacy: An Anthology*. New York: Cambridge University Press, pp. 317–332.
- Westin AF (1967) *Privacy and Freedom*. New York: Atheneum.
- Wharton L (2018) Ethical implications of digital tools and emerging roles for academic librarians. In: Fernandez PD and Tilton K (eds) *Applying Library Values to Decision-Making in the Age of Open Access, Maker Spaces, and the Ever-Changing Library*. Chicago, IL: American Library Association, pp. 35–54.
- Wiegand WA (2016) ‘Baseless hysteria?’ ALA’s opposition to Section 215 of the USA Patriot Act. *American Libraries*, 31 May. Available at: [americanlibrariesmagazine.org/2016/05/31/baseless-hysteria-patriot-act/](http://americanlibrariesmagazine.org/2016/05/31/baseless-hysteria-patriot-act/) (accessed 23 June 2019).
- Wissinger CL (2017) Privacy literacy: From theory to practice. *Communications in Information Literacy* 11(2): 378–389.
- Witek D and Grettano T (2014) Teaching metaliteracy: A new paradigm in action. *Reference Services Review* 42(2): 188–208.
- Woodruff EH (1886) University libraries and seminary methods of instruction. In: *Papers and Proceedings of the eighth general meeting of the American Library Association*, Milwaukee, WI, USA, 7–10 July 1886, pp. 21–26. Boston, MA: Rockwell and Churchill.
- Zimmer M (2013) Assessing the treatment of patron privacy in library 2.0 literature. *Information Technology and Libraries* 32(2): 29–41.
- Zimmer M (2014) Librarians’ attitudes regarding information and internet privacy. *Library Quarterly: Information, Community, Policy* 84(2): 123–151.

### Author biography

**Sarah Hartman-Caverly** MSLIS/MSIS, Drexel, is an Assistant Librarian at Penn State Berks and liaison to Engineering, Business and Computing division programs. She has seven years of reference and instruction experience at an associate’s college and public baccalaureate college in a doctoral university system. Her research examines the compatibility of human and machine autonomy from the perspective of intellectual freedom. Recent contributions include “Human nature is not a machine: On liberty, attention engineering, and learning analytics” (*Library Trends*, summer 2019) and “TRUTH always wins: Dispatches from the information war” (ACRL, 2019).

**Alexandria Chisholm** is an Assistant Librarian at Penn State Berks and liaison to the campus’ first-year experience program and science division. She has seven years of reference and instruction experience at both private and public baccalaureate- and doctoral-degree granting institutions. Her research focuses on information literacy, instructional design, and privacy literacy.

## Appendix A

### Privacy literacy instruction in academic libraries survey

Welcome to the Privacy Literacy Instruction in Academic Libraries research study!

We are interested in understanding current privacy literacy instruction practices, or lack thereof, in academic libraries. You will be presented with information relevant to privacy literacy instruction practices in academic libraries and asked to answer some questions about it. Please be assured that your responses will be kept completely confidential.

The study should take you around 10–15 minutes to complete. Your participation in this research is voluntary and you have the right to skip any question. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail Sarah Hartman-Caverly at [smh767\[at\]psu\[dot\]edu](mailto:smh767[at]psu[dot]edu).

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are at least 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

For your convenience and to ensure the accuracy of responses, please have any privacy-related lesson plans or instructional materials (if applicable) at hand while completing this survey.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

I consent, begin the study (1)

I do not consent, I do not wish to participate (2)

If you consent, proceed to take the survey. If you do not consent, exit the survey.

Skip To: End of Survey If Welcome to the Privacy Literacy Instruction in Academic Libraries research study!

We are interes . . . = I do not consent, I do not wish to participate

For the purposes of our study, below are relevant definitions and knowledge practices from the Framework:

Privacy defined: “privacy is the right to open inquiry without having the subject of one’s interest examined or scrutinized by others” and “the right to read, consider, and develop ideas and beliefs free from observation or unwanted surveillance by the government or others” (ALA)

Knowledge practices (Information has Value frame): “understand how the commodification of their personal information and online interactions affects the information they receive and the information they produce or disseminate online” and “make informed choices regarding their online actions in full awareness of issues related to privacy and the commodification of personal information”

What privacy topics do you include in your information literacy instruction? Select all that apply

Consumer privacy (grouped responses)

- Account privacy; authentication (1)
- Social media; online identity management (2)
- Mobile devices; apps; location-based services (3)
- Smart devices; Internet of Things (4)
- Streaming services; cloud computing (5)
- Educational privacy; FERPA; learning analytics (6)
- Health data; genetic analysis (7)
- Reading Terms of Service/Use (8)
- Private web browsing (9)

Data profiling (grouped responses)

- Automatically monitored data (metadata) (10)
- Algorithms; modeled data (11)
- Recommender systems (ex. Facebook’s People You May Know) (12)
- Algorithmic/machine bias; data discrimination (13)
- Sentiment analysis/shaping (14)
- Targeted advertising (15)
- Filter bubbles; echo chambers (16)

Professional applications (grouped responses)

- Privacy regulations (ex. HIPAA) (17)
- Privacy policymaking (data governance, privacy auditing, privacy impact assessment) (18)
- Data laundering (19)

Surveillance (grouped responses)

- Government/law enforcement surveillance (20)
- Corporate surveillance; surveillance capitalism (21)
- Workplace monitoring (22)
- Chilling effect; self-censorship (23)

Intellectual freedom (grouped responses)

- Right to privacy; civil liberties; social justice (24)
- Selfhood; identity formation; individual will (25)
- Censorship (26)
- Data ethics (27)

Other (28) \_\_\_\_\_

I do not include privacy topics in instruction. (29)

If you do not include privacy topics in instruction, skip to: “From a professional perspective, are you satisfied with your library’s current approach to privacy literacy instruction?”

Skip To: Satisfaction If What privacy topics do you include in your information literacy instruction? Select all that apply. = I do not include privacy topics in instruction.

What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply.

- Resource guide (Ex.: LibGuides, list of sources) (1)
- One-on-one consultation (2)
- Standalone workshop (9)
- One-shot session (3)
- Embedded librarianship (4)
- Team-taught course with subject faculty (5)
- Credit-bearing course (6)
- Independent learning activity (ex. handout or online module) (7)
- Library displays or passive programming (8)
- Social media (10)
- Other (11) \_\_\_\_\_

If you deliver privacy learning outcomes in the following contexts: one-on-one consultation, one-shot session, embedded librarianship, team-taught course with subject faculty, credit-bearing course, standalone workshop, or other, please answer the following question about instruction methods:

Display This Question:

If What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = One-on-one consultation

Or What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = One-shot session

Or What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = Embedded librarianship

Or What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = Team-taught course with subject faculty

Or What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = Credit-bearing course

Or What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = Standalone workshop

Or What instruction contexts do you use to achieve privacy learning outcomes? Select all that apply. = Other

What instruction methods do you use to achieve privacy learning outcomes? Select all that apply

- Privacy topics used as examples in search demonstrations (1)
- Hands-on / applied activities (ex. setting device privacy preferences) (2)
- Personal reflection (3)
- Small group discussion or think-pair-share (4)
- Large group discussion (5)
- Case study analysis (6)
- Pro/Con debate (7)
- Lecture or demonstration (8)
- Other (9) \_\_\_\_\_

Optionally, please share any privacy-related learning outcomes you use in lesson planning.

(Ex.: Students will be able to recognize how their personal data and metadata are collected, along with the potential implications of such data collection.)

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Optionally, please provide URLs for any public websites, online research guides, or instructional videos that you have created or utilized to support privacy instruction.

Any institutionally identifiable information garnered from these responses will be kept confidential.

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How do you assess privacy instruction? Select all that apply

- Do not assess (1)
- Transactional statistics (ex. number of visits to a library guide) (2)
- Student learning (grouped responses)
  - Pre- and post-session test results (3)
  - Formative assessment (ex. worksheets) (4)
  - Summative assessment (ex. graded assignment) (5)
- Instruction evaluation (grouped responses)
  - Student evaluation of instruction (7)
  - Subject faculty evaluation of instruction session (8)
  - Peer observation / evaluation (9)
  - Self-evaluation (10)
- Informal feedback (grouped responses)
  - Feedback from students (11)
  - Feedback from subject faculty (12)
  - Feedback from librarian / peer (13)
  - Self-reflection (14)
  - Other (6) \_\_\_\_\_

From a professional perspective, are you satisfied with your library's current approach to privacy literacy instruction?

- Extremely satisfied (1)
- Somewhat satisfied (2)
- Neither satisfied nor dissatisfied (3)
- Somewhat dissatisfied (4)
- Extremely dissatisfied (5)

If you do not include privacy in information literacy instruction, or are dissatisfied with your library's current approach, please answer the following question about barriers to privacy instruction:

Display This Question:

If What privacy topics do you include in your information literacy instruction? Select all that apply. = I do not include privacy topics in instruction.

Or From a professional perspective, are you satisfied with your library's current approach to privacy instruction? = Somewhat dissatisfied

Or From a professional perspective, are you satisfied with your library's current approach to privacy instruction? = Extremely dissatisfied

You have indicated that you do not include privacy in your information literacy instruction, or are dissatisfied with your library's current approach. What prevents you from including privacy in information literacy instruction, or leads to your dissatisfaction of coverage? Select all that apply

- Privacy literacy falls outside of information literacy (1)
- Privacy is not a priority learning outcome for IL sessions (2)
- I do not have enough instructional time to address privacy (3)
- I do not have time to develop privacy learning activities / lesson plans (4)
- I do not have the expertise to teach about privacy (5)
- Another campus department teaches about privacy (6)
- Lack of student interest (7)
- Lack of subject faculty support (8)
- Lack of library administration support (9)

I don't know (10)

Other (11) \_\_\_\_\_

If you include privacy topics in your instruction, please answer the following question about your basis for privacy instruction:

Display This Question:

If What privacy topics do you include in your information literacy instruction? Select all that apply. != I do not include privacy topics in instruction.

What is the basis for including privacy literacy in your instruction? Select all that apply

Subject-based learning outcome (ex. HIPAA in health science) (1)

Information literacy program outcome (2)

ACRL Framework (Information has Value) (3)

Core values of librarianship; professional code of ethics (4)

Not addressed by other co-/curricular units (5)

Student interest (6)

Subject faculty request / collaboration (7)

Other (8) \_\_\_\_\_

Indicate your institution type

Public (1)

Private (2)

For-profit (3)

Indicate your institution classification

Doctoral university (1)

Master's college or university (2)

Baccalaureate college (3)

Associate's college (4)

Special focus institution (5) \_\_\_\_\_

Indicate your institution size by student FTE

Fewer than 1,000 (1)

1,000–2,999 (2)

3,000–9,999 (3)

At least 10,000 (4)

How many years of academic library instruction experience do you have?

Less than 5 years (1)

5–10 years (2)

11–15 years (3)

More than 15 years (4)

Is classroom library instruction a primary responsibility of your position?

Yes (1)

No (2)

What areas do you support with instruction? Select all that apply

Humanities (1)

Social Sciences (2)

STEM (3)

Health sciences (4)

Business (5)

General education (6)

First-year experience (7)

Co-curricular (8)

Other (9) \_\_\_\_\_



Are you willing to participate in a qualitative follow-up study about privacy instruction in academic libraries?  
 Yes (1)  
 No (2)

If you are willing to participate in a qualitative follow-up study, please provide the following information:

Display This Question:

If Are you willing to participate in a qualitative follow-up study about privacy instruction in acad... = Yes

Personally identifiable information garnered from these responses will be kept confidential.

Name

---

Display This Question:

If Are you willing to participate in a qualitative follow-up study about privacy instruction in acad... = Yes

Email

---

Display This Question:

If Are you willing to participate in a qualitative follow-up study about privacy instruction in acad... = Yes

Phone number

---

## Appendix B

### Privacy workshop feedback

This workshop taught me . . .

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something new about how my personal data can have real world impact	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
strategies I can use to evaluate my preferences & manage my personal data	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a new way to think about privacy	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
something I'd want to share with friends or family	Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Top takeaway, comments, or suggestions: [Free text response field]



# Public libraries and the UN 2030 Agenda for Sustainable Development

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## Abstract

As motors of change driving development, public libraries, with their commitment to information provision and access, are crucial to the realization of the United Nations 2030 Agenda for Sustainable Development. This article contributes to emerging Library and Information Science scholarship on the United Nations 2030 Agenda for Sustainable Development by arguing for the central roles played by public libraries in realizing its goals. The purpose is twofold. First, it overviews the agenda's history coupled with the start of a literature review of the Library and Information Science research on it. Second, it presents a conceptual framework in which to approach the agenda's goals and associated targets within the context of public libraries. The ultimate aim is to establish a base for and expand awareness of the UN 2030 Agenda within the Library and Information Science discipline, in addition to promoting the importance of public libraries in advancing sustainable development efforts generally and the agenda specifically.

## Keywords

Access to information, access to knowledge, information and development, principles of library and information science, public libraries, sustainable development, types of libraries and information providers, United Nations, UN 2030 Agenda

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## Introduction: Motors of change driving development

As anthropogenic alterations accelerate, sustainable development efforts must be urgently adopted and advanced by all. As António Guterres, the present UN Secretary-General, states, 'the coming years will be a vital period to save the planet and to achieve sustainable, inclusive human development' (United Nations, 2019a). Public libraries play important roles in these efforts to advance sustainable development for the benefit of both people and planet. Fiona Bradley (2018: 118) argues that 'libraries have an essential role in helping to meet this grand challenge by providing access to information, public access to ICT (information and communication technology), helping people to develop the capacity to effectively use information, and by preserving information to ensure ongoing access for future generations'. Public libraries are 'motors of change', and their facilitating of information access is a 'driver of development', for both individuals and societies.<sup>1</sup>

As motors of change driving development, public libraries, with their commitment to information provision and access, are crucial to the realization of the United Nations 2030 Agenda for Sustainable Development (herein referred to as the UN 2030 Agenda). Officially named 'Transforming Our World: The 2030 Agenda for Sustainable Development', the UN 2030 Agenda was formally adopted in September 2015 by all 193 members of the UN at an historic international summit on sustainable development at UN headquarters in New York City. Coming into force on 1 January 2016, this ambitious document represents an unprecedented programme promoting shared prosperity and wellbeing for all of humanity and the planet.<sup>2</sup> Over the course of the following 15 years – which at the time of this article's writing approaches the one-third mark of its existence and

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implementation, with varying degrees of success thus far<sup>3</sup> – all UN members and countries are committed, by consensus, to mobilize resources and efforts to address and achieve the Agenda's comprehensive goals and accompanying targets. Public libraries are important resources that must (continue to) be consulted, harnessed, and used to secure sustainable development and, ultimately, a more equitable, inclusive and healthy world.

The importance of public libraries to sustainable development efforts are implicitly recognized within the UN 2030 Agenda. It envisages:

a world free of poverty, hunger, disease and want, where all life can thrive . . . A world with universal literacy. A world with equitable and universal access to quality education at all levels, to health care and social protection, where physical, mental and social well-being are assured. (United Nations, 2015a)

This vision is advanced by public libraries' capacities for providing information, inclusive spaces, and various educational, cultural, and social opportunities to all people.<sup>4</sup> They can help ensure a world where the wellbeing of all individuals, and by extension their wider communities and climates, are assured and can thrive.

While there is growing literature on the UN 2030 Agenda and its applications to and implications for various sectors, especially within the fields of environmental science, economics, health studies, law, feminist studies and human rights, it is an emerging, and relatively under-explored, topic within the Library and Information Science (LIS) scholarship.<sup>5</sup> The emerging LIS literature that addresses the Agenda mostly concentrates on particular aspects or case studies of the role of libraries or librarianship, such as the roles played by academic librarianship, LIS pedagogical responses, and country- or region-specific concerns within the context of the Agenda.<sup>6</sup> This emerging work on the UN 2030 Agenda is making important interventions into the LIS discourse; however there remains a need for broader recognition of the roles played by public libraries in helping realize the Agenda.

This article contributes to this emerging LIS scholarship by arguing for the central roles played by public libraries in realizing the Agenda's sustainable development goals (SDGs). The purpose of the article is twofold. First, it overviews the UN 2030 Agenda's history coupled with the start of a literature review of the LIS research on it. The intention of this overview and literature review is to provide a point of departure for further research on the Agenda within the context

of public libraries. Second, this article presents a conceptual framework in which to approach the Agenda's SDGs within the context of public libraries. Comprised of communal, cultural, educational, economic and democratic contributions that public libraries offer, this conceptual framework presents a case for public libraries in fulfilling the Agenda's SDGs and, in so doing, establishes a foundation upon which to build further analyses of the important roles played by public libraries in sustainable development efforts.

It is important to note that this article does not claim or intend to present a detailed discussion of every goal or target of the UN 2030 Agenda or their many complex features and implications. There is, as aforementioned, an impressive interdisciplinary literature addressing the complexities of this grand global effort. The article, instead, makes its own humble intervention in this ongoing interdisciplinary work by establishing the theoretical connections between public libraries and the roles they can play in achieving the Agenda's SDGs. Indeed, since this article explores and emphasizes the theoretical connections public libraries make with this policy document, it is hoped that it can serve as a basis to conduct further practice-based and/or evidence-focused research on this topic. The ultimate aim is to expand awareness of the UN 2030 Agenda within the LIS discipline, in addition to promoting the importance of public libraries in advancing sustainable development efforts generally and the Agenda specifically.

The following discussion is arranged into three main sections connected by the argument for public libraries' important contributions towards realizing the UN 2030 Agenda's SDGs. The first section presents an overview of the now-classic definition of sustainable development coined by the Brundtland Commission and its recognition of the significance of information for such efforts. The second section provides a descriptive account of the UN 2030 Agenda for Sustainable Development. It explores the interventions made by the international library community in ensuring that information access was recognized and included within the Agenda. The third section offers a conceptual framework of public libraries' contributions to community, culture, education, economy and democracy as a taxonomy in which to help situate and begin analyzing these public institutions' roles in sustainable development efforts. The concluding section reiterates the need for public libraries in going forward with the Agenda as it reaches the one-third mark of its mandate. It was the Brundtland Commission in the 1980s that first acknowledged information's importance for sustainable development.

## The Brundtland Commission on Sustainable Development

The World Commission on Environment and Development (WCED) – popularly known as the Brundtland Commission after the former Norwegian Prime Minister Gro Harlem Brundtland, the United Nations-appointed chairperson of the committee – provided, arguably, the classic definition of sustainable development. In its 1987 report entitled *Our Common Future*, the Brundtland Commission defined sustainable development as ‘development which meets the needs of the present without compromising the ability of future generations to meet their own needs’ (United Nations and World Commission on Environment and Development, 1987). Although this definition mainly focuses on environmental sustainability, it nevertheless remains relevant today and can be expanded to include the need for sustainable development of society and the economy. Thus, sustainable development recognizes that progress includes intersecting and interlocking economic, social and environmental dimensions. It respects the environmental, economic and social needs of both current and future generations. It involves managed, orderly and reasonable growth that actively consults all sectors of society and that ultimately does not exhaust environmental resources.

The Brundtland Commission’s report further acknowledged the importance of information, and access to information in particular, in helping achieve sustainable development. Gobinda Chowdhury and Kushwanth Koya (2017: 2130) highlight major parts within the report emphasizing the importance of information including ‘free access to relevant information’; ‘ensure that new technologies reach all those who need them, overcoming such problems as the lack of information’; ‘many developing countries need information [on various environmental, industry, and health matters and] trained people to apply such information to local circumstances’; ‘new technologies and potentially unlimited access to information offer great promise’; ‘augmented by digital communications and advanced information analysis . . . these data can provide up-to-date information on a wide variety of resource, climatic, pollution, and other variables’; and the need to pool together all this information. They further note that information access has been acknowledge in various

policy documents created by the UN (United Nations, 2012, 2015a, 2015b), European Commission (2010), the OECD (2010), and studies commissioned by national governments (for example, Department for Environment, Food and Rural Affairs, UK, 2013); as well as

by researchers (see, for example, Chowdhury, 2014; Nathan, 2012; Nolin, 2010). (Chowdhury and Koya 2017, 2130)

Information is indeed a central component of sustainable development efforts. Economic expansion, social equity and environmental protection must be treated, not as mutually exclusive concerns, but as mutually inclusive matters that must be addressed together. A lack of availability of and access to information results in barriers prohibiting full social and economic participation in society, knowledge about environmental challenges and opportunities, and a host of other complex environmental, economic and social issues. Such a lack consequently inhibits and undermines efforts to sustainably develop the environment, economy and society.

## Transforming our world: The 2030 Agenda for Sustainable Development

Nearly 30 years after the Brundtland Commission’s report, the United Nations adopted the 2030 Agenda for Sustainable Development, an ambitious, comprehensive plan for making the world a better place for all. Promising positive and productive improvement in people’s lives, economic growth and environmental protection, the UN 2030 Agenda affirms itself as ‘a plan of action for people, planet and prosperity’ (United Nations, 2015a). Its grand aim is to eradicate poverty, enhance prosperity, expand opportunities, strengthen peace and protect the environment for the benefit of everyone, everywhere. It represents an unprecedented global vision and commitment to improve the world, ensure sustainable development and ensure no one is left behind.

Applying to all countries, developed and developing alike, the agenda represents a historic undertaking that is global in nature and universally applicable. Although it is not legally binding, the Agenda has considerable moral force in having been adopted by consensus by every UN member. Further, while the Agenda recognizes and respects diverse circumstances and contingencies, every country nevertheless shares responsibility for achieving these goals and targets, albeit through their own particular but meaningful ways and means. All countries share responsibility whilst each has its own unique role to play in realizing the Agenda’s vision.

Constituted by 17 Sustainable Development Goals (SDGs), which are comprised of 169 targets, the UN 2030 Agenda presents a comprehensive approach for establishing a better world for all. Although it is beyond the scope of this article to explain each SDG,

it is worthwhile to present them in their entirety to help illuminate their ambitious and comprehensive nature, and also because they will be situated within the framework for approaching public libraries within the context of sustainable development later in this article. The Agenda's SDGs strive to:

1. End poverty in all its forms everywhere;
2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture;
3. Ensure healthy lives and promote well-being for all at all ages;
4. Ensure inclusive and equitable quality education and promote life-long learning opportunities for all;
5. Achieve gender equality and empower all women and girls;
6. Ensure availability and sustainable management of water and sanitation for all;
7. Ensure access to affordable, reliable, sustainable, and modern energy for all;
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation;
10. Reduce inequality within and among countries;
11. Make cities and human settlements inclusive, safe, resilient and sustainable;
12. Ensure sustainable consumption and production patterns;
13. Take urgent action to combat climate change and its impacts;
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development;
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss;
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels;
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development. (United Nations, 2015a)

Designed as integrated and indivisible components, the Agenda's SDGs and associated targets are

mutually inclusive of one another. They cannot be achieved in a fragmented manner; instead, they must be implemented together as a whole. Achieving one goal and its targets, in other words, requires the concomitant meeting of other, indeed all, goals and targets.

The SDGs and targets, additionally, are importantly balanced between three main dimensions of sustainable development, namely social, economic and environmental dimensions. It therefore adopts a more holistic approach to sustainable development connecting social inclusion, economic growth and environmental protection. This balancing helps ensure that the diverse perspectives and needs for a truly complete approach to a better world are included. Like the interlinked nature of the SDGs and targets, these three dimensions are similarly interrelated to the extent that each must be addressed to ensure a better world for all. The Agenda cannot be fully implemented or realized in a piecemeal fashion. It requires social, economic and environmental considerations, expressed through the SDGs and targets, and translated into reality through implementation.

The roots of the new post-2015 agenda were planted in a previous UN programme, entitled the Millennium Development Goals (MDGs), which intended to meet the needs of the world's poorest people and societies during the first decade-and-a-half of the new century (United Nations, n.d.). The MDGs were launched in 2000 with a target year for fulfilment set for 2015. Constituted by eight goals and associated 21 targets, including halving extreme poverty rates, providing universal primary education and halting the spread of HIV/AIDS, malaria and other diseases, the MDGs concentrated on addressing social issues in developing countries. As the MDG period neared its conclusion at the end of 2015, the international community recognized the need for a new development agenda beyond 2015 in order to continue extending the successes achieved by the MDGs, completing what these previous goals did not achieve, and expanding the remit to cover additional issues and dimensions.

The new post-2015 agenda would be uniquely different from the MDGs in several significant ways. First, it would call for all countries to promote prosperity and protect the planet. It would extend its focus beyond poorer states to include rich, middle income and poor alike. Second, the scope would be broadened beyond the eight MDGs to more fully combat the complex challenges confronting the world. Third, while the new agenda would build upon the MDGs, it would also expand their focus to include not only social considerations but also economic and

environmental issues. It would therefore adopt a more holistic approach to sustainable development connecting social inclusion, economic growth and environmental protection. And, fourth, it would facilitate an inclusive negotiation process involving all 193 UN member states in addition to participation of civil society and citizens surrounded the creation of the new post-2015 agenda. This inclusive negotiation process was unprecedented insofar as it included diverse perspectives and inputs from various communities and stakeholders instead of an exclusive top-down process involving a small community of experts.

The International Federation of Library Associations and Institutions (IFLA), for example, played a significant role in helping inform the creation of the new agenda by advocating for the importance of information access in helping to meet the emerging sustainable development goals and targets. Bradley (2016) provides a detailed examination of IFLA's engagement with the post-2015 agenda negotiations and its contributions to the resulting 2030 Agenda. She explains that:

to maximise chances of success and to garner support from inside and beyond the library field, IFLA focused on a limited number of issues: access to information, public access to ICT and cultural heritage, each of which encompassed the role of libraries as an essential provider of access, skills and stewardship. (Bradley, 2016: 120)

By illuminating the need for importance of information access, not only for each SDG, but also for connecting them together, IFLA embarked on a successful campaign to include information access in the final version of the agenda.

During the negotiations, IFLA promoted the importance of libraries in advancing sustainable development. It issued a formal statement affirming that libraries represent 'important development partners, both by providing access to information in all formats and by delivering services and programmes that meet the needs for information in a changing and increasingly complex society' (IFLA, 2013). Governments and other stakeholders were confronted with a unique opportunity to leverage their public libraries for realizing sustainable development efforts. IFLA emphasized public libraries' positive impact on local communities through providing of free access to information, facilitating access to cultural heritage and knowledge, establishing diverse opportunities for individuals, empowering people for their own self-development, providing expert information guidance,

and contributing to and working with their multi-stakeholder societies.

The Lyon Declaration, moreover, was another IFLA initiative to advocate for the inclusion of information access and skills within the negotiations. Launched at the 2014 World Library and Information Congress in Lyon, France, the declaration argued that information access and skills have the twin effects of supporting sustainable development and improving people's lives. The declaration stated that 'increased access to information and knowledge, underpinned by universal literacy, is an essential pillar of sustainable development' and, further, that libraries 'have the skills and resources to help governments, institutions and individuals communicate, organize, structure and understand data that is critical to development' (IFLA, 2014). The Lyon Declaration called upon all UN member states to make an international commitment to ensure universal access to information coupled with developing information skills. Garnering the support of 600 signatories from many civil society organizations, this document revealed the strong support from international civil society for advancing information access and advocating for the role of libraries in sustainable development efforts.

These advocacy campaigns successfully secured the inclusion of universal literacy in the Agenda's vision statement in addition to a major SDG target on information access. The SDG 16 – promoting peaceful and inclusive societies, providing access to justice, and building effective, accountable and inclusive institutions at all levels – includes Target 16.10 to 'ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements' (UN, 2015a). Achieving full information access requires everyone to have access and associated skills to use information effectively. Public libraries provide information access, information skills development and other educational opportunities to help individuals seek, locate, organize, structure, communicate and use information for personal, social, cultural and development-related goals, needs and efforts.

Public libraries, however, are more than tools for implementing the SDGs. They are also reliable mechanisms underpinning the delivery of these goals. There are 320,000 public libraries worldwide (as well as more than one million academic, research, school, national, parliamentary and special libraries) representing established, trusted networks that should be leveraged to meet the SDGs.<sup>7</sup> Their provision of information further represents a cross-cutting issue supporting all of the SDGs. As IFLA (2019a) states, public libraries and information access can help

contribute to improved outcomes across the Sustainable Development Goals (SDGs) by promoting universal literacy, including media and information literacy, and digital literacy skills; closing gaps in access to information and helping government, civil society and business to better understand local information needs; providing a network of delivery sites for government programmes and services; advancing digital inclusion through access to ICT, and dedicated staff to help people develop new digital skills; serving as the heart of the research and academic community; and preserving and providing access to the world's culture and heritage.

In this sense, public libraries serve as the proverbial golden thread weaving the goals together into a colourful tapestry for achieving sustainable development. They ensure that people have the information they need to manifest the SDGs into practical results. While the SDGs could appear to be disjointed because of this sweeping ambition – indeed, some critics claim the SDGs should stand for ‘senseless, dreamy, garbled’ (Easterly, 2015) – this golden thread reveals their intertwined nature. A framework for approaching public libraries within the context of the UN 2030 Agenda can shed further light on public libraries’ roles in helping implement and connect the SDGs. Let us now turn to such a framework that situates each SDG within one of its major components.

### **A framework of public libraries’ contributions to the UN 2030 Agenda**

The SDGs of the UN 2030 Agenda are comprehensive to the extent that they could appear overwhelming, especially in terms of their fulfilment; however, public libraries, as ‘public sphere institutions’ (Vårheim et al., 2019: 93) and their provision of information access, help bring together and realize the UN 2030 Agenda’s ambitious SDGs. This article now introduces a conceptual framework of public libraries’ contributions to community, culture, education, economy and democracy to approach the Agenda. These five components are not mutually exclusive but instead are symbiotic, informing and influencing each other in a matrix that makes public libraries significant to individuals and communities.

The Agenda’s SDGs can be situated within this conceptual framework’s five components to illuminate the multidimensional ways in which public libraries connect and contribute to these goals and their integrated social, economic, and environmental dimensions. This framework can be applied at both global and local levels. It can be scaled for either broad or narrow analyses, or more general or granular applications, for approaching the roles of information

and public libraries in diverse contexts. This framework, moreover, can be applied either wholesale or piecemeal. Its components do not necessarily need to be applied in their entirety, but instead could be applied separately, combined in various constellations, or be taken together for analysing public libraries’ contributions to individuals, communities and sustainable development efforts. For instance, the framework’s component of democratic contributions may not apply to every setting or situation, particularly in non-democratic countries or contexts, and, as a result, could possibly be omitted from some analyses. The framework therefore provides multiple potential pathways in which to approach and analyze public libraries’ contributions to individuals, communities and sustainable development efforts.

Ultimately, the aim of this conceptual framework is to provide both a foundation and possible points of departure for further research and studies into public libraries and their importance and implications for the Agenda specifically and sustainable development generally. The following discussion focuses on a selection of goals and associated targets for inclusion for two interrelated reasons. First, as aforementioned, it is beyond this article’s scope and space to provide an exhaustive examination of either the full Agenda or every possible aspect or feature of public libraries’ contributions to sustainable development efforts. Selecting specific goals and associated targets had to be made to ensure a more concentrated approach and focused discussion. Second, the reason behind the goals and associated targets chosen for analyses is their relevance and resonance with issues relating, both directly and indirectly, to information access and public libraries. This selection, in other words, is based on the chosen goals and associated targets being particularly germane to the work, interests and purview of public libraries. Further and other studies on public libraries and the Agenda could possibly explore other SDGs and associated targets. But, for now, let us start applying this framework to the following selection of the SDGs from the UN 2030 Agenda.

#### *Community contributions*

Communities benefit from the presence of public libraries since they are unique public places. They are community places that ‘contribute to the quality of life of their communities’ (Chow and Tian, 2019). Public libraries can help improve the quality of life by offering free and open access to diverse kinds and formats of information, free spaces for assembly and engagement, and opportunities for individual leisure

and education. Their community contributions to their communities can consequently be leveraged to help realize the Agenda's third, fifth and eleventh goals. Specifically,

- Goal 3: Ensure healthy lives and promote well-being for all at all ages.

Public libraries can provide free access to credible, quality health information to help inform individuals about their personal health as well as inform their communities about health issues, treatments and other resources.

- Goal 5: Achieve gender equality and empower all women and girls.

Public libraries promote gender equality by making available equitable and inclusive spaces and information access for women and girls, and indeed all sexes and gender identities. Public libraries provide safe meeting places, programmes and lectures on women's rights and health, and various educational services for lifelong learning including literacy training for women and girls. Public libraries also help specifically implement Target 5.b – enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women – by providing free access to ICTs accompanied by different programmes on literacy for and training on how to use them effectively.<sup>8</sup>

- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

Public libraries play significant roles in helping build and maintain inclusive and resilient communities. They 'function as robust community centers, often providing services that people cannot get elsewhere' (Scott, 2011a: 191). They are 'trusted community institutions contributing to the creation of social capital among patrons . . . [making] use of their resources and the institutional capital in their communities, contributing to community resilience and social capital creation' (Vårheim, 2017). Their provision of open, equitable, inclusive and safe spaces for all individuals and groups, along with their provision of information, are important factors in helping ensure successful and sustainable cities and human settlements. They are consequently vital components of (an increasingly diminishing) public sphere; indeed, they might be 'the nearest thing we have . . . to an achieved public sphere' (Webster 2002, 176).

Public libraries, moreover, help address the information, sociocultural and humanitarian needs of all

individuals, including those from marginalized and disadvantaged groups. For instance, they 'are on the front lines of the current refugee crisis . . . assisting refugees to reconstruct information communities and landscapes, build resilience and social capital, and reconnect with their homelands while simultaneously connecting with their new communities' (Kosciejew, 2019: 94). They are offering language (often English as a second language) classes, resettlement assistance (how and where to find and secure food, housing, work, school registration, etc.), and help learning about and complying with governmental regulations.<sup>9</sup> Public libraries thus help ensure refugees are included in their new communities 'by making relevant information available, accessible, and usable, through the provision of free information resources, services, and technologies in addition to other logistical and humanitarian assistance, social support, and communal spaces' (Kosciejew 2019: 94).

- Goal 11.b. By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement . . . holistic disaster risk management at all levels.

Public libraries are essential resources in times of emergency and crisis.<sup>10</sup> In the United States, for example, the US Federal Emergency Management Agency (FEMA) has formally recognized public libraries as essential community organizations. Since they are typically well established in their local communities, they can help develop local policy on issues and plans relating to disaster risk management. Further, they often play vital roles in disaster recovery efforts 'even when other government actors fail. Libraries are centers of local information and have local knowledge. Patrons, as well as government agencies and NGOs, benefit from public libraries' local grounding' (Vårheim, 2015: 2). Public libraries 'are able to be staffed and opened quickly so librarians can interview disaster victims for actual needs. This dependable mechanism has proven to enhance a community during the marked low moments that disasters cause' (Mabe and Ashley, 2017: 27).<sup>11</sup>

Many public libraries, in fact, either contribute to and/or intervene in emergency situations by taking on various roles

to support disaster recovery in communities . . . periodically adjust[ing] their policies and services based on



what their community needed at the time. These practices are not only indicative of a resilient system, but if integrated with emergency management could support a more resilient community. (Veil and Bishop, 2014: 723)

### *Cultural contributions*

Culture is promoted by and through the presence of public libraries. They are cultural places. Culture is presented and protected, in many practical ways, by and through public libraries. Their cultural contributions to their communities can be harnessed to help support the Agenda's Goal 11 Target of 11.4. Specifically,

- Goal 11.4 Strengthen efforts to protect and safeguard the world's cultural . . . heritage.

Public libraries play essential roles in the development, safeguarding and preservation of cultural heritage in all forms from print to digital resources. Public libraries help 'broaden their community's cultural understanding and awareness of the world through [their collections,] programming, displays, and discussions' (Scott, 2011a: 201). They collect, organize, preserve and make accessible diverse kinds of cultural resources of their communities and, indeed, of the world, thereby making available diverse facts, ideas and perspectives. This cultural accessibility nourishes creativity and intellectual activities that, in turn, lead to the creation of more culture.

### *Educational contributions*

Educational opportunities are expanded through public libraries. They are educational places. They help reduce barriers to learning by providing free, equitable and inclusive pathways for acquiring and developing new knowledge and skills. They not only make information both available and accessible, they also represent places of thinking; put differently, they are places associated with obtaining information and thinking about and reflecting upon that information. Their educational contributions to their communities can be extended to help achieve the Agenda's fourth goal overall and, in particular, Targets 4.4, and 4.6. Specifically,

- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Public libraries are learning environments providing safe spaces for education, where individuals can engage in study and research in order to increase their

education, stimulate their imagination, and garner new perspectives and possibilities for self-discovery. They consequently support other educational institutions and efforts within their communities by providing lectures, programmes and services for diverse purposes and needs from language instruction to literacy skills development. Their supportive role for formal education is further enriched by their provision of 'direct education through formal [and informal] instruction, for free, to many groups that at best are offered in only a few other venues' (Scott, 2011a: 203). Public libraries, for example, offer diverse programmes including children's programming, early childhood and adult literacy, language instruction such as English as a second language, civic education, and computer classes and digital literacy development.<sup>12</sup> They further provide access to diverse kinds of information which helps support research efforts in not only accessing and (re)using information but also creating new knowledge. Ultimately, public libraries support the lifelong learning and education of their communities.

- Target 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical . . . skills, for employment, decent jobs and entrepreneurship.

Public libraries help support and advance the development of technical skills, specifically digital and related technical and literacy skills, for all individuals, from youth to adults with varying degrees of knowledge and experience, that, in turn, helps them in their employment or in their search for and securement of employment. By offering classes and programmes for developing, expanding, and/or refining digital knowledge and skills, public libraries help individuals develop abilities to efficiently and effectively access, analyse and produce information in diverse forms and formats for their diverse work needs.

- Target 4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy.

Public libraries are places of and for literacy. They have, historically, helped promote and support reading and numerical literacies for all ages. They offer diverse programmes on reading and writing for youth and adults. They often play important roles 'in developing early literacy skills and a love of reading in children . . . [as well as] working intergenerationally and developing a national culture of reading' (Campbell-Hicks, 2016: 121). Some public libraries

also ‘support increased financial literacy in their communities’ (Smith and Eschenfelder, 2013: 299) by offering programmes on financial literacy, including for general matters for personal or organizational financial management and tax compilation and submission assistance.

### *Economic contributions*

Economies are enhanced by public libraries. They are places for economic development at both local and national levels. They help enable entrepreneurial activity, support local businesses and assist individuals search for jobs or new employment. They can also positively increase their communities’ reputation by attracting visitors who could then visit, support and shop at surrounding businesses.<sup>13</sup> Their economic contributions to their communities can be further employed to help secure the Agenda’s eighth and ninth goals. Specifically,

- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Public libraries provide free and equitable spaces and access to information, ICTs, skills training and other educational opportunities that can help individuals develop skills and build knowledge for employment and other economic opportunities.

They offer services for employment searches and government benefits, especially for individuals who may not have computer or Internet access or may require assistance navigating the job market or government platforms. This assistance includes helping people navigate job sites, complete online applications, compose resumes and learn interviewing techniques.

This information access and skills training further benefits local businesses and entrepreneurs in conducting research, especially on local matters, that can help their economic development and growth. In fact, public libraries:

can play a significant role in the economic development of their [local] communities. Economic development in [their local] communities... benefit from many of the same resources and services all enjoy at public libraries, including free and public Internet access, space, education, question answering, and materials on many business-related subjects. (Bishop et al., 2016: 37)

These public institutions provide places where local businesses and entrepreneurs can access information and conduct research to support their ventures,

in addition to access resources on local matters that can benefit their local endeavours.

Further, public libraries’ provision of free access to ICTs, Internet access, and digital and technical literacy programmes to help individuals create, consume, share, navigate and otherwise use digital information. In fact, public libraries are increasingly prioritizing ‘their roles in promoting digital inclusion and view digital inclusion efforts as central to their missions to serve their communities’ (Bertot et al., 2013: 270). This free provision of digital technologies, services and the Internet help bolster educational and research infrastructure and, in more economically underprivileged and/or rural communities, represent the main sources for digital inclusion. Indeed, public libraries’ provision and promotion of ICTs and the Internet increases individuals’ connectivity to diverse kinds of professional and personal opportunities.

- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Public libraries, significantly, are parts of infrastructure themselves. They form part of the backbone of the vital ‘social infrastructure’ (Klinenberg, 2018a), the physical places providing the settings and context for social participation. Social ties are forged when people have access to robust social infrastructures. Living near and having access to public libraries ‘brings a host of social benefits, such as increased trust, decreased loneliness, and a stronger sense of attachment to where we live’ (Cox and Streeter, 2019a). According to a recent study on the importance of place (Cox and Streeter, 2019b), individuals who live in close proximity to public libraries, along with other amenities, are more content with their communities, exhibit more social trust and display lower levels of loneliness. Cox and Streeter discovered that even after accounting for factors including urban or rural residents, social class, educational level, gender and race, greater amenity access to places like public libraries predicts feelings of community satisfaction, social trust, and social inclusion (2019b: 1). As parts of social infrastructure, public libraries therefore help foster increasing social participation through contact, communication and collaboration among neighbours, friends and other community members.

### *Democratic contributions*

Democratic principles and practices are upheld by public libraries. They are, in many ways, democratic places. Public libraries often serve ‘as both symbols

of freedom and democracy and as mechanisms to support those values through open access to information and culture' (Byrne, 2018: 285). Extensive networks of well-provisioned and well-used public libraries help strengthen democracy; indeed, 'strong public library systems tend to go hand in hand with strong democratic values and traditions' (Byrne, 2018: 291). Public libraries facilitate, for example, some of the fundamental features of democracy, including freedoms of expression, assembly and association. Their democratic contributions to their communities can be further used to help advance the agenda's tenth, sixteenth and seventeenth goals. Specifically,

- Goal 10. Reduce inequality within and among countries.

Public libraries help reduce inequality in two fundamental ways: first, by providing open, inclusive and safe civic spaces for all people located in urban and rural areas; and second, by providing free and equitable access to diverse information and other socio-cultural and educational services available to all individuals. They are truly 'palaces for the people' (Klinenberg, 2018a) offering space, information, and opportunities 'for everyone, regardless of whether they're a citizen, a permanent resident, or even a convicted felon – and all of it for free' (Klinenberg, 2018b). Public libraries, in these ways, can often reasonably claim the mantle of being democratic institutions.<sup>14</sup>

Further, public libraries can help reduce inequality among countries through regional or international collaborations, partnerships and support.<sup>15</sup> They can help build each other up through efforts such as resource sharing and interlibrary loans; professional development programmes, bursaries and scholarships; fundraising efforts and volunteer arrangements; and specialized curriculum in library schools focusing on international librarianship, information issues and social justice.

- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Public libraries help contribute to peaceful and inclusive societies by providing safe, inclusive and open civic spaces. Their 'welcoming of diversity and respect for all users – from the indigent to the wealthy, the infant to the senior, the educated to the less informed – models democracy for the

community' (Byrne, 2018: 293). They help inculcate civic understanding by actively engaging with their communities, embracing minorities and responding to local information, cultural, educational and other social needs, thereby promoting 'democracy in a practical, 'grass roots' manner . . . [being] 'radically inclusive' for their communities' (Byrne, 2018: 293). In this sense, they not only provide information but also advance social justice and inclusion whilst simultaneously foster community for all people. As inclusive public places, they 'often help establish the foundation upon which, given sufficient time, trust levels are based and can increase' (Kosciejew, 2019: 90). As many individuals may increasingly feel alienated, atomized and afraid, public libraries can help serve as community hubs to promote and facilitate increased social interaction and connection.

- Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Public libraries represent a well-established network of community-based, cultural and information institutions in urban and rural areas in most countries that can help promote, implement, and advance local and national development plans. Many public libraries 'have the skills and resources to help governments, institutions and individuals communicate, organise, structure and use information and data for development' (IFLA, 2017). Thus, these public institutions 'in addition to providing the recreational and educational resources desired by their communities . . . actively offer resources relating to law, government, public policy, town planning, health and the many other fields of interest to an active citizenry' (Byrne, 2018: 293). These resources, collections and services offered by public libraries further represent and serve as essential tools for decision-making at all levels, including for deliberations regarding the creation, implementation and monitoring of sustainable development efforts.

Ultimately, the Agenda's global vision requires the support of local advocacy and action to turn it into reality. Global vision and action

must be supported by local advocacy, and with the support of libraries and librarians at all levels to support and promote the UN 2030 Agenda, the difference that access to information and libraries make . . . [can help] ensure that the sector makes a counted, vital contribution to achieving the SDGs. (Bradley, 2016: 124)

Indeed, 'libraries, in every part of the world, can be reliable mechanisms for underpinning the delivery of

sustainable development programmes' (IFLA, 2013). These public institutions are ideally situated within their local communities to help translate this global vision into local action by providing public access to information, literacy skills development and other educational opportunities, cultural heritage provision and protection, and inclusive and equitable community spaces.

### **Conclusion: Going forward with sustainable development efforts**

Going forward, sustainable development efforts rest upon access to and the provision of information. Economic, social and environmental development suffers when and where there is a lack of information. Public libraries are motors of change that can help drive development for a sustainable, prosperous, inclusive, and healthy future for all people.

As the UN 2030 Agenda reaches its one-third mark, both its implementation and the work of public libraries in helping achieve its SDGs remains ongoing. IFLA and the international library community continues advancing the Agenda through raising awareness, contributing resources and services to meet various goals and targets, and collaborating with the UN and other organizations in making sustainable development of the economy, society, and environment a reality for all. In 2016, for example, IFLA launched the International Advocacy Programme (IAP), which is a capacity-building effort 'designed to promote and support the role libraries can play in the planning and implementation of the UN 2030 Agenda and the SDGs' (IFLA, 2018b). The IAP has been holding and hosting activities, workshops and follow-up actions to raise awareness of and advocate for (public) libraries as key partners of government, industry and other actors in supporting the Agenda.

Further, in 2019, the Ministers of Culture of Latin American and Caribbean countries, with the advice and support of IFLA, issued the so-called Buenos Aires Declaration (re)affirming and emphasizing 'the place of access to information both as a universal human right and as a cross-cutting driver of development' and recognizing 'the indispensable contribution of [public] libraries across the region [and the world] to development' (Forum of Ministers and Secretaries of Culture of Latin America and the Caribbean, 2019). Since the declaration's launch, IFLA has begun work on extending its reach to more countries to support the roles of information access and (public) libraries in achieving the SDGs (IFLA, 2019b).

By increasing awareness of the UN2030 Agenda, this article emphasized and promoted the ways in

which public libraries address, contribute to, and realize sustainable development efforts. To this end, this article's twin objectives outlined the start of a wide-ranging literature review and exploration of public libraries' intersections with sustainable development efforts. First, it began a literature review of the emerging LIS research on the Agenda and other LIS-related research that can be leveraged to both demonstrate and support the centrality of public libraries in sustainable development efforts. This literature review also provides numerous points of departure in which to continue expanding and exploring their importance for these efforts. Second, this article presented a conceptual framework of public libraries' contributions to community, culture, education, economy and democracy, applying it as a taxonomy to situate and discuss their contributions to the Agenda's SDGs. This framework offers a model for further analyses on the intersections between public library values, assets and functions with the Agenda; moreover, it can be scaled to different degrees of analyses, from the global to the local, whilst its various components can be applied individually, in combination with one another, or in their entirety.

There were admittedly some challenges encountered in conducting this research into and analyses of public libraries and sustainable development. One challenge involved the degree of detailed coverage of this topic. It is important to reiterate that it is beyond this article's scope and space to present a comprehensive or total overview of all the literature pertaining to the rich and varied contributions made by public libraries to individuals and communities. It is also beyond this article's scope and space to present a complete conversation on all these important contributions. This article, instead, aims to begin such an overview to both start and stimulate more conversations about public libraries' contributions and, specifically, their contributions to and for sustainable development efforts within the Agenda's context.

There also appears to be an apparent lack of substantial engagement with the roles and contributions of public libraries to realizing the UN 2030 Agenda emanating from discourses within more developed countries and regions. A large portion of the literature on this specific topic appears to be from scholars and professionals working within or focusing upon undeveloped or underdeveloped countries and regions. This work is necessary and vital, and it is hoped this article can help contribute to further ongoing and other studies being done within these countries and regions. But this seeming regional imbalance in engagement with and focus on this topic illuminates that scholarship from certain areas is not adequately

addressing or tackling public libraries and their roles in achieving the Agenda to the extent that it needs. Sustainable development, after all, is a global concern that requires concerted, collaborative and cooperative efforts across multidimensional boundaries. This article can begin to contribute to filling this apparent research gap, stimulate increased scholarly and practice-based research, and connect and support other interdisciplinary, as well as multinational and multicultural studies, on this topic from diverse scholars, professionals and other interested parties from various countries and regions at all levels of development.

Applying this conceptual framework was also challenged by the seemingly minimal scholarly attention to public library services for various issues relating to natural heritage. Goal 11.4, for instance, states the need to strengthen efforts to protect and safeguard the world's cultural *and* natural heritage. Libraries of all stripes are conducting important work in protecting and safeguarding cultural heritage. Public libraries are of course instrumental in these efforts, especially at local levels. But it was a challenge to find any substantial scholarship on (public) libraries' roles in providing services relating to, let alone protecting and safeguarding, aspects or issues of natural heritage. Greater research on public libraries' contributions to and for natural heritage could help further reveal their important roles in these efforts, not to mention their roles in achieving all aspects of Goal 11.4.

Possible next steps that public libraries could potentially take in approaching the UN 2030 Agenda are numerous. They include addressing the aforementioned challenges encountered in this particular research, in addition to continuing scholarly research, conducting more professional studies, and generating practice-based evidence on the impacts of and values represented by public libraries within the Agenda's context. By providing a basis upon which to conduct further studies into this topic, this article can serve as a springboard for additional attention to public libraries, sustainable development, and the UN 2030 Agenda. It could, for instance, be used to help inform both qualitative and quantitative approaches measuring the impact and value of public libraries' work on and for the Agenda. Additionally, while this article focused on how public libraries support the Agenda and how the SDGs fit into current public library practices, a possible goal for future research could be adjusting the question to examine how public libraries can innovate to better serve and meet the Agenda's SDGs or what particular actions and steps can public libraries adopt to advance sustainable development efforts.

Public libraries matter for our lives, societies and sustainable development. Ultimately, this article is a foundation upon which to build, and a framework within which to apply, further research into the important intersections between public libraries, information access and sustainable development efforts. It is hoped that, through its humble contribution, this article can help the UN2030 Agenda's ambition to ensure that no one is left behind and, in so doing, help enable, empower and include everyone in achieving a better future for all.

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### Notes

1. See Carlton 2018; IFLA 2018a, 2019a, 2019c, 2019d.
2. See Bryant 2015; Ford, 2015; Jones and Kweifio-Okai 2015; Sengupta 2015; Wooldridge 2016.
3. See the United Nations 2019 SDG Report.
4. Public libraries' claim to be open to all people, however, may not always be practically realized. There are instances where not everyone is equally welcome. Critical race theory is interrogating this claim; see, for instance, Al-Qallaf and Mika, 2013; Burke 2010; Gibson et al., 2018; Hudson, 2017; Pawley, 2006; Velez and Villa-Nicholas, 2017. There are also expanding inquiries into other social justice issues within public library contexts; see, for example, Berman, 2005; Gorham et al., 2016; Jaeger et al., 2015, 2016; Kim and Sin 2008; LaBossiere et al., n.d; Pateman and Vincent, 2016; Wheeler, 2005; Williment, 2019. There is also growing recognition that public libraries can create or reinforce hegemony and even foster their own sociopolitical agendas; see, for instance, Jaeger and Sarin, 2016.
5. See, for example, Abelenda, 2014; Atkinson and Fankhauser, 2019; Bebbington and Unerman, 2018; Bexell and Jönsson, 2017; Biermann et al., 2017; Bowen et al., 2017; Brende and Høie, 2015; Browne, 2017; Caiado et al., 2018; Chasek and Wagner, 2016; Chasek et al., 2016; Dodds et al., 2016; Elder and Olsen, 2019; Enns, 2015; Esquivel, 2016; Filho et al., 2018; Fitchett and Atun, 2014; French and Kotzé, 2018; Fukuda-Parr, 2016; Galli et al., 2018; Griggs et al., 2013; Hák et al., 2016; Halati and He, 2018; Haysom, 2018; Kamau et al., 2018; Kanie and Biermann, 2017; Koehler, 2016; Kostoska and Kocarev 2019; LeBlanc, 2015; Lim et al., 2016; Lu et al., 2015; Morton et al., 2017; Musindarwezo, 2018; Nilsson et al., 2016; Ntona and

- Morgera, 2018; Okech and Musindarwezo, 2019; Omisore et al., 2017; Pogge and Sengupta, 2015; Pradhan et al., 2017; Ruhil, 2017; Sachs, 2012; Scholte and Söderbaum, 2017; Stevens and Kanie, 2016; Sridhar, 2016; UN Women, 2018; Utama et al., 2015; Van Norren, 2014; Vandemoortele, 2014; Waage et al., 2015; Webb et al., 2017; Winkler and Williams, 2018; Wood et al., 2018; Wood and DeClerck, 2015.
6. See, for instance, Abata-Ebire et al., 2018; Anasi et al., 2018; Bradley, 2016; Chowdhury and Koya, 2017; Igbinovia, 2016; Koya and Chowdhury, 2019; Nicholas and Perpetual, 2015; Onah et al., 2015.
  7. There are admittedly other respected networks – from public school systems and universities to non-governmental organizations (NGOs) – that can also be leveraged for sustainable development efforts. Public libraries, however, are uniquely qualified because of their being open and free to all people. Public school systems, however, are geared towards teachers, staff and their pupils (and pupils' families), some NGOs are subject-specific, such as focusing on human rights or environmental concerns, and even others may require fee-based memberships or subscriptions, and so on.
  8. For more detailed discussions of library services and programmes that help advance and empower women and girls, see, for instance, Audunson et al., 2011; McKenzie et al., 2006; Smallwood and Sanborn, 2017; Ulvik, 2010; Yoshida, 2013.
  9. For a more detailed examination of the vital roles played by public libraries in addressing the plight of refugees see, for instance, Koscieljew 2019.
  10. For more in-depth coverage of the roles played by public libraries in disaster risk management and recovery contexts, see, for example, Bertot et al., 2006; Dickerson, 2007; Featherstone et al., 2008; Hagar, 2012; Halsted et al., 2014; Mabe and Ashley, 2017; Robertson, 2015; Vårheim, 2015, 2016; Steward, 2014; Young, 2018.
  11. There are, admittedly, other organizations, including civil society organizations and welfare agencies, that contribute humanitarian interventions during emergencies. Public libraries, however, are particularly special in such interventions insofar as they often provide wide-ranging assistance and support, such as information provision coupled with humanitarian, shelter, relief, and other services, whereas other organizations typically concentrate on one particular kind of assistance or support.
  12. Public libraries play many educational and literacy roles; for further discussion, see, for example: Arndt, 2016; Batchelor, 2017; Bertot et al., 2012, 2016; Bossaller, 2017; Clark and Hawkins, 2011; Jaeger et al., 2012; Julien and Hoffman, 2008; Koik, 2019; Koscieljew, 2019; LaPierre and Kitzie, 2019; Lopez et al., 2016; Lor, 2018; McLoughlin and Morris 2004; McShane, 2011; Ottonica et al., 2018; Rhinesmith and Urbano Stanton, 2018; Sabo, 2017; Stevenson and Domsy, 2016; Subramaniam et al., 2018; Zapata, 1994.
  13. Public libraries often contribute to local and national economies in various ways; see, for instance: Aabø, 2005a, 2005b; Arts Council England, 2014; Audunson et al., 2019; Franks and Johns, 2015; Goulding, 2016; Hancks, 2012; Herrera, 2016; Hildreth and Sullivan, 2015; Liu, 2004; Mehra et al., 2016, 2017; Miller, 2017; Reid and Howard, 2016; Scott, 2011b; Seleb and Kolo, 2017; Stenstrom et al., 2019; Summers and Buchanan, 2018; Taylor et al., 2012; White, 2014; Wyatt and Leorke, 2017.
  14. Yet not all public libraries in all contexts aim or intend to be democratic institutions. Depending upon context, public libraries can serve undemocratic ideologies and regimes; for a contemporary example of non-democratic public libraries, such as North Korean libraries, see Koscieljew 2009a, 2009b.
  15. Many public libraries and library associations collaborate across borders and other boundaries. IFLA is arguably the preeminent example of such international collaboration. For other discussions on aspects of public libraries' international cooperation, see, for example: Chakraborty and Das, 2014; Mark, 2007; Norman, 2013; Saurombe and Ngulube, 2018; Weinberger, 2012; Yarrow et al., 2008.

## References

- Aabø S (2005a) Are public libraries worth their price? *New Library World* 106(11/12): 487–495.
- Aabø S (2005b) The role and value of public libraries in the age of digital technologies. *Journal of Librarianship and Information Science* 37(4): 205–211.
- Abata-Ebire BD, Adebowale JA and Ojokuku BY (2018) Achieving Sustainable Development Goals (SDGs) in Nigeria: The roles of libraries. *International Journal of Applied Technologies in Library and Information Management* 4 (2): 89–95.
- Abelenda AI (2014) A feminist perspective on the post-2015 Development Agenda. *Equal Rights Review* 13: 117–128.
- Al-Qallaf C and Mika J (2013) The role of multiculturalism and diversity in library and information science: LIS education and the job market. *Libri* 63(1): 1–20.
- Anasi SN, Ukangwa C and Fagbe A (2018) University libraries: Bridging digital gaps and accelerating the achievement of sustainable development goals through information and communication technologies. *World Journal of Science, Technology and Sustainable Development* 15(1): 13–25.
- Arndt TS (2016) Health literacy: A natural role for librarians. *Reference Services Review* 44(2): 81–84.
- Arts Council England (2014) Evidence review of the economic contribution of libraries. Available at: [https://www.artscouncil.org.uk/sites/default/files/download-file/Evidence\\_review\\_economic\\_contribution\\_libraries\\_2014.pdf](https://www.artscouncil.org.uk/sites/default/files/download-file/Evidence_review_economic_contribution_libraries_2014.pdf) (accessed 19 October 2019).
- Atkinson G and Fankhauser S (2019) *Sustainability Economics*. Cheltenham: Edward Elgar.

- Audunson R, et al. (2019) Public libraries as an infrastructure for a sustainable public sphere. *Journal of Documentation* 75(4): 773–790.
- Audunson R, Essmat S and Aabø S (2011) Public libraries: A meeting place for immigrant women? *Library and Information Science Research* 33: 220–227.
- Batchelor O (2017) Getting out the truth: The role of libraries in the fight against fake news. *Reference Services Review* 45(2): 143–148.
- Bebbington J and Unerman J (2018) Achieving the United Nations Sustainable Development Goals: An enabling role for accounting research. *Accounting, Auditing & Accountability Journal* 31(1): 2–24.
- Berman S (2005) Classism in the stacks: Libraries and poverty. ALA: 2005 Jean E. Coleman Library Outreach Lecture. Available at: <http://www.ala.org/aboutala/offices/olos/olosprograms/jeanecoleman/05berman> (accessed 19 October 2019).
- Bertot JC, et al. (2006) Public access computing and Internet access in public libraries: The role of public libraries in e-government and emergency situations. *First Monday* 11(9). Available at: <https://uncommonculture.org/ojs/index.php/fm/article/view/1392> (accessed 19 October 2019).
- Bertot JC, Real B and Jaeger PT (2016) Public libraries building digital inclusive communities: Data and findings from the 2013 Digital Inclusion Survey. *Library Quarterly* 86(3): 270–289.
- Bertot JC, Gorham U, Jaeger PT, et al. (2012) Public Libraries and the Internet 2012: Key findings, recent trends, and future challenges. *Public Library Quarterly* 31(4): 303–325.
- Bexell M and Jönsson K (2017) Responsibility and the United Nations Development Goals. *Forum for Development Studies* 44(1): 13–29.
- Biermann F, Kanie N and Kim RE (2017) Global governance by goal-setting: The novel approach of the UN Sustainable Development Goals. *Current Opinion in Environmental Sustainability* 26/27: 26–31.
- Bishop BW, Mehra B and Partee II RP (2016) The role of public libraries in small business development. *Public Library Quarterly* 35(1): 37–48.
- Bossaller JS (2017) Alternatives to apathy and indifference: Civic education in public libraries. *Library Quarterly* 87(3): 195–210.
- Bowen KJ, et al. (2017) Implementing the ‘Sustainable Development Goals’: Towards addressing three key governance challenges – collective action, trade-offs, and accountability. *Current Opinion in Environmental Sustainability* 26/27: 90–96.
- Bradley F (2016) ‘A world with universal literacy’: The role of libraries and access to information in the UN 2030 Agenda. *IFLA Journal* 42(2): 118–125.
- Brende B and Høie B (2015) Towards evidence-based, quantitative Sustainable Development Goals for 2030. *The Lancet* 385(9964): 206–208.
- Browne S (2017) *Sustainable Development Goals and UN Goal-Setting*. Abingdon-on-Thames: Routledge.
- Bryant N (2015) UN approves new sustainable development goals. *BBC News*, 25 September. Available at: <https://www.bbc.com/news/av/world-34363556/un-approves-new-sustainable-development-goals> (accessed 19 October 2019).
- Byrne A (2018) Democracy and libraries: Symbol or symbiosis? *Library Management* 39(5): 284–294.
- Burke SK (2010) Social tolerance and racist materials in public libraries. *Reference & User Services Quarterly* 49(4): 369–379.
- Caiado R, et al (2018) A literature-based review on potentials and constraints in the implementation of the Sustainable Development Goals. *Journal of Cleaner Production* 198: 1276–1288.
- Campbell-Hicks R (2016) Early literacy programmes in public libraries: Best practice. *Australian Library Journal* 65(2): 121–129.
- Carlton A (2018) IFLA President’s program reunites leaders. *American Libraries*, 26 August. Available at: <https://americanlibrariesmagazine.org/blogs/the-scoop/ifla-presidents-program-reunites-leaders/> (accessed 19 October 2019).
- Chakraborty S and Das AK (2014) *Collaboration in International and Comparative Librarianship*. Hershey, PA: IGI Global.
- Chasek PS and Wagner L (2016) Breaking the mold: A new type of multilateral sustainable development negotiation. *International Environmental Agreements: Politics, Law and Economics* 16(3): 397–413.
- Chasek PS, et al. (2016) Getting to 2030: Negotiating the Post-2015 Sustainable Development Agenda. *RECIEL: Review of European, Comparative & International Environmental Law* 25(1): 5–14.
- Chow A and Tian Q (2019) Public libraries positively impact quality of life: A big data study. *Public Library Quarterly*. DOI: 10.1080/01616846.2019.1632105.
- Chowdhury G and Koya K (2017) Information practices for sustainability: Role of iSchools in achieving the UN Sustainable Development Goals (SDGs). *Journal of the Association for Information Science and Technology* 68(9): 2128–2138.
- Chowdhury G (2014) *Sustainability of Scholarly Information*. London: Facet.
- Clark C and Hawkins L (2011) Public Libraries and Literacy: Young People’s Reading Habits and Attitudes to Public Libraries, and an Exploration of the Relationship between Public Library Use and School Attainment. National Literacy Trust. Available at: <https://files.eric.ed.gov/fulltext/ED515944.pdf> (accessed 19 October 2019).
- Cox D and Streeter R (2019a) Having a library or café down the block could change your life. *The Atlantic*, 20 May. Available at: <https://www.theatlantic.com/ideas/archive/2019/05/america-needs-more-community-spaces/589729/> (accessed 19 October 2019).
- Cox D and Streeter R (2019b) The Importance of Place: Neighborhood Amenities as a Source of Social Connection and Trust. American Enterprise Institute. Available

- at: <https://www.aei.org/wp-content/uploads/2019/05/The-Importance-of-Place.pdf> (accessed 19 October 2019)
- Department for Environment, Food & Rural Affairs, UK (2013) Sustainable development indicators. Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/223992/0\\_SDIs\\_final\\_\\_2\\_.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223992/0_SDIs_final__2_.pdf) (accessed 19 October 2019).
- Dickerson L (2007) Capitalizing on a disaster to create quality services: Some lessons from Hurricane Katrina. *Public Library Quarterly* 26(1/2): 101–115.
- Dodds F, Donoghue D and Roesch JL (2016) *Negotiating the Sustainable Development Goals: A Transformational Agenda for an Insecure World*. Abingdon-on-Thames: Routledge.
- Easterly W (2015) The SDGs should stand for Senseless, Dreamy, Garbled. *Foreign Policy*, 28 September. Available at: <https://foreignpolicy.com/2015/09/28/the-sdgs-are-utopian-and-worthless-mdgs-development-rise-of-the-rest/> (accessed 19 October 2019).
- Elder M and Olsen SH (2019) The design of environmental priorities in the SDGs. *Global Policy* 10(2): 70–82.
- Enns C (2015) Transformation or continuation? A critical analysis of the making of the post-2015 education agenda. *Globalisation, Societies and Education* 13(3): 369–387.
- Esquivel V (2016) Power and the Sustainable Development Goals: A feminist analysis. *Gender & Development* 24(1): 9–23.
- European Commission (2010) A Digital Agenda for Europe: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM (2010), 245. Available at: [http://ec.europa.eu/information\\_society/digital-agenda/documents/digital-agendacommunication-en.pdf](http://ec.europa.eu/information_society/digital-agenda/documents/digital-agendacommunication-en.pdf) (accessed 19 October 2019).
- Featherstone RM, Lyon BJ and Ruffin AB (2008) Library roles in disaster response: An oral history project by the National Library of Medicine. *Journal of the Medical Library Association* 96(4): 343–350.
- Filho W, et al. (2019) Using the Sustainable Development Goals towards a better understanding of sustainability challenges. *International Journal of Sustainable Development & World Ecology* 26(2): 179–190.
- Fitchett JR and Atun R (2014) Sustainable Development Goals and country-specific targets. *The Lancet Global Health* 2(9): 503.
- Ford L (2015) Sustainable Development Goals: All you need to know. *The Guardian*, 19 January. Available at: <https://www.theguardian.com/global-development/2015/jan/19/sustainable-development-goals-united-nations> (accessed 19 October 2019).
- Forum of Ministers of Culture of Latin America and the Caribbean (2019) Declaration of the Ministers of Culture of Latin America and the Caribbean. May 22. Available at: <https://president2019.ifla.org/wp-content/uploads/2019/05/buenos-aires-declaration.pdf> (accessed 18 October 2019).
- Franks JE and Johns C (2015) Entrepreneur assistance & economic development in Florida Libraries. *Reference Services Review* 43(3):400–418.
- French D and Kotzé LJ (eds) (2018) *Sustainable Development Goals: Law, Theory and Implementation*. Cheltenham: Edward Elgar.
- Fukuda-Parr S (2016) From the Millennium Development Goals to the Sustainable Development Goals: Shifts in purpose, concept, and politics of global goal setting for development. *Gender & Development* 24(1): 43–52.
- Galli A, et al. (2018) Think globally, act locally: Implementing the sustainable development goals in Montenegro. *Environmental Science & Policy* 84: 159–169.
- Gibson A, Hughes-Hassell S and Threats M (2018) Critical Race Theory in the LIS curriculum. In: Percell J et al. (eds) *Re-Envisioning the MLS: Perspectives on the Future of Library and Information Science Education*. Bingley: Emerald, pp. 49–70.
- Gorham U, Taylor NG and Jaeger PT (eds) (2016) *Perspectives on Libraries as Institutions of Human Rights and Social Justice*. London: Emerald.
- Goulding A (2016) *Public Libraries in the 21st Century: Defining Services and Debating the Future*. New York: Routledge.
- Hancks JW (2012) Rural public libraries' role in community economic development. *Public Library Quarterly* 31(3): 220–236.
- Herrera L (2016) The paradox and the promise: Perspectives on the future of public libraries. *Public Library Quarterly* 35(4): 267–275.
- Hildreth S and Sullivan M (2015) Rising to the challenge: Re-envisioning public libraries. *Journal of Library Administration* 55(8): 647–657.
- Griggs D, et al. (2013) Sustainable Development Goals for people and planet. *Nature* 495: 305–307.
- Hagar C (ed.) (2012) *Crisis Information Management: Communication and Technologies*. Sawston: Woodhead.
- Halatic A and He Y (2018) Intersection of economic and environmental goals of sustainable development initiatives. *Journal of Cleaner Production* 189: 813–829.
- Halsted DD, Shari C and Wilson DT (2014) *Library as Safe Haven: Disaster Planning, Response, and Recovery*. Chicago, IL: Neal-Schuman.
- Hák T, Janoušková S and Moldan B (2016) Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators* 60: 565–573.
- Haysom L (2018) The gender equality discourse of the Sustainable Development Goals and other instruments: Advancing feminist agendas in Africa? *Agenda: Empowering Women for Gender Equity* 32(1): 1–3.
- Hudson DK (2017) On 'diversity' as anti-racism in Library and Information Studies: A critique. *Journal of Critical Library and Information Studies* 1(1): 1–36.



- Igbinovia M (2016) Libraries as vehicle to Sustainable Developmental Goals (SDGs): Nigeria's current status and outlook. *Library Hi Tech News* 33(5): 16–17.
- International Federation of Library Associations and Institutions (IFLA) (2013) IFLA Statement on Libraries and Development. 16 August. Available at: [https://www.ifla.org/files/assets/alp/statement\\_on\\_libraries\\_and\\_development.pdf](https://www.ifla.org/files/assets/alp/statement_on_libraries_and_development.pdf) (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2014) The Lyon Declaration on Access to Information and Development. Available at: <https://www.lyondeclaration.org/about/> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2017) Talking points on libraries and the post-2015 development agenda. 7 July. Available at: <https://www.ifla.org/FR/node/9392> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2018a) IFLA President's session motors of change: Changing ourselves to change our world. In: *World Library and Information Congress, 84th IFLA general conference and assembly*, 26 August. Available at: <https://2018.ifla.org/live-streaming-wlic-ifla-2018#1535120514555-3c86b261-fd96> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2018b) The International Advocacy Programme (IAP). Available at: <https://www.ifla.org/ldp/iap> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2019a) Access and Opportunity for All: How libraries contribute to the United Nations 2030 Agenda. Available at: <https://www.ifla.org/files/assets/hq/topics/libraries-development/documents/access-and-opportunity-for-all.pdf> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2019b) From Buenos Aires to New York: Spreading the message of support for libraries. 19 July. Available at: <https://www.ifla.org/node/92295> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2019c) IFLA President's Meeting 2019: New perspectives, new possibilities and a call to action for libraries as motors of change. 31 May. Available at: <https://www.ifla.org/node/92200> (accessed 19 October 2019).
- International Federation of Library Associations and Institutions (IFLA) (2019d) Ministers of Culture and Representatives from Latin America and the Caribbean commit to libraries as motors of change. 22 May. Available at: <https://www.ifla.org/node/92185> (accessed 19 October 2019).
- Jaeger PT, et al. (2012) The intersection of public policy and public access: Digital divides, digital literacy, digital inclusion, and public libraries. *Public Library Quarterly* 31(1): 1–20.
- Jaeger PT and Sarin LC (2016) The politically engaged public library: Admitting and embracing the political nature of libraries and their goals. *Public Library Quarterly* 35(4): 325–330.
- Jaeger PT, Shilton K and Koepfler J (2016) The rise of social justice as a guiding principle in library and information science research. *Library Quarterly* 86(1): 1–9.
- Jaeger PT, Taylor NG and Gorham U (2015) *Libraries, Human Rights, and Social Justice: Enabling Access and Promoting Inclusion*. Lanham, MD: Rowman & Littlefield.
- Julien H and Hoffman C (2008) Information literacy training in Canada's public libraries. *Library Quarterly* 78(1): 19–41.
- Jones S and Kweifio-Okai C (2015) World leaders agree Sustainable Development Goals – as it happened. *The Guardian*, 25 September. Available at: <https://www.theguardian.com/global-development/live/2015/sep/25/un-sustainable-development-summit-2015-goals-sdgs-united-nations-general-assembly-70th-session-new-york-live> (accessed 19 October 2019).
- Kamau M, Chasek P and O'Connor D (eds) (2018) *Transforming Multilateral Diplomacy: The Inside Story of the Sustainable Development Goals*. Abingdon-on-Thames: Routledge.
- Kanie N and Biermann F (eds) (2017) *Governing through Goals: Sustainable Development Goals as Governance Innovation*. Cambridge, MA: MIT Press.
- Kim KS and Sin SCJ (2008) Increasing ethnic diversity in LIS: Strategies suggested by librarians of color. *Library Quarterly* 78(2): 153–177.
- Klinenberg E (2018a) *Palaces for the People: How to Build a More Equal and United Society*. New York: Random House.
- Klinenberg E (2018b) Palaces for the people: Why libraries are more than just books. *The Guardian*, 24 September. Available at: <https://www.theguardian.com/cities/2018/sep/24/palaces-for-the-people-at-the-library-everyone-is-welcome> (accessed 19 October 2019).
- Koehler G (2016) Tapping the Sustainable Development Goals for progressive gender equity and equality policy? *Gender & Development* 24(1): 53–68.
- Koik M (2019) What is the role of libraries in adult education? European Commission: Electronic Platform for Adult Learning in Europe (EPALE). Available at: <https://epale.ec.europa.eu/en/blog/what-role-libraries-adult-education> (accessed 19 October 2019).
- Kosciejew M (2009a) Inside an axis of evil library: A first-hand account of the North Korean Dear Leader's library system (Part One). *Feliciter* 55(4): 167–170.
- Kosciejew M (2009b) Inside an axis of evil library: A first-hand account of the North Korean Dear Leader's library system (Part Two). *Feliciter* 55(5): 207–209.
- Kosciejew M (2019) Information's importance for refugees: Information technologies, public libraries, and the current refugee crisis. *Library Quarterly* 89(2): 79–98.

- Kostoska O and Kocarev L (2019) A novel ICT framework for Sustainable Development Goals. *Sustainability* 11(7): 1–31.
- Koya K and Chowdhury G (2019) Cultural heritage information practices and iSchools education for achieving sustainable development. *Journal of the Association for Information Science and Technology*. DOI: 10.1002/asi.24283.
- LaBossiere T, Paige E and Steenken B (n.d.) Keeping up with ... implicit bias. Association of College & Research Libraries. Available at: [http://www.ala.org/acrl/publications/keeping\\_up\\_with/bias](http://www.ala.org/acrl/publications/keeping_up_with/bias) (accessed 19 October 2019).
- LaPierre SS and Kitzie V (2019) Lots of questions about 'fake news': How public libraries have addressed media literacy, 2016–2018. *Public Library Quarterly*. DOI: 10.1080/01616846.2019.1600391.
- LeBlanc D (2015) Towards integration at last? The Sustainable Development Goals as a network of targets. *Sustainable Development* 23: 176–187.
- Lim SS, et al. (2016) Measuring the health-related Sustainable Development Goals in 188 countries: A baseline analysis from the Global Burden of Disease Study 2015. *The Lancet* 388(10053): 1813–1850.
- Liu L (2004) The contribution of public libraries to countries' economic productivity: A path analysis. *Library Review* 53(9): 435–441.
- Lopez ME, Caspe M and McWilliams L (2016) *Public Libraries: A Vital Space for Family Engagement*. Cambridge, MA: Harvard Family Research Project. Available at: [https://globalfrp.org/content/download/72/431/file/Public%20Libraries-A%20Vital%20Space%20for%20Family%20Engagement\\_HFRP%20PLA\\_%20August-2-2016.pdf](https://globalfrp.org/content/download/72/431/file/Public%20Libraries-A%20Vital%20Space%20for%20Family%20Engagement_HFRP%20PLA_%20August-2-2016.pdf) (accessed 19 October 2019).
- Lor PP (2018) Democracy, information, and libraries in a time of post-truth discourse. *Library Management* 39(5): 307–321.
- Lu Y, et al. (2015) Policy: Five priorities for the UN Sustainable Development Goals. *Nature* 520: 432–433.
- Mabe M and Ashley EA (2017) *The Developing Role of Public Libraries in Emergency Management: Emerging Research and Opportunities*. Hershey, PA: IGI Global.
- McKenzie PJ, et al. (2006) Behind the program-room door: The creation of parochial and private women's realms in a Canadian public library. In: Leckie G and Bushman J (eds) *The Library as Place: History, Community, and Culture*. Westport, CT: Libraries Unlimited, pp. 117–134.
- McLoughlin C and Morris A (2004) UK public libraries: Roles in adult literacy provision. *Journal of Librarianship and Information Science* 36(1): 37–46.
- McShane I (2011) Public libraries, digital literacy and participatory culture. *Discourse: Studies in the Cultural Politics of Education* 32(3): 383–397.
- Mark T (2007) National and international library collaboration: Necessity, advantages. *LIBER Quarterly* 17(3/4).
- Mehra B, Bishop BW and Partee II, RP (2016) Information science professionals as community action researchers to further the role of rural public libraries in small business economic development: A case study of Tennessee. *Canadian Journal of Information and Library Science* 40(4): 37–48.
- Mehra B, Bishop BW and Partee II, RP (2017) How do public libraries assist small businesses in rural communities? An exploratory qualitative study in Tennessee. *International Journal of Libraries and Information Studies* 67(4).
- Miller KA (2017) Rural public library assets: A multi-classification study. *Proceedings of the Association for Information Science and Technology* 54(1): 759–760.
- Morton S, Pencheon D and Squires N (2017) Sustainable Development Goals (SDGs), and their implementation: A national global framework for health, development and equity needs a systems approach at every level. *British Medical Bulletin* 124(1): 81–90.
- Musindarwezo D (2018) The 2030 Agenda from a feminist perspective: No meaningful gains without greater accountability for Africa's women. *Agenda: Empowering Women for Gender Equity* 32(1): 25–35.
- Nathan LP (2012) Sustainable information practice: An ethnographic investigation. *Journal of the American Society for Information Science and Technology* 63(11): 2254–2268.
- Nolin J (2010) Sustainable information and information science. *Information Research* 15(2).
- Norman M (2013) Collaborative libraries: Can we do and measure 'things' differently? *Public Library Quarterly* 32(3): 223–239.
- Nicholas MT and Perpetual AE (2015) Library and education: Panacea for sustainable development in Nigeria. *Asian Journal of Information Science and Technology* 5(2): 28–31.
- Nilsson M, Griggs D and Visbeck M (2016) Policy: Map the interactions between Sustainable Development Goals. *Nature* 534: 320–322.
- Ntona M and Morgera E (2018) Connecting SDG 14 with the other Sustainable Development Goals through marine spatial planning. *Marine Policy* 93: 214–222.
- Okech A and Musindarwezo D (2019) Transnational feminism and the post-2015 development agenda. *Soundings: A Journal of Politics and Culture* 71: 75–90.
- Omisore A, et al. (2017) Awareness and knowledge of the Sustainable Development Goals in a university community in Southwestern Nigeria. *Ethiopian Journal of Health Science* 27(6): 669–676.
- Onah EA, Urom OC and Amanze-Unagha B (2015) Emergence of Sustainable Development Goals and the case for rebranding information agencies for action in Nigeria. *Ebonyi Journal of Library and Information Science* 2(1): 217–225.
- Organisation for Economic Cooperation and Development (OECD) (2010) Committee on Information, Communications and Computer Policy. Available at: [www.oecd.org/dataoecd/18/39/37328586.pdf](http://www.oecd.org/dataoecd/18/39/37328586.pdf) (accessed 19 October 2019).

- Ottocar SLC, Da Silva RC and Barboza EL (2018) The contributions of information and media literacy to public hybrid libraries. *Library Quarterly* 88(3): 225–236.
- Pateman J and Vincent J (2010) *Public Libraries and Social Justice*. New York: Routledge.
- Pawley C (2006) Unequal legacies: Race and multiculturalism in the LIS curriculum. *Library Quarterly* 76(2): 149–168.
- Pogge T and Sengupta M (2015) The Sustainable Development Goals: A plan for building a better world? *Journal of Global Ethics* 11(1): 56–64.
- Pradhan P, et al. (2017) A systematic study of Sustainable Development Goal (SDG) interactions. *Earth's Future* 5(11): 1169–1179.
- Reid H and Howard V (2016) Connecting with community: The importance of community engagement in rural public library systems. *Public Library Quarterly* 35(3): 188–202.
- Rhinesmith C and Urbano Stanton CL (2018) Developing media literacy in public libraries: Learning from community media centers. *Public Library Quarterly* 37(4): 420–440.
- Roberston G (2015) *Disaster Planning for Libraries: Process and Guidelines*. Sawston: Chandos.
- Ruhil R (2017) Millennium Development Goals to Sustainable Development Goals: Challenges in the health sector. *International Studies* 52(1/4): 118–135.
- Sabo RM (2017) Lifelong learning and library programming for third agers. *Library Review* 66(1/2): 39–48.
- Sachs JD (2012) From Millennium Development Goals to Sustainable Development Goals. *The Lancet* 379: 2206–2211.
- Saurombe N and Ngulube P (2018) To collaborate or not to collaborate, that is the question. *Information Development* 34(2): 162–181.
- Scholte JA and Söderbaum F (2017) A changing global development agenda? *Forum for Development Studies* 44(1): 1–12.
- Scott R (2011a) The role of public libraries in community building. *Public Library Quarterly* 30(3): 191–227.
- Scott R (2011b) Strategies that public libraries use to build communities. *Public Library Quarterly* 30(4): 307–346.
- Seleb DJ and Kolo J (2017) Our path to engagement, learning, and stewardship: The Oak Park Public Library, the American Library Association, and the Harwood Institute. *Public Library Quarterly* 36(2): 123–135.
- Sengupta S (2015) UN adopts ambitious global goals after years of negotiations. *The New York Times*, 25 September. Available at: <https://www.nytimes.com/2015/09/26/world/africa/un-adopts-ambitious-global-goals-after-years-of-negotiations.html> (accessed 19 October 2019).
- Smallwood C and Sanborn L (eds) (2017) *Gender Issues and the Library: Case Studies of Innovative Programs and Resources*. Jefferson, NC: McFarland & Company.
- Smith CA and Eschenfelder K (2013) Public libraries in an age of financial complexity: Toward enhancing community financial literacy. *Library Quarterly* 83(4): 299–320.
- Sridhar D (2016) Making the SDGs useful: A Herculean task. *The Lancet* 388(10053): 1453–1454.
- Stenstrom C, Cole N and Hanson R (2019) A review exploring the facets of the value of public libraries. *Library Management* 40(6/7): 354–367.
- Stevens C and Kanie N (2016) The transformative potential of the Sustainable Development Goals (SDGs). *International Environmental Agreements: Politics, Law and Economics* 16(3): 393–396.
- Stevenson SA and Domsy C (2016) Redeploying public librarians to the front-lines: Prioritizing digital inclusion. *Library Review* 65(6/7): 370–385.
- Stewart A (2014) When disaster strikes: Opportunities for community and institutional renewal at Elliot Lake Public Library. *Public Library Quarterly* 33(4): 304–329.
- Subramaniam M, et al. (2018) Using technology to support equity and inclusion in youth library programming: Current practices and future opportunities. *Library Quarterly* 88(4): 315–331.
- Summers S and Buchanan S (2018) Public Libraries as cultural hubs in disadvantaged communities: Developing and fostering cultural competencies and connections. *Library Quarterly* 88(3): 286–302.
- Taylor NG, et al. (2012) Public libraries in the new economy: Twenty-first-century skills, the Internet, and community needs. *Public Library Quarterly* 31(3): 191–219.
- Ulvik S (2010) Why should the library collect immigrants' memories? A study of a multicultural memory group at a public library in Oslo. *New Library World* 111(3/4): 154–160.
- UN Women (2018) The SDGs and Feminist Movement Building. Available at: <https://dawnnet.org/wp-content/uploads/2019/01/Discussion-paper-The-SDGs-and-feminist-movement-building-en-1.pdf> (accessed 19 October 2019).
- United Nations (2012) The Future We Want, resolution adopted by the General Assembly, A/RES/66/288. Available at: <http://daccess-ddsny.www.un.org/doc/UNDOC/GEN/N11/476/10/PDF/N1147610.pdf?OpenElement> (accessed 19 October 2019).
- United Nations (2015a) Transforming Our World: The 2030 Agenda for Sustainable Development. Available at: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf> (accessed 19 October 2019).
- United Nations (2015b) Resolution adopted by the General Assembly on 27 July 2015. Available at: [http://www.un.org/ga/search/view\\_doc.asp?symbol5A/RES/69/313&Lang5E](http://www.un.org/ga/search/view_doc.asp?symbol5A/RES/69/313&Lang5E) (accessed 19 October 2019).
- United Nations (2019a) Sustainable Development Goals Report. Available at: <https://www.un.org/sustainabledevelopment/progress-report/> (accessed 19 October 2019).
- United Nations (2019b) Contribution of libraries to the SDGs. Sustainable Development Goals Partnerships.

- Available at: <https://sustainabledevelopment.un.org/partnership/?p=10909> (accessed 19 October 2019).
- United Nations and World Commission on Environment and Development (1987) *Our Common Future: The World Commission on Environment and Development*. Oxford: Oxford University Press. Available at: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf> (accessed 19 October 2019).
- United Nations (n.d.) We can end poverty: Millennium Development Goals and beyond 2015. Available at: <https://www.un.org/millenniumgoals/> (accessed 19 October 2019).
- Utama YJ, et al. (2018) Sustainable Development Goals as the basis of university management towards global competitiveness. *Journal of Physics: Conference Series* 1025(012094): 1–5.
- Van Norren ED (2014) The nexus between Ubuntu and global public goods: Its relevance for the post 2015 Development Agenda. *Development Studies Research* 1(1): 255–266.
- Vandemoortele J (2014) Post-2015 Agenda: Mission impossible? *Development Studies Research* 1(1): 223–232.
- Vårheim A (2015) Public libraries worked in the Tohoku mega-disaster. *Proceedings from the Document Academy* 2(1): Article 10.
- Vårheim A (2016) A note on resilience perspectives in public library research: Paths towards research agendas. *Proceedings from the Document Academy* 3(2): Article 12.
- Vårheim A (2017) Public libraries, community resilience, and social capital. *Information Research* 22(1).
- Vårheim A, Skare R and Lenstra N (2019) Examining libraries as public sphere institutions: Mapping questions, methods, theories, findings, and research gaps. *Library & Information Science Research* 41(2): 93–101.
- Veil SR and Bishop BW (2014) Opportunities and challenges for public libraries to enhance community resilience. *Risk Analysis* 34(4): 721–734.
- Velez L and Villa-Nicholas M (2017) Mapping race and racism in US library history literature, 1997–2015. *Library Trends* 65(4): 540–554.
- Waage J, et al. (2015) Governing the UN Sustainable Development Goals: Interactions, infrastructures, and institutions. *The Lancet: Global Health* 3(5): 251–252.
- Webb S, et al. (2017) Lifelong learning for quality education: Exploring the neglected aspect of Sustainable Development Goal 4. *International Journal of Lifelong Education* 36(5): 509–511.
- Webster F (2002) *Theories of the Information Society*. London: Routledge.
- Weinberger D (2012) Library as platform: Creating an infrastructure for the circulation of ideas and passions. *Library Journal* 137(8): 34–36.
- Wheeler MB (2005) *Unfinished Business: Race, Equity, and Diversity in Library and Information Science Education*. Lanham, MD: Scarecrow Press.
- White D (2014) The Rural Library Project: Building libraries, building community. *Public Library Quarterly* 33(2): 108–120.
- Williment K (2019) It takes a community to create a library. *Public Library Quarterly*. DOI: 10.1080/01616846.2019.1590757.
- Winkler I and Williams C (2018) *The Sustainable Development Goals and Human Rights: A Critical Early Review*. Abingdon-on-Thames: Routledge.
- Wood SLR and DeClerck F (2015) Ecosystems and human well-being in the Sustainable Development Goals. *Frontiers in Ecology and the Environment* 13(3): 123.
- Wood SLR, et al. (2018) Distilling the role of ecosystem services in the Sustainable Development Goals. *Ecosystem Services* 29(Part A): 70–82.
- Wooldridge M (2016) Extreme poverty: Can it become a thing of the past? *BBC News*, 23 January. Available at: <https://www.bbc.com/news/world-35370021> (accessed 19 October 2019).
- Wyatt D and Leorke D (2017) Public libraries aren't dead just yet. *The Conversation*, 23 August. Available at: <https://www.weforum.org/agenda/2018/08/technology-hasn-t-killed-public-libraries-it-s-inspired-them-to-transform-and-stay-relevant/> (accessed 19 October 2019).
- Yarrow A, Clubb B and Draper J (eds) (2008) *Public Libraries, Archives and Museums: Trends in Collaboration and Cooperation*. IFLA Professional Reports, No. 108. Available at: <http://tefkos.comminfo.rutgers.edu/Courses/Zadar/Readings/Yarrow%20library%20cooperation%20IFLA%20reprt%202008.pdf> (accessed 19 October 2019).
- Young E (2018) The role of public libraries in disasters. *New Visions for Public Affairs* 10: 31–38.
- Yoshida Y (2013) Public libraries as places for empowering women through autonomous learning activities. *Information Research* 18(3): Paper C20.
- Zapata ME (1994) The role of public libraries in literacy education. *Libri* 44(2): 123.

### Author biography

**Marc Koscieljew** is a Lecturer and previous Head of Department of Library, Information, and Archive Sciences at the University of Malta. He received his PhD from Western University in London, Canada. He conducted research in North Korea on its library system, becoming one of the first English speakers to publish on this topic. In 2016–2017, he was appointed by Malta's Minister for Education and Employment as chairperson of the Malta Libraries Council, a government-appointed council stipulated in the *Malta Libraries Act 2011* to help advise senior cultural and political figures on libraries, learning and literacy.



# Libraries as promoters of environmental sustainability: Collections, tools and events

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## Abstract

Striving for a balance between economic development and environmental protection is an ambitious goal requiring sufficient information on the part of all actors. Public libraries can play an important role in acting as promoters of knowledge on environmental sustainability. The researchers analysed the status of German public libraries and their efforts towards a sustainable society. We considered the libraries' collections and created a questionnaire, asking librarians to evaluate the current situation in their library. The results show that many libraries promote environmental sustainability by highlighting books and other media on several subtopics through special conventions or shelves. Energy meters were the most frequently mentioned tools provided to sensitize to the topic. Furthermore, libraries organize several information events. Therefore, partnerships with other organizations and schools are of utmost importance. Beside these efforts, there is still more potential to promote environmental sustainability. Often, the lack of budget and personnel poses a challenge.

## Keywords

Environmental sustainability, Germany, public libraries, sustainable literacy

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## Introduction

Environmental sustainability is a concept that has gained increasing public interest in recent years. More and more public organizations are considering environmental aspects in their strategic plans (Gelderman et al., 2017). Inspired by the triple bottom line (Elkington, 1997), environmental sustainability is one of three main dimensions of sustainability: social, economic and environmental sustainability. The dimensions interact with each other and are frequently coined by political, social and cultural tensions, as different objectives shape different societies regarding social, economic and environmental goals (Sachs, 2012). Sustainable development is often seen as the pathway to sustainability (Circular Ecology, 2019), whereby the most common definition describes it as a 'development that meets the needs of the present

without compromising the ability of future generations to meet their own needs' (WCED, 1987: 37). In 2015, the United Nations agreed on 17 goals – the Sustainable Development Goals (SDGs) – aiming at enhancing sustainability regarding all dimensions by demanding actions from all countries, developing nations and industrial states alike. Striving for environmental sustainability and economic growth simultaneously is an ambitious task. In Europe and the USA, public perception about the importance of economic growth on the one hand and environmental

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protection on the other hand seems to be balanced (Drews et al., 2018). In particular, ‘evidence also suggests that in all countries a part of the population is undecided or has seemingly inconsistent attitudes on this issue’ (p. 271). One of the reasons for this is the lack of sufficient information and knowledge on the topics. As a result, we are in need of promoters for information on environmental sustainability.

Among others, public libraries all over the world already see themselves as places for enhancing awareness and conveying information on sustainability by providing resources and learning tools (Miller, 2010) and becoming green libraries. Libraries further contribute to teaching information literacy skills, which can enhance environmental sustainability in manifold ways (Kurbanoglu and Boustany, 2014). According to Miller (2010: vii) ‘public libraries are challenged with the new role of connecting the public with environmental awareness and education’. The Green Library Movement has already been active since the 1990s and since then the number of librarians and cities striving for environmental sustainability in libraries is growing (Antonelli, 2008). For example, the International Federation of Library Associations and Institutions (IFLA) ‘[a]cknowledges the importance of a commitment to sustainable development to meet the needs of the present without compromising the ability of the future’ (IFLA, 2002: 1) in their Statement on Libraries and Sustainable Development. IFLA also supports the SDGs and became a partner of the United Nations in order to achieve progress towards these goals. The importance of this partnership is substantiated with the libraries’ potential to promote information literacy and to provide access to information, whereas access to environmental information is also among the targets embedded in the SDGs (United Nations, Department of Economic and Social Affairs, 2019). The UN Agenda 2030 (United Nations, 2015) addresses libraries as educational institutions and encourages them to make a valuable contribution to achieving the SDGs. The German ‘National Action Plan for Education for Sustainable Development’ (Federal Ministry of Education and Research, 2017) and the ‘German Sustainable Development Strategy’ (German Federal Government, 2017) consolidate this appeal on the national level.

This article seeks to contribute to the discussion on the role of public libraries for environmental sustainability in Germany by providing an extensive overview of green practices and efforts in German public libraries.

## Literature review

‘The green library is a multi-faceted concept with several components, such as green buildings, green operations and practices, green programs and services, green information systems and green collections’ (Kurbanoglu and Boustany, 2014: 49). Although the concept of a green library has already been investigated since the 1990s and research in this regard is growing (Antonelli, 2008), the number of existing studies is still sparse. A search with the query ‘green librar\*’ reveals 52 hits in the database Scopus (field: *TITLE-ABSTRACT-KEYS*) and 32 hits within the Web of Science Core Collection<sup>1</sup> (field: *TOPIC*) on 12 December 2019. An extensive overview on current green practices in libraries is provided by the IFLA Publications Series 161 entitled ‘The Green Library – Die Grüne Bibliothek’,<sup>2</sup> which mainly reports on case studies from Germany and other European countries, but also gives some examples from Asia, Australia, and the US.

Current studies on green library research show many different ways in which public libraries can support and contribute to sustainability. Hauke et al. (2013) state that libraries are sustainable institutions in themselves, as they provide media for lending and in-house use or proving spaces for learning and socialization. However, they also point to the high energy and resource requirements of libraries and their buildings.

For this reason, many studies focus on the sustainability of library buildings (e.g. Afacan, 2017; Barnes, 2012; Edwards, 2011). Rabidas (2016) emphasizes that sustainability must be taken into account right from the planning stage of a building. With the LEED (Leadership in Energy and Environmental Design) certification system developed in 2000, library buildings can be planned and upgraded sustainably.<sup>3</sup> Site selection, water and energy conservation, building materials and indoor air quality play an important role in this context. For some public libraries in Germany new library buildings are currently being planned, while environmental aspects are considered right from the beginning. For example, for the new construction of the Central and Regional Library Berlin (ZLB), integral concepts are supposed to ensure environmental sustainability (e.g. through energy efficiency), but also social and economic sustainability (Heller and Fansa, 2013). Of course, not every municipality can afford to build a new library from scratch. In many cases, old buildings are being recycled into libraries. Examples from Austria, Germany, Italy and Switzerland have shown that it is possible to reduce the ecological footprint by adapting old buildings for

libraries, while at the same time the buildings' cultural heritage can be conserved (Hauke and Werner, 2012). Not only is the architecture of a library building essential for environmental sustainability, but also the interior design, e.g. by applying energy-saving lighting concepts. Of course, saving energy should be an issue in all buildings, but some libraries offer their services 24/7, which makes energy-saving lighting concepts even more crucial (Franz, 2013). As a positive side effect, the library may create a more pleasant atmosphere for its users and save expenses. For example, the Central Library in Hamburg, Germany, improved their lightning facilities and successfully managed to halve the annual energy consumption (Keite and Banduch, 2013).

Many authors, however, agree that there is more to the term *green library* (e.g. Aulisio, 2013; Hauke, 2018; Jankowska and Marcum, 2010) than a sustainable building. 'Sustainability should be seen as part of the corporate identity of the library, not only concerning energy saving but as part of the strategic aims of the library' (Hauke and Werner, 2012: 64). Libraries are a part of an information provision system and meet educational expectations (Marcum, 2009). Providing access to information and teaching different skills (such as research or writing skills) have always been core issues of public libraries. They play a key role in raising awareness of the community and are ideal places to teach sustainability literacy (Forsyth, 2005). Information literacy can have a positive impact on the environment as these skills support making more informed decisions on environmental issues (Kurbanoglu and Boustany, 2014). For this purpose, libraries may offer books and other media as well as events on various topics of environmental sustainability (Hauke, 2018). The selection of resources on topics regarding the environment, energy conservation or organic gardening can contribute to facilitating the access to green information (Kurbanoglu and Boustany, 2014).

Other offers such as the rental of energy meters or thermal imaging cameras as well as the provision of recycling depots or do-it-yourself workshops within the library are also conceivable. Another approach to enhancing environmental conditions is the facilitation of green transit to the library site and by library employees. For example, the provision of electric vehicles and bicycle parking spaces, as well as good access to public transport can enhance a green transit (Aldrich et al., 2013). Some studies focus on special sustainability practices within libraries like Green Printing and copying (Singh and Mishra, 2019). A 'daily green culture', e.g. by reducing waste and paper consumption, can reduce the libraries' ecological

footprint (Aldrich et al., 2013). Werner (2013) has published a checklist for libraries to make it easier for them to promote sustainability. According to this checklist, attention should be paid, for example, to energy-efficient information and communication technology or the use of sustainable office materials, in order to make library operations and workflows more sustainable. The support of employees also plays an important role. Carpool offers, showers for cyclists or discounted travel by public transport can be mentioned here (Townsend, 2014). Many libraries offer digital services with which users can, for example, download e-books or access information online. On the one hand, this helps users save time and effort and reduces trips to the libraries, thus contributing to sustainability. On the other hand, Chowdhury (2014, 2016) mentions the high energy cost in the operation of information and communication technology and among end-users and highlights the need for more research in this area.

In summary, it can be observed that there is not only one way to make libraries 'green(er)'. Many different approaches can be applied to the different needs of library users, employees and communities. There are several case studies reporting on library initiatives to become more green and sustainable, but there is a lack of empirical analyses considering environmental sustainability in libraries (Meschede and Henkel, 2019). With this article, the authors aim at closing this gap for German public libraries. Hence, this article aims at investigating the importance of environmental sustainability for German public libraries by raising the following research questions:

RQ1. How do librarians perceive the role of German public libraries for environmental sustainability?

RQ2. What efforts regarding environmental sustainability can be discovered in German public libraries?

## Methods

The list of libraries to be examined was compiled with the help of the 'Deutsche Bibliotheksstatistik'<sup>4</sup> (German Library Statistics; reporting year 2017). All full-time operating public libraries and their branches located in German cities with more than 100,000 inhabitants were examined. Thereof, all public libraries with a stock size of at least 1,000,000 physical media were selected. In addition, all regional libraries were included which are classified as public libraries by the German Library Association (DBV Sections 1 to 3) and which present themselves in their

mission statement as public rather than academic libraries. Only libraries under municipal or state ownership were included in the study. Due to these limitations, all scientific and ecclesiastical libraries were excluded from the investigation. A list of the examined libraries can be found in the Appendix. A total of 91 libraries from 80 cities were examined. The corresponding branch offices, district or special libraries were integrated into the results of the respective main library.

In order to learn about the specific activities of public libraries, we designed a short questionnaire. It focuses on the topic of environmental sustainability and includes the general awareness-raising activities for the community on the topic, the provision of books, equipment and tools (e.g. energy meters) as well as the organization of events for sustainability. The survey also asked about offers within the libraries, such as recycling depots, and about sustainability in internal workflows (e.g. economical printing). All questionnaire items were created in accordance with existing literature on environmental sustainability in libraries. The survey was created using the online tool 'Umfrage Online'<sup>5</sup> and sent to the libraries via e-mail. The participants were invited to take part in the survey from 9 July to 31 July 2019. In addition to closed-ended questions such as dichotomous questions and 5-point Likert scales, the survey also contained open-ended questions that made an open text answer possible. Since in some cases several employees of the same library took part in the survey, these results were summarized for the respective institutions when analysing the data on the library level. If employees of the same library gave opposing answers, the most frequent response was used for analysis.

In addition to the questionnaire, we investigated the availability of (physical) books on environmental sustainability. Therefore, it is necessary to determine a set of books used for the analysis. As a starting point, we performed a search on the web portal of the German National Library.<sup>6</sup> Due to legal requirements, this central archival library has to include all books and other media in German language published since 1913. The library uses a controlled vocabulary for indexing its collection. Within this system, the keyword 'Nachhaltigkeit' (sustainability) is defined as the use of a regenerative system in a way that substantial characteristics remain and existence can regenerate in a natural way (German National Library, 2019). We used the advanced search of the portal to obtain only books in the German language that are indexed with the keyword *sustainability*. For all resulting 3356 hits that were provided with an

ISBN, we stored all metadata and keywords for the further analysis in the library catalogues. For each library we retrieved the corresponding OPAC catalogue and wrote a python script with the help of the framework *selenium*<sup>7</sup> to search for the ISBNs from our initial list. The data gathering process was conducted in June 2019. All resulting hits were then stored in an SQLite database. Therefore, different editions of books with several ISBNs were merged into one entity for the analysis. The evaluations were performed with the python libraries *numpy*, *pandas* and *matplotlib*. Keyword networks were visualized with the help of VOSviewer version 1.16.11, whereby each keyword was translated into English beforehand. VOSviewer is a freely available tool for visualizing networks from bibliometric data, such as authors, journals, co-citations or keywords. The resulting maps are constructed by using co-occurrence data (van Eck and Waltman, 2010).

## Results

A total of 141 employees from 54 (out of 91) libraries completed the entire questionnaire. Of the participants, 61 only answered the questionnaire partially. The answers of these participants will not be taken into account in further analysis.

Some items of the questionnaire relate to the personal opinions and subjective views of the consulted library staff. In the beginning of the questionnaire, the participants were asked about their personal perception of the importance of living their life in an environmentally sustainable manner. They were asked to rate this question on a scale from 0 (completely unimportant) to 100 (extremely important). The average value was 79.34 ( $SD = 17.88$ ).

Figure 1 shows the expectations and concrete experiences of respondents in the field of environmental sustainability in libraries. Of the 141 participants, 56 strongly agreed (five on the 5-point Likert-scale) that public libraries have the mission to inform and raise the awareness of the community for the topic of environmental sustainability. On the other hand, only 13 respondents strongly agreed that their library is fulfilling this mission. The agreement that public libraries should have good prerequisites to be able to work in an environmentally sustainable way results in a mean value of 4.46. However, the experiences in their own library contradict this expectation. Here, the average agreement is 2.16. Similar values can also be found for the question of whether libraries should pay attention to environmental sustainability when operating the building.



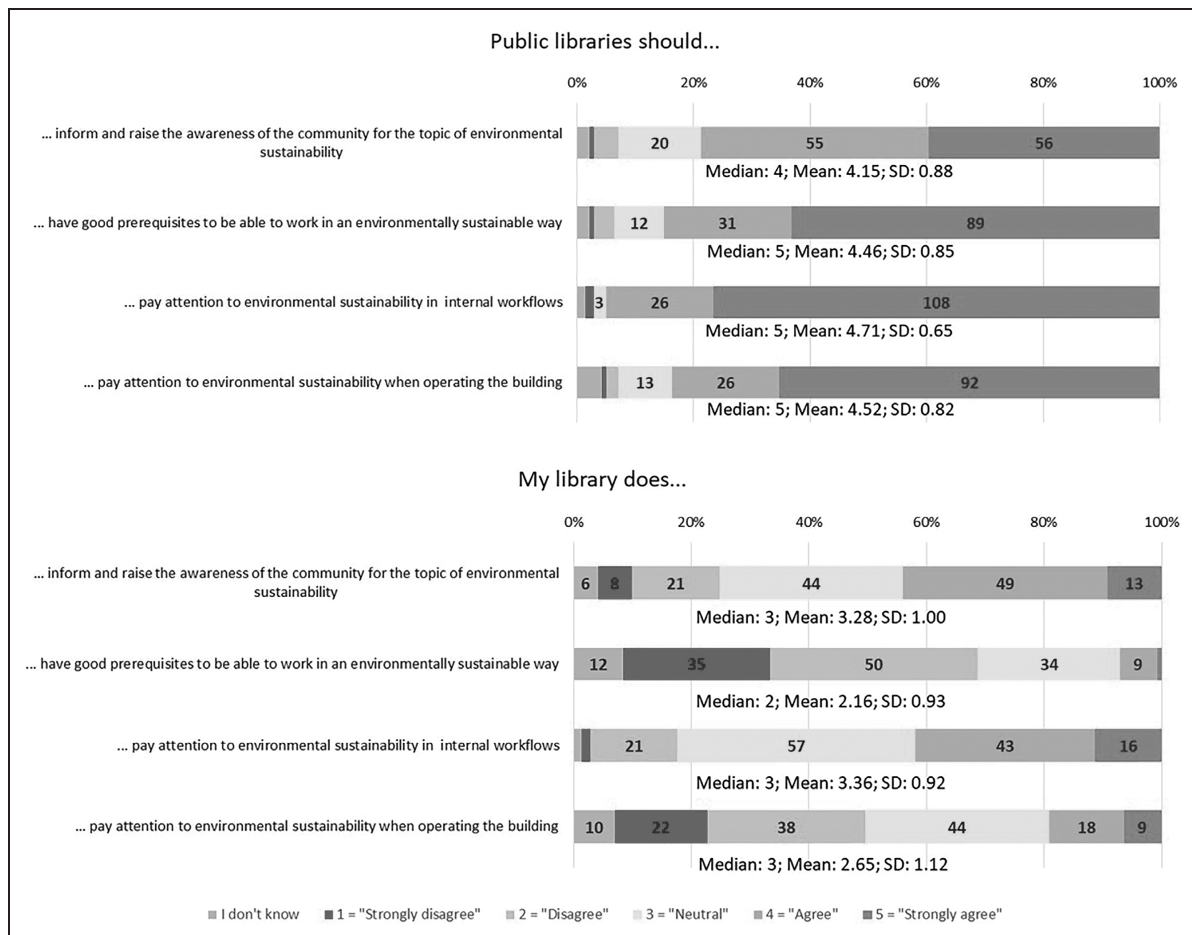


Figure 1. Expectations and experiences of library employees (n=141).

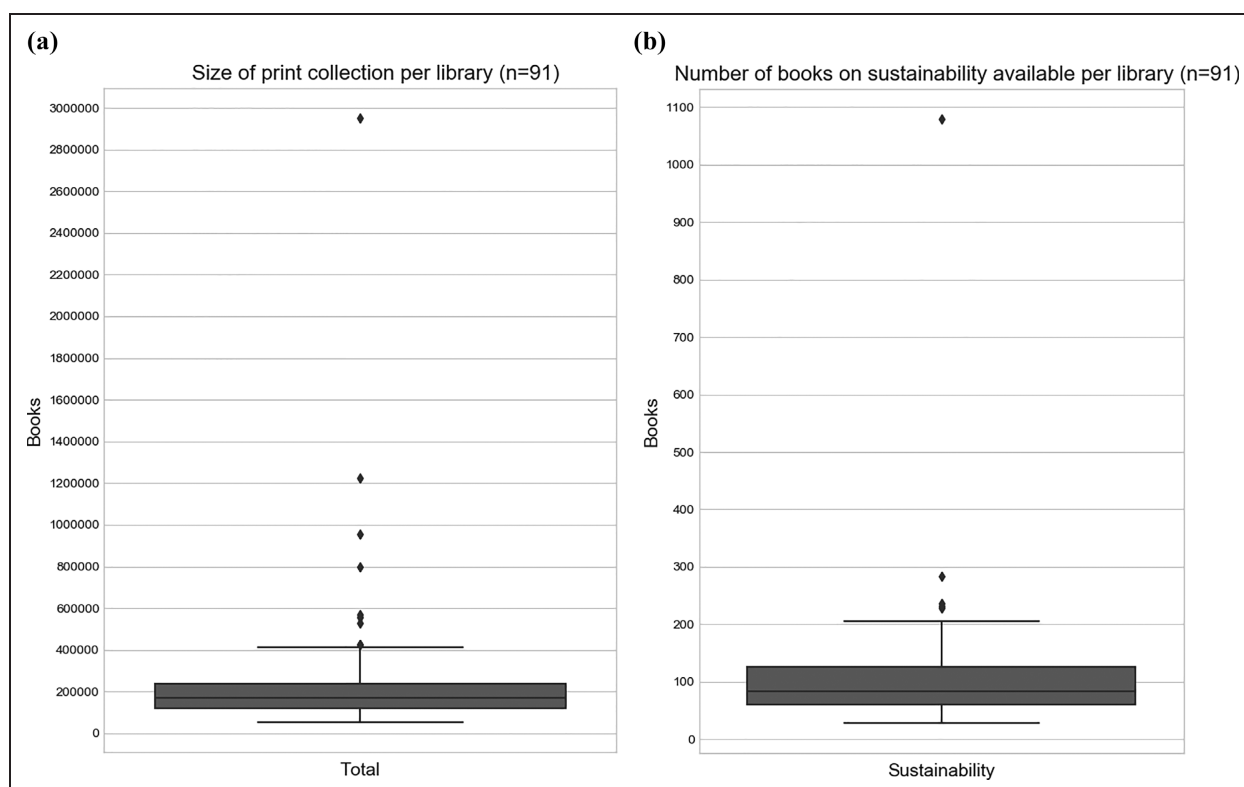
The highest degree of agreement is reached with the question whether a public library should pay attention to environmental sustainability in the internal workflows. With 3.36 on average, the agreement is also the highest regarding the actual experience.

*Offers to promote environmental sustainability*

**Book collection.** In total, 117 participants fully agreed (five on the 5-point Likert-scale) with the statement that libraries should offer books or other media to promote environmental sustainability. All 54 participating libraries stated that they provide their users with books and other media on the subject of environmental sustainability; 25 libraries indicated that they cover specific topics in particular. The main topics mentioned were waste and plastic avoidance, sustainable nutrition, upcycling, gardening and sustainable food production, as well as general information on environmental protection and climate change. Minor topics were species protection, e.g. bees and other insects, energy conservation or mobility. In addition, 23 libraries stated that they present the

books and other media to the user in a certain way. The main approach was to (temporarily) set up shelves or organize exhibitions on the subject of environmental sustainability. Presentations in the context of environmental weeks or special events could be identified as well. Some libraries reported on special exhibitions and locations for children and students. The role of social media was also mentioned, which are often used to convey information and advice on the topic.

Besides the librarians' views on the availability of books on environmental sustainability in their library, we also investigated the actual availability of physical books on environmental sustainability in the 91 German public libraries, as described in the methods section. After merging the different editions of the initial 3356 books with the keyword *sustainability*, 2766 different books remained. From these 2766 initial books, 1388 could be found in at least one of the 91 investigated public libraries' catalogue. These 1388 books are available in 7.01 libraries on average (arithmetic mean, *SD* = 14.87), whereby the median equals 1 and the maximum value is 89, which means that



**Figure 2.** Distribution of books on environmental sustainability in public libraries in Germany.

only two libraries do not include this book in their collection.

The number of books available in each library differs strongly, which becomes apparent with a minimum value of 28 and a maximum number of 1079 books. On average, the public libraries include 108.05 items (arithmetic mean,  $SD = 115.40$ ) from the investigated book list, whereas the median is at 83. Unsurprisingly, the number of books on environmental sustainability highly correlates with the size of the total print collection of the library ( $r=0.93$ ;  $p<0.01$ ). For example, the Central and Regional Library Berlin (ZLB) is the biggest public library in Germany and offers the broadest number of printed books (nearly 3 million) and similarly includes by far the largest number of books on sustainability of our list (1079 out of 2766, 39%). Figure 2 shows the distribution of (a) the total amount of printed books per library and (b) the number of books indexed with the keyword sustainability per library. The apparent outlier is the abovementioned ZLB. Compared to the size of the total collection, the public library of Chemnitz sticks out with 231 available books from our initial list. Interestingly, this library has a branch focusing in particular on environmental aspects. Since 1990, the branch offers over 9000 media units. A special focus lies on Education for Sustainable

Development (ESD) with which they intend to address especially teachers and students (Umweltbibliothek Chemnitz, 2011).

Figure 3 gives an overview of the thematic foci based on the 1388 available books and the corresponding indexed keywords, whereby only those keywords were considered that are used for at least five books. Eight clusters could be detected within the keyword network, which are displayed in different colours in Figure 3. The heart of the network is the keyword *sustainability* which is dedicated to every book included in the analysis, as it was used as the search term. Overall, the following thematic foci were identified through the keyword clusters:

- **Mobility & urban planning.** The biggest cluster comprises 18 keywords and includes the search term *sustainability*. *Mobility* is especially linked to *urban planning*, *traffic management* and *electric mobility*.
- **Consumer behavior & lifestyle.** This cluster consists of nine items. The focus lies on consumers and their awareness and *behaviour* regarding *consumption* and *waste reduction*.
- **Climate change.** The cluster on *climate change* and *climate protection* is formed by seven items. The keywords *globalization*,

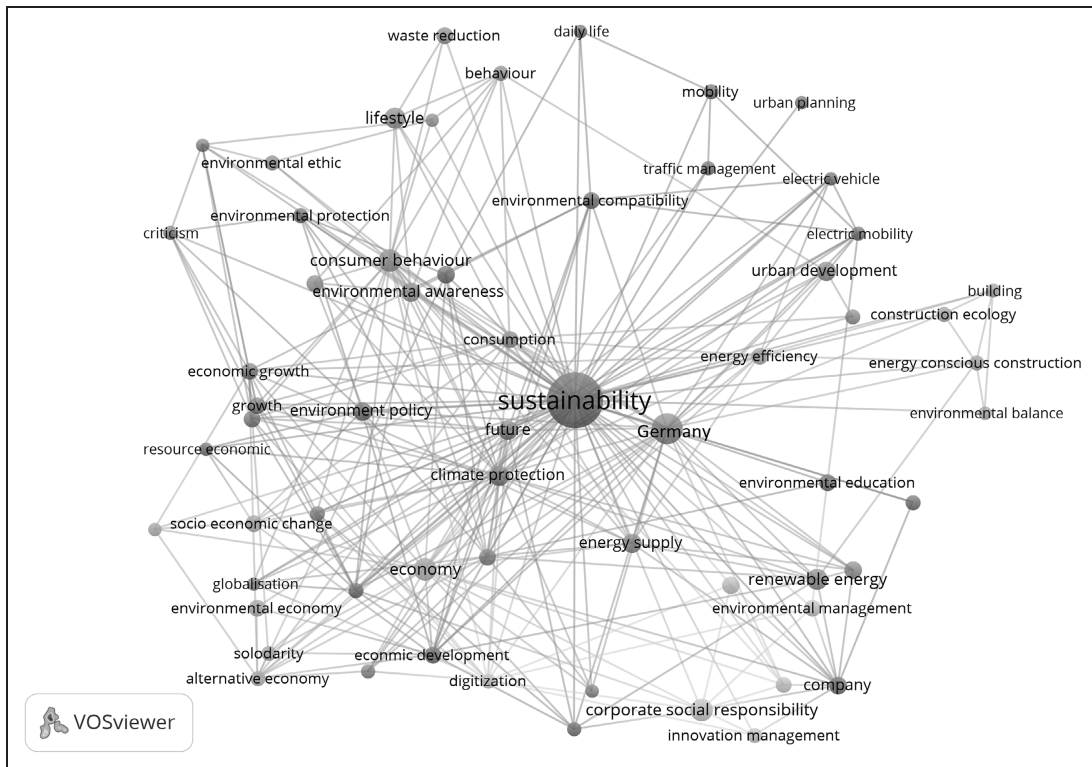


Figure 3. Keyword network of 1388 available books indexed with the keyword sustainability created with VOSviewer version 1.6.11.

future and social change play a major role for this cluster.

- **Environmental management of companies.** Six keywords, which range from *environmental management* to *corporate social responsibility*, but also *digitization*, describe this cluster.
- **Urban development and energy use.** This cluster, which also contains six keywords is linked to *urban development* with regard to *energy supply* and *renewable energy*. A special focus on *Germany* and partially *Switzerland* can be detected through the keywords.
- **Alternative economy.** Six items describing *socio-economic* change linked to an *alternative economy* form this cluster.
- **Construction & energy.** Five keywords in this cluster focus on *construction ecology* and *energy efficiency* of *buildings*.
- **Economic growth.** The last cluster is about the *consumer society* related to *economic growth* and *criticism* in this regard.

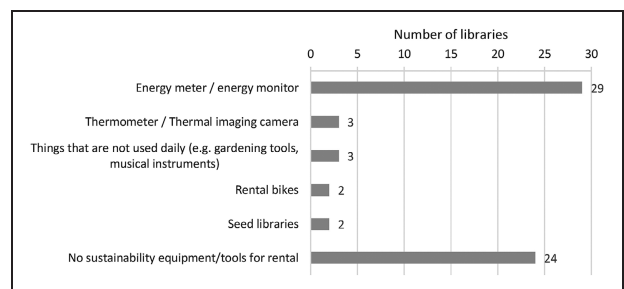


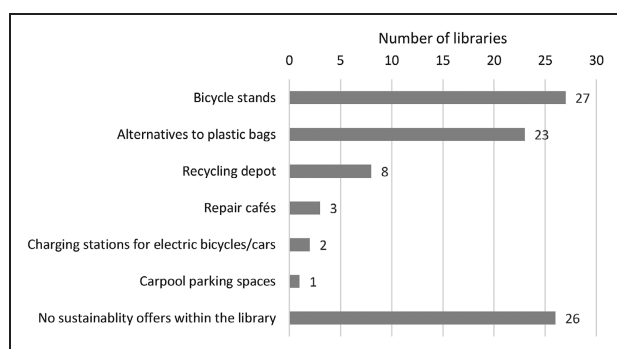
Figure 4. Equipment and tools for rental in German public libraries (n=54).

(Figure 4). These devices are meant to help users in controlling and monitoring their electricity consumption at home and thus reducing it. Thermometers or thermal imaging cameras, which can indicate heat losses in or near the house, follow at a considerable distance with only three mentions.

Libraries have excellent conditions to lend not only books and other media, but also things that are not used daily. This category includes, for example, garden tools or musical instruments. Bicycles can also be borrowed from two libraries. The so-called Seed Libraries offer users the possibility of borrowing plant seeds and returning new seeds to the library once the plants have been cultivated. These were also named by two out of the 54 participating libraries.

*Equipment and tools for rental.* Besides books, 30 of the 54 libraries stated that they provide equipment and tools to promote environmental sustainability among their users. It becomes clear here that the majority of these devices are energy meters and energy monitors

*Offers within library premises.* A total of 28 libraries provide offers for users within their premises for the promotion of environmental sustainability (Figure 5). Approximately half of the participating libraries reported about bicycle racks. Plastic bags and other containers are being replaced by alternatives in 23 cases in libraries and their cafés. Recycling depots for batteries or electronic equipment can also be found in eight libraries. Repair cafés, charging stations for electric vehicles and car parks were rarely mentioned by the libraries.



**Figure 5.** Offers for users within libraries for the promotion of environmental sustainability (n=54).

### Events on environmental sustainability

Of the 141 participants, 129 agreed at least partially, that libraries should offer events to promote environmental sustainability. In the questionnaire, 37 libraries stated that they offer events on environmental sustainability. Figure 6 shows topics dealt with in such events. With 30 mentions, general information events on the topic of environmental sustainability are most frequently offered. Do-it-yourself and upcycling projects are provided by almost one-third of the libraries surveyed. Events on sustainable nutrition have been identified almost as frequently. The topics

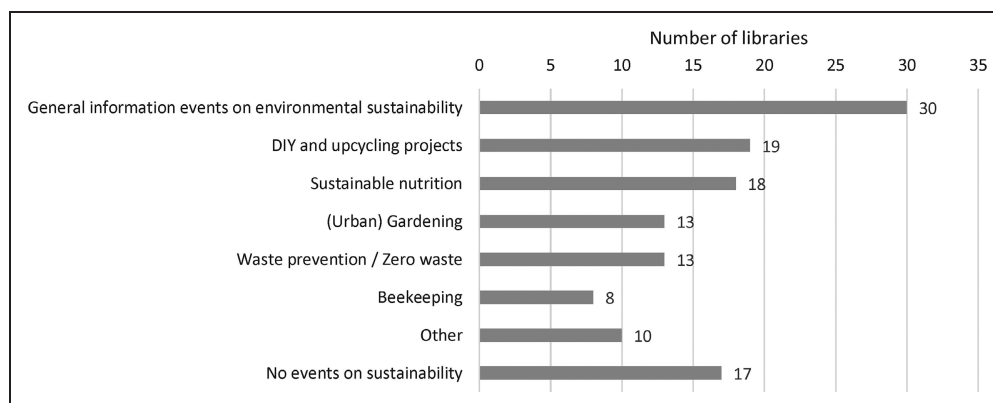
of gardening and waste avoidance were each mentioned 13 times. In addition to beekeeping events, some libraries also deal with topics such as energy-saving, transportation and fair trade projects, summarized under the category 'other' in Figure 6.

### Partnerships

In addition to the standardized items in the questionnaire, the libraries also had the opportunity to make comments and remarks on the subject of environmental sustainability. This gave us the opportunity to discover previously unnoticed topics or to focus on topics that were particularly important to the libraries.

Thereby, the significance of cooperation and partnerships for public libraries came to the fore. Some libraries work closely with associations and initiatives that stand for sustainability. For instance, they collaborate with the initiative 'Fridays for Future', a group of young people who are committed to environmental protection and sustainability. Some libraries allow these initiatives to distribute information material on their premises, plan joint actions or receive support at information events in the library. Cooperation with schools and kindergartens as well as with consumer centres, societies of friends, municipal utilities and waste disposal companies was also mentioned.

Many libraries emphasized that further efforts in the area of environmental sustainability were planned for the future. For this purpose, among other things, internal working groups would be formed. Future plans range from the introduction of electronic files to the purchase of library bicycles for employees. However, it was also mentioned that the budget and staff would need to be increased in order to further improve sustainability.



**Figure 6.** Topics of sustainability events (n=54).

## Discussion

The presented analysis gives an overview of the efforts of German public libraries in raising awareness for and practising environmental sustainability. Thereby, we contribute to the debate on green and sustainable libraries by providing a broader picture of the efforts of German public libraries in this regard, whereas existing studies mainly focus on single case studies.

From the initial list of 91 public libraries, 54 participated in our questionnaire. In general, we could identify a gap between the expectation of the libraries' potential to promote sustainability and the actual efforts made in the individual libraries. Thereby, the librarians considered the internal workflow as the most important aspect with regard to environmental sustainability in the library. In addition, the investigated libraries offer a variety of media, tools and events to promote environmental sustainability.

## Collections

Apparently, the provision of books on this topic seems to be the most obvious medium to be provided in a library. The topics of the books that we could find in the libraries' catalogues range from mobility and urban planning to consumer behaviour, climate change, environmental management of companies, energy use in urban development, alternative economy, energy use in construction and economic growth. The librarians especially mentioned topics like plastic avoidance, nutrition and more general topics like environmental protection and climate change. Especially, current trends like the zero waste movement come to the fore. Thereby, the topics mentioned by the librarians and the topics found in the libraries' catalogue largely coincide. Looking at the number of books available in the library catalogues, the median value of 83 (out of 2766 considered books) seems to be low. But here, the total size of the libraries' collection should be taken into account before drawing conclusions. Further, we only considered books indexed with the keyword *sustainability* according to the German National Library. Further books dealing with the topic that lack this keyword were not included in the analysis, but might still be available in the libraries.

## Tools

Many libraries go beyond offering books on environmental sustainability, but also provide useful tools and equipment for rental as well as offers within the library. Considering the rental of tools, the most

frequently mentioned items are energy meters or monitors. Other items such as gardening tools, bicycles or plant seeds are only mentioned by a handful of libraries. Within the library, offers of bicycle stands, alternatives to plastic bags and recycling depots predominate. Only a few libraries provide repair cafés or charging stations for electric vehicles. From the provision of these offers, it becomes clear that public libraries in Germany already provide several tools and equipment that might help users to become aware of and to perform a more sustainable lifestyle.

## Events

The same holds true for events organized by public libraries addressing sustainability and its subtopics. A lot of libraries inform about environmental sustainability in general information events. Besides, a wide range of specialized events could be identified, addressing, for example, upcycling, sustainable nutrition, urban gardening, waste prevention or beekeeping. The public library can be an excellent venue for workshops and discussions for the civil society as it stands for openness and accessibility. In this context, but also in order to generally promote environmental sustainability, partnerships are of particular importance. Many public libraries already cooperate with schools, organizations and political parties in order to organize events and distribute information. For example, the initiative 'Netzwerk Grüne Bibliothek' (network green libraries) addresses the importance of partnerships and invites everyone interested in supporting libraries on their way to environmental sustainability to join the network (Netzwerk Grüne Bibliothek, 2019). Today's significance of social media is considered as well. Therefore, together with 'bibTalk Stuttgart', the network started a social media campaign in summer 2019, invoking libraries to report on their 'green' engagement via the hashtag #WeGreenItUp. The topics of the resulting social media posts largely coincide with those identified in our analysis.

## Limitations

This work has some limitations. Firstly, only a part of the German libraries was included in the study (see section Methods). We focused on public libraries and did not examine scientific or church libraries. In addition, only libraries of large cities with more than 100,000 inhabitants were examined. About 60% of these libraries fully completed the questionnaire. Therefore, we cannot draw a full picture of environmental sustainability in German public libraries.

Considering the availability of books on environmental sustainability, we narrowed the investigation on those being indexed with the keyword *sustainability*, which limits the analysis as described above. Moreover, only the physical library holdings were examined. Further investigations could also focus on the digital holdings, as they are constantly growing.

## Conclusion

In spite of the aforementioned limitations of this study, our analysis revealed interesting insights into public libraries' efforts to contribute to environmental sustainability. The results show that German public libraries are on their way to further contributing to building a sustainable future. Libraries as places accessible for every citizen have the potential to raise awareness on the topic. Thereby, a lot of effort is put into children's education and sensitization. One participant of our questionnaire emphasized that the process of lending books itself contributes to a sustainable society, which supports current literature on green libraries. Beyond that, '[l]ibraries practiced sustainability long before the concept of sustainability gained a wider acceptance, by maintaining knowledge and information from one generation to the next' (Kurbanoglu and Boustany, 2014: 49). In addition, a library offers many more possibilities to disseminate information and sensitize the public. There is still much more potential to provide further tools to promote sustainability. Thereby, challenges like a tight budget or a lack of personnel have to be considered. In particular, sustainability leadership is necessary to green a library systematically. 'Leadership is required to facilitate an organizational culture shift. "Going green" can be the impetus for change' (Aldrich et al., 2013: 18).

## Future work

The results of this article can be used for further, in-depth analyses and best practices in the field of green library research. For example, it would be interesting to further investigate the libraries' efforts to promote environmental sustainability. The mere provision of books, tools and events does not necessarily lead to a more sustainable lifestyle of the library users. Therefore, an examination of the public's perception of the available offers and efforts of the libraries would be useful. The role of social media for promoting environmental sustainability via libraries is a further interesting subject. Beside environmental aspects, the importance of libraries for the social and economic dimensions of sustainability should not be omitted, not least because of the interdependency of these

three dimensions (Heller and Fansa, 2013). The contribution of public libraries to the SDGs should hence be further investigated systematically in future research.

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## Notes

1. The following collections of the Web of Science Core Collection were considered due to the authors' institutional subscriptions: SCI-EXPANDED: Science Citation Index Expanded (1945–present); SSCI: Social Sciences Citation Index (1956–present); A&HCI: Arts & Humanities Citation Index (1975–present); ESCI: Emerging Sources Citation Index (2015–present)
  2. <https://www.ifla.org/publications/ifla-publications-series-161>
  3. <https://new.usgbc.org/leed>
  4. <https://www.bibliotheksstatistik.de>
  5. [www.umfrageonline.com](http://www.umfrageonline.com)
  6. <https://portal.dnb.de/>
  7. <https://www.seleniumhq.org/>
  8. The libraries are ordered by the size of their print collection;
- (\*) libraries that participated in our questionnaire

## References

- Afacan Y (2017) Sustainable library buildings: Green design needs and interior architecture students' ideas for special collection rooms. *Journal of Academic Librarianship* 43(5): 375–383.
- Aldrich RS, Benton S, Schaper L, et al. (2013) Sustainable thinking. Passageway to better buildings, budgets and beyond. In: Hauke P, Latimer K and Werner KU (eds) *The Green Library – Die Grüne Bibliothek. IFLA Publications* No. 161. Berlin/Munich: De Gruyter, Saur, pp. 15–37.
- Antonelli M (2008) The Green Library Movement: An overview of green library literature and actions from 1979 to the future of green libraries. *Electronic Green*

- Journal* 1(27). Available at: <https://escholarship.org/uc/item/39d3v236>.
- Aulisio GJ (2013) Green libraries are more than just buildings. *Electronic Green Journal* 1(35). Available at: <https://escholarship.org/uc/item/3x11862z>.
- Barnes LL (2012) Green buildings as sustainability education tools. *Library Hi Tech* 30(3): 397–407.
- Chowdhury G (2014) Sustainability of digital libraries: A conceptual model and a research framework. *International Journal on Digital Libraries* 14(3–4): 181–195.
- Chowdhury GG (2016) How to improve the sustainability of digital libraries and information services? *Journal of the Association for Information Science and Technology* 67(10): 2379–2391.
- Circular Ecology (2019) Sustainability and Sustainable Development Guide. Available at: <http://www.circularecology.com/sustainability-and-sustainable-development.html> (accessed 23 July 2019).
- Drews S, Antal M and Den Bergh JCM Van (2018) Challenges in assessing public opinion on economic growth versus environment: Considering European and US data. *Ecological Economics* 146: 265–272.
- Edwards BW (2011) Sustainability as a driving force in contemporary library design. *Library Trends* 60(1): 190–214.
- Elkington J (1997) *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*. North Mankota, MN: Wiley John & Sons.
- Federal Ministry of Education and Research (2017) National Action Plan on Education for Sustainable Development. Available at: [https://www.bne-portal.de/sites/default/files/downloads/publikationen/BMBF\\_NAP\\_BNE\\_EN\\_Screen\\_2.pdf](https://www.bne-portal.de/sites/default/files/downloads/publikationen/BMBF_NAP_BNE_EN_Screen_2.pdf) (accessed 17 September 2019).
- Forsyth E (2005) Public libraries and the Millennium Development Goals. *IFLA Journal* 31(4): 315–323.
- Franz M (2013) „...dass sich Menschen wohlfühlen”. Energiesparende Konzepte aus dem Buchhandel übertragen auf Bibliotheken. In: Hauke P, Latimer K and Werner KU (eds) *The Green Library – Die Grüne Bibliothek*. IFLA Publications No. 161. Berlin/Munich: De Gruyter Saur, pp. 152–159.
- Gelderman CJ, Semeijn J and Vluggen R (2017) Development of sustainability in public sector procurement. *Public Money and Management* 37(6): 435–442.
- German Federal Government (2017) German Sustainable Development Strategy (Summary). Available at: <https://accra.diplo.de/blob/1124598/b1b54d37a18806c0506f74ff3d047756/german-sustainable-deve-strategy-dld-data.pdf> (accessed 17 September 2019).
- German National Library (2019) Nachhaltigkeit. Available at: <http://d-nb.info/gnd/4326464-5> (accessed 1 August 2019).
- Hauke P (2018) From information literacy to green literacy: Training librarians as trainers for sustainability literacy. In: *IFLA WLIC 2018*, Kuala Lumpur, Malaysia. Available at: <http://library.ifla.org/2147/1/116-hauke-en.pdf> (accessed 11 September 2019).
- Hauke P and Werner KU (2012) The second hand library building: Sustainable thinking through recycling old buildings into new libraries. *IFLA Journal* 38(1): 60–67.
- Hauke P, Latimer K and Werner KU (2013) Introduction. In: Hauke P, Latimer K and Werner KU (eds) *The Green Library – Die Grüne Bibliothek*. IFLA Publications No. 161. Berlin/Munich: De Gruyter Saur, pp. 5–12.
- Heller V and Fansa J (2013) Nachhaltigkeit in drei Dimensionen. Ressourcenverantwortung im Fokus der Planung für die neue Zentral- und Landesbibliothek Berlin. In: Hauke P, Latimer K and Werner KU (eds) *The Green Library – Die Grüne Bibliothek*. IFLA Publications No. 161. Berlin/Munich: De Gruyter Saur, pp. 333–344.
- IFLA (2002) Statement on Libraries and Sustainable Development. Available at: <https://www.ifla.org/publications/statement-on-libraries-and-sustainable-development> (accessed 23 July 2019).
- Jankowska MA and Marcum JW (2010) Sustainability challenge for academic libraries: Planning for the Future. *College & Research Libraries* 71(2): 160–170.
- Keite U and Banduch R (2013) Bücherhallen Hamburg im rechten Licht. Neue Beleuchtung in der Zentralbibliothek. In: Hauke P, Latimer K and Werner KU (eds) *The Green Library – Die Grüne Bibliothek*. IFLA Publications No. 161. Berlin/Munich: De Gruyter Saur, pp. 345–364.
- Kurbanoglu S and Boustany J (2014) From green libraries to green information literacy. In: *ECIL 2014* (ed. Kurbanoglu S al, et al.), Dubrovnik, Croatia, 20–23 October 2014, pp. 47–58. New York: Springer International. DOI: 10.1007/978-3-319-14136-7.
- Marcum JW (2009) Design for sustainability. *The Bottom Line* 22(1): 9–12.
- Meschede C and Henkel M (2019) Library and information science and sustainable development: A structured literature review. *Journal of Documentation* 75(6): 1356–1369.
- Miller K (2010) *Public Libraries Going Green*. Chicago, IL: American Library Association.
- Bibliothek Netzwerk Grüne (2019) Netzwerk Grüne Bibliothek. Available at: <https://www.netzwerk-gruene-bibliothek.de/> (accessed 12 December 2019).
- Rabidas S (2016) Green library buildings: A sustainable process. *International Journal of Advance Research and Innovative Ideas in Education* 2(6): 342–346.
- Sachs JD (2012) From Millennium Development Goals to Sustainable Development Goals. *The Lancet* 379(9832): 2206–2211.
- Singh P and Mishra R (2019) Environmental sustainability in libraries through green practices/services. *Library Philosophy and Practice (e-journal)* 2312. Available at: <https://digitalcommons.unl.edu/libphilprac/2312>.
- Townsend AK (2014) Environmental sustainability and libraries: Facilitating user awareness. *Library Hi Tech News* 31(9): 21–23.
- Umweltbibliothek Chemnitz (2011) Umweltbibliothek und Dritte-Welt-Archiv Chemnitz. Available at: <https://>

- umweltbibliothek-chemnitz.de/bibliothek-und-dwa.html (accessed 6 August 2019).
- United Nations, Department of Economic and Social Affairs PD (2019) *World Urbanization Prospects: The 2018 Revision*. New York: United Nations.
- United Nations (2015) *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations Sustainable Knowledge Platform. Available at: <https://sustainabledevelopment.un.org/post2015/transformingourworld> (accessed 12 December 2019).
- van Eck NJ and Waltman L (2010) Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 84(2): 523–538.
- WCED (1987) *Report on the World Commission on Environment and Development. Our Common Future*. Oxford: Oxford University Press.
- Werner KU (2013) Sustainable buildings, equipment, and management. A checklist. In: Hauke P, Latimer K and Werner KU (eds) *The Green Library – Die Grüne Bibliothek*. IFLA Publications No. 161. Berlin/Munich: De Gruyter, Saur, pp. 395–404.

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### Appendix: Analysed libraries<sup>8</sup>

Zentral- und Landesbibliothek Berlin; Bücherhallen Hamburg (\*); Münchner Stadtbibliothek; Stadtbibliothek Stuttgart; Stadtbibliothek Hannover (\*); Städtische Bibliotheken Dresden (\*); Stadtbüchereien Düsseldorf; Stadtbibliothek Duisburg (\*); Stadtbücherei Frankfurt am Main (\*); Stadtbibliothek Essen; Stadtbibliothek Köln (\*); Leipziger Städtische Bibliotheken (\*); Stadt- und Landesbibliothek Dortmund (\*); Stadtbibliothek Bremen (\*); Stadtbibliothek im Bildungscampus Nürnberg (\*); Stadtbibliothek Mitte. BZB Philipp-Schaeffer; Stadtbibliothek Mannheim (\*); Stadtbücherei Bochum (\*); Stadtbibliothek

Ulm/Do; Bibliothek der Hansestadt Lübeck; Stadtbibliothek im Ständehaus Karlsruhe (\*); Stadtbibliothek Steglitz-Zehlendorf; Stadtbibliothek Friedrichshain-Kreuzberg (Berlin), Bezirkszentralbibliothek (\*); Stadtbibliothek Bielefeld; Stadtbibliothek Reinickendorf. Humboldt-Bibliothek; Stadtbibliothek Bonn (\*); Stadtbibliothek Spandau; Stadtbibliothek Tempelhof-Schöneberg, Bezirkszentralbibliothek (\*); Stadtbücherei Kiel; Stadtbibliotheken der Landeshauptstadt Wiesbaden; Stadtbibliothek Neukölln, Hauptbibliothek; Stadtbibliothek Ludwigshafen/Rh (\*); Stadt- und Landesbibliothek im Bildungsforum Potsdam (\*); Stadtbibliothek Chemnitz (\*); Stadtbücherei Münster (\*); Stadtbibliothek Charlottenburg-Wilmersdorf; Stadtbibliothek Freiburg/Br; Neue Stadtbücherei Augsburg (\*); Stadtbibliothek Aachen (\*); Stadtbibliothek Marzahn-Hellersdorf, Bezirkszentralbibliothek 'Mark Twain' (\*); Stadtbibliothek Treptow-Köpenick (\*); Stadtbibliothek Mönchengladbach; Stadtbibliothek Wuppertal (\*); Stadtbibliothek Wolfsburg (\*); Stadtbibliothek Berlin-Lichtenberg, Hauptbibliothek 'Anna Seghers'; Stadtbücherei Regensburg; Stadtbibliothek Braunschweig (\*); Stadtbibliothek Reutlingen (\*); Städtische Volksbücherei Fürth; Stadtbibliothek Herne (\*); Stadtbibliothek Magdeburg (\*); Stadtbüchereien Hamm, Zentralbibliothek im Heinrich-von-Kleist-Forum; Stadtbücherei Heidelberg; Stadtbibliothek Pforzheim; Stadtbibliothek Oberhausen (\*); Stadtbibliothek Gelsenkirchen; Stadt- und Regionalbibliothek Erfurt (\*); Stadtbibliothek Mülheim an der Ruhr (\*); Stadtbibliothek Heilbronn (\*); Öffentliche Bücherei Mainz - Anna Seghers; Öffentliche Bibliothek des Kommunalen Bildungszentrums der Stadt Remscheid; Stadtbibliothek Oldenburg (\*); Stadtbibliothek Halle/S; Mediothek Krefeld (\*); Stadtbibliothek Koblenz; Stadtbibliothek Osnabrück; Stadtbibliothek Kassel (\*); Stadtbibliothek Darmstadt; Stadtbibliothek Göttingen (\*); Stadtbücherei Hagen (\*); Stadtbibliothek Neuss; Stadtbibliothek Erlangen; Stadtbücherei Ingolstadt (\*); Stadtbibliothek Rostock (\*); Stadtbibliothek Salzgitter (\*); Stadtbücherei Würzburg (\*); Jena Kultur Ernst-Abbe-Bücherei und Lesehalle (\*); Stadtbibliothek Bremerhaven (\*); Stadtbibliothek Paderborn (\*); Stadtbibliothek Saarbrücken (\*); Bibliothek Moers (\*); Stadtbibliothek Hildesheim; Stadtbibliothek Leverkusen, KulturStadtLev (\*); Lernzentrum Cottbus - Stadt- und Regionalbibliothek (\*); Stadtbibliothek Palais Walderdorff im Bildungs- und Medienzentrum Trier; Stadtbücherei / Medienzentrum Bergisch Gladbach (\*); Stadtbibliothek Offenbach/M (\*); Stadtbibliothek Solingen (\*); Stadtbibliothek Siegen (\*); Lebendige Bibliothek Bottrop; Stadtbücherei Recklinghausen





# Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage

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## Abstract

Since public libraries in Iran have a rich and strong intangible cultural heritage, it is important to study the capacities of these libraries. For this purpose, the method implemented for the study was the Delphi technique. The population of the study consisted of 30 experts and researchers who were selected through targeted sampling. Based on the findings of this study, the roles of Iranian public libraries were the provision of intangible cultural heritage by collecting from local areas, holding public exhibitions and re-narration of intangible cultural heritage. This study further emphasizes the application of intellectual property rights and provision of infrastructure of information technology by Iranian public libraries for the preservation and dissemination of intangible cultural heritage. Concerning research findings, Iranian public libraries are considered one of the knowledge cultural centers for diversity within society that, through preservation and dissemination of intangible cultural heritage, could play a significant role in promotion of the individual's awareness.

## Keywords

Dissemination, intangible cultural heritage, Iran, preservation, public libraries

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## Introduction

This study deals with identification of the capacities of public libraries in preservation and dissemination of intangible cultural heritage in Iran. In the present study, “capacities” is taken to mean skills, competencies, abilities, capabilities and set of activities that have been practically applied to the dissemination and preservation of intangible cultural heritage resources by Iran public libraries or which the library has the ability to perform.

Sciences, traditions, narratives, religious virtues and ceremonies benefit from historical, social and cultural value in communities. Identification, preservation and dissemination of these virtues make individuals closer to the traditional collective thoughts and thinking (Amiri et al., 2011). Preservation and dissemination of cultural heritage were used to refer to physical and tangible protection (Navaneethakrishnan, 2013); however, in recent years, a different trend

has emerged in this area which covers thoughts, beliefs, folklore and religious traditions, which are taken to mean intangible cultural heritage.

According to UNESCO (2015), intangible cultural heritage means the behaviors, symbols, expressions, knowledge, skills and also instruments, objects, artifacts and their associated cultural concepts such as traditions and oral expressions, language as media of intangible cultural heritage, performance arts, social behaviors, religious ceremonies and festivals, knowledge and behaviors related to nature and world and traditional artifacts.

Preservation of cultural, historical and scientific heritage of the countries and different areas of the

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world along with its dissemination and provision to others has been the task and duty of libraries and information centers (Dybkjaer, 1995). Libraries all over the world have significant roles in preservation and dissemination of physical and tangible information and resources (Amiri et al., 2011; Anasi et al., 2012). In the Convention for the Safeguarding of the Intangible Cultural Heritage, "preservation" is used to mean all measures taken for identification, registration, recording, documentation and any other action taken to prevent deviation of cultural heritage. In libraries and information centers, "preservation" is used to mean the acquisition activities including collection, ordering, organizing and documentation of information and cultural resources that could be printed or digital.

In fact, the ideal of every library is to provide desired services to the user community and fulfill the objectives of the main organization. Each of the main Iranian libraries including national and academic libraries and libraries affiliated with religious centers have taken efforts to preserve and maintain some cultural heritage such as manuscripts; however, little effort has been taken in the realm of intangible cultural heritage (Amiri et al., 2011).

Meanwhile, public libraries in Iran have a prominent status because of their role in elevation of the literacy level and awareness of the segments of society. They are one of the main institutions in the contemporary world for presenting free and equal services to all individuals (Mokhtarpour, 2008). Therefore, public libraries have various tasks including collection of all resources related to society, written scientific resources or written resources in different dialects and accents (Dim and Osadebe, 2009) and its dissemination to current and future generations (Sen, 2005). Data, information and resources of intangible cultural heritage are associated with various cultural organizations; however, it does not mean the authority of one organization and disclamation of other organizations; rather, libraries and other organizations could confederate in a joint culture (Gorman, 2007).

Iran is one of the largest Middle East countries with a rich ancient cultural heritage and a diverse society that includes different minority groups (i.e. Turk, Kurd, Balouch, Arab, among others). In such a culturally rich, literate population, education and the public library play an important role. Public libraries in Iran have a history of nearly 80 years and since the last two decades, the number of public libraries has increased.

The Iran Public Libraries Foundation is legally responsible for governing the public libraries of Iran based on the Act of Establishment and Administration of Public Libraries approved in 2003. Before approval of this law, public libraries were governed by the

Ministry of Culture and Islamic Guidance as board of trustee of public libraries.

The library area in Iran is 300 m<sup>2</sup> per 25,000 people. Every member, on average, borrows three books every year. There are approximately 40,000,000 books and 2.5% of the Iranian population, who have access to libraries, are members of public libraries of Iran. There are 7000 personnel (about 4000 librarians) working in the Public Libraries Foundation.

The financial resources of the Public Libraries Foundation are supplied through a special budget of parliament and 0.5% of the revenues of municipalities. Currently, there are approximately 3500 public libraries in Iran (Public Libraries Foundation, 2019).

## Literature review

The theoretical bases and research background indicate that there just a few studies dealing with tangible and intangible cultural heritage resources (e.g. Barrio et al., 2012; Kabiri Hendi and Danekhar, 2011; Raseroka, 2008). Therefore more studies need to be carried out in this area.

The review of some literature (including Anasi et al., 2012; Dim and Osadebe, 2009; Sen, 2005) indicates the significance of intangible cultural heritage in the view of communities; however, hardly any studies have dealt with the capacities of public libraries in the preservation and dissemination of the resources of intangible cultural heritage.

Another group of studies have dealt with evaluation and examination of the role of librarians and libraries in managing local knowledge (e.g. Byrne, 2005; Karggbo, 2013; Lilley and Paringarai, 2014; Maina, 2012; Pedram et al., 2011). The approach of these studies was mainly qualitative and the results revealed that libraries have a responsibility to curate it and ensure its transmission through good times and bad to those who may need or appreciate it in other periods and places. They achieve it through their participation in establishing institutional repositories and libraries. There were also some challenges for librarians, the proposed solution to which is the use of established protocols and inter-library cooperation.

Another group of studies has focused on preservation of local knowledge (Lwoga, 2011; Pilot, 2005; Rao, 2006) mostly through a qualitative or combined approach. The results of these studies indicate that local knowledge is always at risk of downfall and disappearance, because of death and loss of memory. That is why effort should be taken to preserve it, which is possible through intellectual property rights and utilization of IT capacities.

To protect and preserve local knowledge, collection, documentation, storage and dissemination of knowledge are required. Some studies have specifically dealt with documentation (Joranson, 2008; Nypan, 2003) and concluded that in so far as the task of libraries is knowledge documentation, they could succeed in this area. Moreover, for documentation of local knowledge, it is necessary to use printed and electronic templates and formats and special classification designs. One issue that is rarely taken into account in local knowledge management, is sharing (Brown, 2017; Lwoga et al., 2010). Brown (2017) and Lwoga et al. (2010) concluded that in order to access local knowledge and have the possibility of sharing and disseminating it, policies, legal framework and IT capacity should be considered. Moreover, in order to classify and organize local knowledge, it should be specifically taken into account and the local classifications of each area should be used so that it becomes possible to retrieve and access them.

As far as the significance and value of intangible cultural heritage is known to researchers and users, and because of the research gap in its preservation and dissemination in Iran, especially in public libraries, the present study seeks to investigate the capacities of public libraries in the preservation and dissemination of intangible cultural heritage resources.

### Research questions

For investigating the statement problem of research, these questions were formulated and answered:

- Question 1: What are the most important capacities of Iranian public libraries for the preservation of intangible cultural heritage resources?
- Question 2: What are the most important capacities of Iranian public libraries in the dissemination of intangible cultural heritage?
- Question 3: What strategies facilitate the preservation of intangible cultural heritage resources in Iranian public libraries?
- Question 4: What strategies facilitate the dissemination of intangible cultural heritage resources in Iranian public libraries?

### Methods

The present study is a descriptive study in which the Delphi method was applied for collecting data. Because of its focus on identifying capacities of Iranian public libraries in the preservation and dissemination of intangible cultural heritage and decision-

making abilities, the Delphi technique was identified as a suitable research tool.

The following steps were taken in this study:

- Completing a literature review on intangible cultural heritage resources and public libraries;
- Extracting items related to the preservation and dissemination of intangible cultural heritage resources with regards to public libraries;
- Extracting items on solutions for the preservation and dissemination of intangible cultural heritage resources in Iranian public libraries;
- Utilizing the experts' opinion and its application in designing the questionnaire;
- Designing Delphi questionnaire – first round;
- Transmitting questionnaire to an expert panel in the first round through email;
- Classifying and coding the open-ended questions to closed questions;
- Examining the responses of Delphi – first round (calculation of mean);
- Preparing Delphi questionnaire – second round and informing the expert panel on the feedbacks of first-round questions;
- Redistributing the second-round questionnaire through email among the expert panel;
- Examining the responses of second round (recalculation of mean, standard deviation and median) and implementation of final confirmation round in terms of experts and researchers;
- Consensus and agreement;
- The research population included 30 experts and researchers in cultural heritage and public libraries who were selected through targeted sampling (Table 1). This selection was done based on research background, professional activities of experts, inclination and sufficient time on the part of experts to attend in Delphi panel.

The Delphi panel implementation method was used for this study and was implemented in two rounds and one final confirmation round of experts and researchers. The researcher-made questionnaire was utilized as the data collection tool in each round.

The first-round questionnaire included 30 closed and 4 open questions on the capacities for preservation and dissemination of intangible cultural heritage resources by Iranian public libraries and presentation of the proposed solutions.

In order to measure the reliability of the researcher-made questionnaire, to ensure that the most important and valid content (the necessity of item) was selected, this questionnaire was presented to five experts and

**Table 1.** The steps for selection of expert panel and implementation method.

First step: Preparation for selection	<ul style="list-style-type: none"> <li>• Selection of experts and researchers of cultural heritage and public libraries; Inclination of experts and researchers to attend in Delphi panel and sufficient time</li> </ul>
Second step: Determination of named population	<ul style="list-style-type: none"> <li>• Writing the names and contact information of experts and researchers with expertise in cultural heritage and public libraries</li> </ul>
Third step: Introducing extra members	<ul style="list-style-type: none"> <li>• Contact with each panel member: Introduction of other experts if not inclined</li> </ul>
Fourth step: Prioritization of Delphi panel members	<ul style="list-style-type: none"> <li>• Creating two subgroups of experts and researchers of cultural heritage and public libraries; Classification of members based on two subgroups of experts and researchers of cultural heritage and public libraries; Prioritization of members in each category based on their competency</li> </ul>
Fifth step: Delphi panel	<ul style="list-style-type: none"> <li>• Announcement of the opinion of experts for participation in Delphi panel; Stopping the selection and finally selecting 30 members as research population</li> </ul>

the required modifications were applied based on their feedback. They were asked to respond to each of 30 items by “It is necessary”, “It is useful but not necessary” and “It is not necessary”. The responses were calculated based on content validity such that the score of 30 items was higher than Lavshe table number (0.99), which indicated that the presence of related item with acceptable statistical significance level ( $p < 0.05$ ) in this tool is necessary.

To determine the reliability of the questionnaire, several experts and professionals who did not participate in the study were interviewed and their opinions were utilized for the required modification and final confirmation (Linstone et al., 2002).

In this study, the rounds of the Delphi technique were implemented until a consensus was reached. After collecting data from the researcher-made questionnaire in Delphi first round, all 30 items of questionnaire were scored based on a 5-point Likert scale from (1) Completely important, (2) Important, (3) To some extent important, (4) Not important and (5) Never important. The results were analyzed through descriptive statistics, including mean.

## Findings

Question 1: What are the most important capacities of Iranian public libraries for the preservation of intangible cultural heritage resources?

As seen in Table 2, the capability of “Revisiting and collection of data from existing compiled resources related to intangible cultural heritage in public libraries” with mean value of 4.3 was realized as the most important capability and then, “Collection of data related to intangible cultural heritage from experts of cultural heritage”, “Interviewing the archaeologists and historians on identification of

intangible cultural heritage”, “Recording intangible cultural heritage (oral narrations, literature, etc.) through conversation with experienced and local people” with mean value of 4.1 were at the second rank.

Question 2: What are the most important capacities of Iranian public libraries in the dissemination of intangible cultural heritage?

According to Table 3, the capacities of “Holding cultural exhibitions in public libraries for introducing compiled intangible cultural heritage” and “Re-narration of intangible cultural heritage (oral narrations, literature, etc.) for promotion of culture for future generations” with mean value of 4.2 were realized as the most important capacities.

Question 3: What strategies facilitate the preservation of intangible cultural heritage resources in Iranian public libraries?

The strategies for the preservation of intangible cultural heritage resources by Iranian public libraries are presented in the Table 4 with mean value of 4.

Question 4: What strategies facilitate the dissemination of intangible cultural heritage resources in Iranian public libraries?

The strategies for dissemination of intangible cultural heritage resources by Iranian public libraries are presented in the Table 5 with mean value of 4.

## Discussion and conclusion

### *The most important capacities of Iranian public libraries in preservation of cultural heritage resources*

According to Manaf (2007), human communities have created objects and records that are considered as statements or symbols of success and progress of

**Table 2.** The agreed capacities of preservation.

The preservation capacities of intangible cultural heritage resources by Iranian public libraries	Mean
Revisiting and collection of data from existing compiled resources related to intangible cultural heritage in public libraries	4.3
Collection of data related to intangible cultural heritage from experts of cultural heritage	4.1
Interviewing the archaeologists and historians on identification of intangible cultural heritage	4.1
Recording intangible cultural heritage (oral narrations, literature, etc.) through conversation with experienced and local people	4.1
Identification of intangible cultural heritage through communication with museum centers and archives	4
Collection of data from local festivals (games, foods, cloths, handicrafts, etc.) through mass media such as television, radio, etc.	4
Note taking about intangible cultural heritage (language, traditions, etc.) through conversation with local and experienced people	4
Registration of intangible cultural heritage (traditional knowledge and natural teachings, ceremonies, etc.) using audiovisual media by librarians of public libraries	4
Establishing and expanding training programs for preservation of intangible cultural heritage for employees of public libraries	4
Documentation of recorded intangible cultural heritage (oral narrations, literature and etc.)	4
Application of preservation software including Ganj software for compiling intangible cultural heritage	4
Preparation of brochures related to compiled intangible cultural heritage in public libraries	4
Allocation of part of library space for preservation of compiled intangible cultural heritage	4
Training of NGOs for protection of public libraries in preservation and dissemination of cultural heritage	4
Digitalization of compiled intangible cultural heritage	4

**Table 3.** The agreed dissemination capacities.

The dissemination capacities of intangible cultural heritage resources by Iranian public libraries	Mean
Holding cultural exhibitions in public libraries for introducing compiled intangible cultural heritage	4.2
Re-narration of intangible cultural heritage (oral narrations, literature and etc.) for promotion of culture for future generations	4.2
Developing appropriate policy for promotion of intangible cultural heritage in public libraries	4
Informing community on the significance of intangible cultural heritage through mass media	4
Holding cultural camps for visiting museums and archived centers by public libraries	4
Cooperation with cultural centers for encouraging individuals to use compiled intangible cultural heritage	4
Holding training workshops of intangible cultural heritage for transmission of culture to future generations	4
Holding cultural competitions related to intangible cultural heritage by public libraries	4
Presentation of electronic brochures on intangible cultural heritage through social networks	4

**Table 4.** Agreed preservation strategies.

The preservation strategies of intangible cultural heritage resources by Iranian public libraries	Mean
Proposing the application of intellectual property right for protection of compiled intangible cultural heritage	4
Provision of instruments and appropriate technology equipment for preservation of intangible cultural heritage by public libraries	4

communities that could be used as resources for research and learning and as instruments for protection regulations. In this study, "Revisiting and collection of data from existing compiled resources related to intangible cultural heritage in public libraries" with mean value of 4.3 was recognized as the most

important capability of Iranian public libraries in the preservation of intangible cultural heritage resources.

Since intangible cultural heritage researchers need access to credible resources, it is important to consider "Revisiting and collection of data from existing compiled resources related to intangible cultural

**Table 5.** Agreed dissemination strategies.

The dissemination strategies of intangible cultural heritage resources by Iranian public libraries	Mean
Proposing the application of intellectual property right for protection of compiled intangible cultural heritage	4
Provision of instruments and appropriate technology equipment for preservation of intangible cultural heritage by public libraries	4
Holding online exhibitions for dissemination of intangible cultural heritage by public libraries	4
Holding cultural festivals concerning local culture in public libraries for future generations	4
Holding training entrepreneurship programs through declaration of intangible cultural heritage to current generation in public libraries	4

heritage in public libraries". Moreover, collection and preservation of valid resources in public libraries could be accessible, concerning the nature of these libraries and the users, and used in a shorter time and at a lower cost by the researchers. According to Anasi et al. (2012), provision of cultural materials for all sections, presentation of lectures and seminars to disseminate information, and recording intangible cultural heritage resources, which can be used by the public in collective listening sessions, are the most important roles of public libraries in the preservation of cultural heritage.

Navaneethakirshnan (2013) also emphasized the role of library and information science professionals as first-call information providers and reporters during the recording of social practices, rituals and festive events of the nation. In Hong Kong Public Libraries (2018) and National Library of Sri Lanka (2018) respectively, such activities have been performed.

The capability of "Collection of data related to intangible cultural heritage from experts of cultural heritage" with mean value of 4.1 and "Interviewing the archaeologists and historians on identification of intangible cultural heritage" with mean value of 4.1 were determined as the next ranked capacities in the preservation of intangible cultural heritage by public libraries. In as far as intangible cultural heritage indicates the identity of a country and transfers various historical, social and cultural aspects, the written resources cannot solely satisfy the information needs of researchers in this area. It seems that the use of theorists, experts and other informed individuals is necessary to satisfy the needs. As an example, interviews with experts of cultural heritage, archaeologists and historians make the interviewer gain more accurate information thanks to interviewees' expertise. That is why it is one of the main methods of obtaining information. The activities of National Library of Sri Lanka (2018) and the resulting studies such as Navaneethakrishnan (2013) and Sen (2005) emphasize the collection of data related to intangible cultural

heritage from theorists and experts of this field, as they take into account the subject of intangible cultural heritage from different aspects.

#### *The main capacities of Iranian public libraries in the dissemination of cultural heritage resources*

Dissemination is an aspect of information services that deals with presentation and transmission of related information for satisfaction of experts and users' demands (Forutnani et al., 2018). Desired and efficient dissemination of knowledge and information requires an appropriate container for knowledge transmission for quick productivity (Li et al., 2015).

There are various capacities for the dissemination of intangible cultural heritage resources that can be utilized by public libraries. In this study, "Holding cultural exhibitions in public libraries for introducing compiled intangible cultural heritage" with mean value of 4.2 was realized as an important item.

Since holding cultural exhibitions and performing group activities and measures are recommended, it can be argued that gathering of a high number of cultural heritage experts and local individuals, when holding such exhibitions in public libraries, leads to prevalence of local knowledge gained by previous generations. Therefore, holding cultural exhibitions and dissemination of intangible cultural heritage resources and declaration of the benefits of such heritage to individuals can make the younger generation motivated and interested, as well as encourage them to get involved in entrepreneurship through holding various exhibitions such as handicrafts, etc. The Chicago Public Library holds cultural exhibitions in order to disseminate intangible cultural heritage resources to the public. Therefore, to further confirm the significance of the mentioned capability, one can refer to the Chicago Public Library (2018).

The capability of "Re-narration of intangible cultural heritage (oral narrations, literature, etc.) for promotion of culture for future generation" with mean value of 4.2 was recognized as the next important capability in the dissemination of intangible cultural

heritage resources. As far as a great part of intangible cultural heritage, such as stories, myths and traditions have been disseminated through narrative and minstrelsy, its re-narration leads to familiarity of the younger generation with the history of their ancestors, which promotes the individual's awareness of intangible cultural heritage and protection of conservations and cultural diversity. The results of The results of Urbaniak's study (2012) confirm our finding in terms of attracting an audience for the revival of an intangible cultural heritage and its dissemination by the public library through storytelling, rereading of myths, narratives, etc.

The capability of "Developing appropriate policy for the promotion of intangible cultural heritage in public libraries" with mean value of 4 was recognized as the next main capability. Public libraries are required to develop an appropriate policy for the promotion of intangible cultural heritage by specifying the target group.

#### *Strategies for the preservation of intangible cultural heritage in public libraries*

There are various strategies for the preservation of intangible cultural heritage resources that public libraries could apply. In this study, "Proposing the application of intellectual property right for protection of compiled intangible cultural heritage" with mean value of 4 was recognized as the main strategy of Iranian public libraries for the preservation of intangible cultural heritage resources.

Since the achievements and scientific, cultural and artistic activities are the results of intellectual, physical and material efforts of their authors, the owner of each work of intangible cultural heritage is entitled to be the owner of their thought. If the author can be assured that their works and thoughts would be safe from unauthorized access by presenting it to society, they would be encouraged to create new works. At the same time, the user would gain more recognition of the works and use them, and is assured of the accuracy of information. Therefore, the intellectual property right is the basis and prerequisite for economic development and growth for the author and the user, encouraging them to use information of known identity.

"The provision of instruments and appropriate technology equipment for preservation of intangible cultural heritage by public libraries" with mean value of 4 was recognized as one of the other main strategies of Iranian public libraries for the preservation of intangible cultural heritage.

IT has been effective in most aspects of life, especially in the production and dissemination of information. It has made the production of digital versions and long-term preservation, as well as transforming printed versions to digital versions, very feasible. Additional to these digital versions, it is possible to hold virtual exhibitions, through which the public libraries could attract a wide range of users and researchers in most parts of the world, at any time and place. Similar activities of international libraries have been performed by Hong Kong Public Libraries (2018) and the National Library of Sri Lanka (2018).

#### *Strategies for dissemination of intangible cultural heritage resources in Iranian public libraries*

There are various strategies for the dissemination of intangible cultural heritage that could be used by public libraries. In this study, "The application of intellectual property right for preservation and dissemination of developed intangible cultural heritage" with mean value of 4 was recognized as one of the main strategies for public libraries in the dissemination of intangible cultural heritage.

One of the main goals of protecting intellectual property right is to encourage authors to conduct more effective studies. It could be argued that human creative thinking will flourish when the authors benefit financially from their work. Therefore, practicing intellectual property rights could lead to the increase in productivity, as it would encourage innovation and creativity. Therefore, the strategic use of intellectual property rights could increase the ability of authors in competition with other works. According to Abankina (2013) in the leisure-time civilization of today, branding plays an important role as a strategic resource and capital of an organization especially in the cultural and tourism sectors, which enables it to get economic profits from non-economic benefits, such as symbolic attributes and advantages, tangible and intangible reputation elements. Branding becomes a symbol of the public's trust in the quality and attractiveness of a cultural offer. It also guarantees cultural product authenticity. Dim and Osadebe (2009) state that protection of intellectual property rights for intangible cultural heritage had been a problem in most African countries, especially in Nigeria. Lynch (2003) also emphasizes the importance of applying intellectual property rights for cultural heritage resources for the sake of the marketplace, preservation and dissemination. According to George (2010) with the application of intellectual property rights to intangible cultural heritage through tourism, these cultural resources become converted into commercial products for

exchange. The results of these studies emphasize the necessity of applying intellectual property rights to intangible cultural heritage. Therefore, the application of intellectual property rights for the preservation and dissemination of intangible cultural heritage could provide branding for these valuable resources.

“The provision of instruments and appropriate technology equipment for preservation of intangible cultural heritage by public libraries” with mean value of 4 was realized as one of the other main strategies of Iranian public libraries in the dissemination of intangible cultural heritage resources. The useful measures in public libraries could be provision of technological instruments and equipment. By making digital versions of intangible cultural heritage resources available to researchers, the public libraries increase their dissemination and accessibility as well as maintain the original work. Moreover, by holding virtual exhibitions in intangible cultural heritage resources, they could avoid possible damages to the resources, while attracting a bigger audience inside and outside of Iran.

Considering the significance of intangible cultural heritage in the preservation and identification of national and cultural identity of Iran, reflection of national and local beliefs and transfer of this heritage to the younger generation, public libraries are one of the most important institutions and organizations to uphold it. However, there are only a few studies on the preservation and dissemination of intangible cultural heritage resources in Iranian public libraries.

## Conclusion

As the general conclusion of this research, it could be claimed that public libraries have a prominent role in cultural development among various generations and society from childhood to adulthood, as well as the provision of cultural services to all generations without ethnic, age, religious and sexual discrimination. The introduction and dissemination of intangible cultural heritage by public libraries could lead to identification of the value of this heritage. In addition, provision of rich content and updating websites of public libraries in terms of intangible cultural heritage could have a significant role in the preservation and dissemination of the resources that satisfy users' information needs. Moreover, it is recommended for public libraries to put more effort into fulfilling their role in cultural development, as well as in helping the community they serve in the identification of their national and local identity. Concerning the effective role of public libraries in the promotion of culture among different classes of the society, consideration of such issues in public libraries does not only

guarantee the preservation of national values, but it also increases the public trust and improves the status of public libraries within the society.

## Recommendations

Based on the results, we present the following recommendations for the preservation and dissemination of intangible cultural heritage resources in public libraries of Iran:

- Use of subject experts such as archaeologists and historians in the preservation and dissemination of intangible cultural heritage in public libraries;
- Holding cultural events by public libraries with focus on various social groups;
- Holding festivals, exhibitions and cultural events in public libraries;
- Allocation of part of websites of public libraries for introducing the news about intangible cultural heritage resources;
- Material and intellectual protection of researchers focusing on intangible heritage by public libraries;
- Application of appropriate instruments and tools for the preservation and dissemination of intangible cultural heritage in public libraries;
- Installation of social networks to better convey the intangible cultural heritage to the younger generation;
- Encouraging people with local knowledge to hold training workshops with a goal to present and transfer this knowledge to the current generation;
- Creating NGOs specializing in identification and collection of intangible cultural heritage for preservation and dissemination by public libraries;
- The examination and collection of more compiled resources in intangible cultural heritage;
- Encouraging employees of public libraries to participate in congresses related to intangible cultural heritage.

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**References**

- Abankina T (2013) Regional development models using cultural heritage resources. *International Journal of Culture, Tourism and Hospitality Research* 7(1): 3–10.
- Amiri A, Shabani A, Hasanlarijani H, et al. (2011) Investigating the status of manuscripts and lithographs of cultural centers affiliated with the public libraries institution of the country and providing desirable strategies. *Scientology (Library and Information Science and Information Technology)* 4(15): 1–9. [In Persian]
- Anasi S, Ibegwam A and Oyediran-Tidings S (2012) Preservation and dissemination of women's cultural heritage in Nigerian university libraries. *Library Review* 1(62): 472–491.
- Barrio MJ, Devesa M and Herrero LC (2012) Evaluating intangible cultural heritage: The case of cultural festivals. *City, Culture and Society* 3(4): 235–244.
- Brown K (2017) The role of an indigenous nations library program and the advancement of indigenous knowledge. *Collection Management* 42(3/4): 167–207.
- Byrne A (2005) Indigenous knowledge and libraries: An afterword. *Australian Academic and Research Libraries* 36(2): 201–205.
- Chicago Public Library (2016) Intangible cultural heritage. Available at: <https://chipublib.bibliocommons.com> (accessed 10 April 2018).
- Dim CL and Osadebe NE (2009) The role of public libraries in the preservation of cultural heritage in Nigeria: Challenges and strategies. *Journal of Applied Information Science and Technology*. Available at: [http://www.jaistonline.org/ChibuzoOsadebe\\_2k09.pdf](http://www.jaistonline.org/ChibuzoOsadebe_2k09.pdf) (accessed October 2017).
- Dybkjaer L (1995) The role of Danish libraries in the continuing democratization. *IFLA Journal* 23(5/6): 1–12.
- Forutnani S, Nowkarizi M, Kiani MR, et al. (2018) The role of rural libraries in preserving the indigenous knowledge of rural residents: The case of South Khorasan Province. *World Journal of Science, Technology and Sustainable Development* 15(3): 245–256.
- George EW (2010) Intangible cultural heritage, ownership, copyrights, and tourism. *International Journal of Culture, Tourism and Hospitality Research* 4(4): 376–388.
- Gorman M (2007) The wrong path and the right path: The role of libraries in access to, and preservation of, cultural heritage. *New Library World* 108(11/12): 479–489.
- Hong Kong Public Libraries (2018) Storytelling Workshops: What's a Wonderful World – December. Available at: <https://www.hkpl.gov.hk/en/extension-activities/event/100154/storytelling-workshops-what-s-a-wonderful-world> (accessed 17 July 2018).
- Joranson K (2008) Indigenous knowledge and the knowledge commons. *International Information and Library Review* 40(1): 64–72
- Kabiri Hendi M and Danehkar A (2011) An integrated approach to the management and conservation of natural and cultural heritage. *Archaeological Letter* 1(1): 147–159. [In Persian]
- Kargbo JA (2013) Managing indigenous knowledge: What role for public librarians in Sierra Leone? *International Information and Library Review* 3(3): 199–207.
- Li Y, Shi D and Wang W (2015) Influencing factors of knowledge dissemination in rural areas in China. *Nankai Business Review International* 1(6): 128–155.
- Lilley S and Paringatai T (2014) Kia whai taki: Implementing indigenous knowledge in the Aotearoa New Zealand Library and Information Management Curriculum. *Australian Academic and Research Libraries* 45(2): 139–146.
- Linstone HA, Turoff M and Helmer O (eds) (2002) *The Delphi Method: Techniques and Applications*. Boston, MA: Addison-Wesley Educational.
- Lwoga E T (2011) Knowledge management approaches in managing agricultural indigenous and exogenous knowledge in Tanzania. *Journal of Documentation* 67(3): 407–430.
- Lwoga ET, Ngulube P and Stilwell C (2010) Managing indigenous knowledge for sustainable agricultural development in developing countries: Knowledge management approaches in the social context. *International Information and Library Review* 42(3): 174–185. [In Persian]
- Lynch CA (2003) Chapter 18. The coming crisis in preserving our digital cultural heritage. *Journal of Library Administration* 38(3/4): 149–161.
- Maina CK (2012) Traditional knowledge management and preservation: Intersections with Library and Information Science. *International Information and Library Review* 44(1): 13–27.
- Manaf AZ (2007) The state of digitisation initiatives by cultural institutions in Malaysia: An exploratory survey. *Library Review* 56(1): 45–60.
- Mokhtarpour R (2008) Locating public libraries in the country: Necessities and components (with emphasis on GIS) *Science and Information Technology* 1(24): 203–217. [In Persian]
- National Library of Sri Lanka (2018) Intangible Cultural Heritage Collection. Available at: <https://icom.museum/en/activities/heritage-protection/intangible-cultural-heritage-ich/> (accessed June 2018).
- Navaneethakrishnan S (2013) Preservation and documentation of intangible cultural heritage: The strategic role of the library and information science professionals in Sri Lanka. *Journal of the University Librarians Association of Sri Lanka* 17(1): 58–65.
- Nyan T (2003) Cultural heritage monuments and historic buildings as generators in a post-industrial economy–culture: New jobs and working conditions through new information technology. In: *The annual MEDICI conference*, Milan, Italy, 13–14 November 2003. Milan: Vertikult Project Office.
- Pedram B, Oliya M and Vahidzade R (2011) Assessment of authenticity in the process of preservation of historical monuments of Iran: The need to pay attention to the

- continuation of the native culture of artistic creation. *Two Resumes, Works and Textures of History, Culture* 1(2): 1–16. [In Persian]
- Pilot J (2005) Developing indigenous knowledge centres. *Australian Academic and Research Libraries* 36(2): 34–43.
- Public Libraries Foundation (2019) Information database of Public Libraries Foundation. Available at: <https://www.iranpl.ir/news/3807/anout-us> (accessed 1 August 2019).
- Rao SS (2006) Indigenous knowledge organization: An Indian scenario. *International Journal of Information Management* 26: 224–233.
- Raseroka K (2008) Information transformation Africa: Indigenous knowledge – Securing space in the knowledge society. *International Information and Library Review* 40(4): 243–250.
- Sen B (2005) Indigenous knowledge for development: Bringing research and practice together. *International Information and Library Review* 37(4): 375–382.
- UNESCO (2015) What is intangible cultural heritage? Available at: <http://www.unesco.org/culture/ich/en/what-is-intangible-heritage-00003> (accessed 15 May 2018).
- Urbaniak T (2012) The public library and intangible cultural heritage: The storyteller-in-residence program of the Cape Breton Regional Library. *Journal of Library Innovation* 3(2): 33–42.

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# Skills, competencies and literacies attributed to 4IR/Industry 4.0: Scoping review

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## Abstract

Much has been said about the fourth industrial revolution (4IR) or Industry 4.0 since its launch in 2011. In addition, certain skills have been touted as specifically 4IR or Industry 4.0 skills. Amidst all this, not much work has been done that focuses on and identifies what those skills are from a cross-disciplinary perspective. The current scoping review study set out to identify skills, competencies and literacies attributed to 4IR/Industry 4.0 by 64 peer-reviewed journal articles drawn from diverse subject disciplines. Three of its findings are worth mentioning. First, skills and competencies attributed to 4IR by the reviewed journal articles are generic soft skills often dubbed the 21st-century skills such as communication, creativity and problem solving. Second, of the hard skills, programming skills feature predominantly as the 4IR skills from the reviewed articles. Thirdly, information literacy is under-represented and under-cited as a skill for 4IR in the reviewed articles.

## Keywords

Fourth industrial revolution, Industry 4.0/4IR/Industry 4.0 competencies, 4IR/Industry 4.0 literacies, 4IR/Industry 4.0 skills, scoping review, stylised facts

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## Introduction

Every so often when a new turn beckons in human history, be it a new era, a new revolution or a new paradigm shift, there is an aura of hype associated with its (impending) arrival. The same seems to be the case with the fourth industrial revolution (4IR). Accompanying the aura of its hype are, usually, clarion calls for new behaviours, new orientations, new practices or new mindsets on the part of society or on the part of individuals (Drath and Horch, 2014; Frey and Osborne, 2013; Hussin, 2018; Korean Educational Development Institute (KEDI), 2017; Liao et al., 2017; Razak et al., 2018; Schwab, 2016; Smithers and Gray, n.d.; Wallner and Wagner, 2016; Welsh, 2018). Four of the sectors in which the 4IR hype has gained traction are technology, job market, production (factories and industries) and education. For instance, Hariharasudan and Kot (2018: 1) put one such clarion call thus: ‘Almost everyone is talking about the 4th Industrial Revolution (4IR). The 4IR wave is so strong that change is inevitable,

including within the education setting, making Education 4.0 the famous buzzword among educationists today’. In a different but related instance, Hussin (2018: 92) frames this clarion call as follows: ‘Industry 4.0 is a current trend of automation and digitalisation of industries. The impacts and importance of Industry 4.0 are reflected in all aspects of our lives’.

Albeit the four sectors mentioned above are not the only ones affected by 4IR, and even though they are not necessarily mutually exclusive, especially since technology underscores the other three sectors and others not mentioned here, this paper intends focusing on skills, competencies and literacies attributed to or associated with 4IR or Industry 4.0. As it is evident from the sources cited here and elsewhere (see Cotet

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et al., 2017; Hartmann and Hattingh, 2018; Ottonicar et al., 2018; Pereira and Romero, 2017; Sackey et al., 2017; Xing and Marwala, 2017) the short form, 4.0, stands for the word, *fourth*, especially as used in the expression, 'the fourth industrial revolution'. In this case, it is plausible to suggest that the short form, 4.0, tends to be used as a permutation and a signifier of the fourth industrial revolution in the names of the different sectors in which it is used. Overall, 4.0 is the code used to signal disruptive changes taking place in modern-day industries (Messias et al., 2018; Pereira and Romero, 2017; Wallner and Wagner, 2016) and those occurring in other sectors of the present-day society. Classic permutations of the code 4.0 are Education 4.0, Information Literacies 4.0, Digital Literacies 4.0, Media Literacy 4.0 and Cities 4.0 (see, for example, Abdelrazeq et al., 2016; Wittenstein Group, 2016).

#### **4IR/Industry 4.0: Skills, competencies and literacies**

A brief commentary on Industry 4.0 is necessary as a prelude to the aspects discussed in this scoping review. Credited to the Hanover fair held in Germany in 2011 to encourage the computerisation, digitisation and automation of manufacturing (Afrianto, 2018), the expression, Industry 4.0, refers to cyber-physical systems (CPS) in which connected systems of software, smart networks, automated machines, sensors, workpieces, communication technologies, the Internet of Things (IoT), augmented reality, and virtual reality interact and communicate with one another. It is also related to the CPS in which such connected systems interact with humans and with remote controllers in real-time by tapping into distributed computing (Afrianto, 2018; Drath and Horch, 2014; Hariharasudan and Kot, 2018; Imran et al., 2018; Pereira and Romero, 2017; Rüßmann et al., 2015; Sackey et al., 2017; Schwab, 2016). In some instances, it is associated with the Internet of Services and the Internet of People (Sackey et al., 2017). Often, it is used to refer to the fourth industrial revolution itself, or it is used as one of the flagship 4.0 versions of the fourth industrial revolution. However, it is worth pointing out that there is no consensus as to what precisely constitutes Industry 4.0. As such, the concept is both complex and nebulous (Cotet et al., 2017; Pereira and Romero, 2017; Ślusarczyk, 2018).

Most of the functions, processes and practices related to Industry 4.0 have underlying cognate, and in some instances, complementary technologies. Three such technologies are artificial intelligence (AI), machine learning (ML) and algorithms. These

technologies, even though they are regarded as sub-fields in certain cases (Peters, 2018; Shorey and Howard, 2016), nonetheless, serve as bedrock technologies in the different spheres of Industry 4.0. Evidence of AI-powered techs which also leverage ML are self-driving cars, drones, robotic personal assistants and intelligent virtual personal assistants (Schwab, 2016; cf. Botha, 2019; Chaka, 2019; Davie, 2019; Frey and Osborne, 2013; Goksel-Canbek and Mutlu, 2016; Oranye, 2018; Penprase, 2018; Shorey and Howard, 2016). In this context, Rüßmann et al. (2015) point out that nine key technologies are driving and transforming Industry 4.0. These are autonomous robots; simulation; big data and analytics; augmented reality; cloud computing; the (Industrial) Internet of Things; horizontal and vertical system integration; additive manufacturing; and cybersecurity (also see Cotet et al., 2017; Pereira and Romero, 2017).

Against this background, studies have been conducted to investigate the types of skills and competencies needed for either 4IR or Industry 4.0. Among such studies that are relevant for this paper are those by Aberšek (2017), Bermúdez and Juárez (2017), Cotet et al. (2017), Fitsilis et al. (2018), Grzelczak et al. (2017), Hussin (2018), and Kamaruzaman et al. (2019). For example, Bermúdez and Juárez's (2017) study explores competencies required for operations management personnel at automotive parts suppliers in the Industry 4.0 era. It identifies the following four dimensions together with their requisite competencies:

- Information and communication technologies (e.g. knowledge of big data, data analysis ability, and knowledge and management of software and interfaces intended to support operations management);
- Innovation management (e.g. virtual collaboration, knowledge and management of simulation systems, and ability to adopt new models);
- Organisational learning (e.g. developing employee skills and capacities, encouraging participation, and knowledge of lean manufacturing techniques);
- Environment (e.g., creativity in designing strategies to introduce new practices, developing research, and transdisciplinarity). (p. 742)

The study concludes that in each of the four dimensions, respectively, the following competencies were ranked highly: knowledge and management of software and interfaces intended to support operations management; knowledge and management of simulation systems; developing employee skills and capacities; and

creativity in designing strategies to introduce new practices. The study also concludes that financial analysis skills, leadership skills, and critical and disruptive skills, even though they were not listed in the four dimensions, were rated as essential for Industry 4.0.

Cotet et al.'s (2017) study proposes an assessment model for a constellation of skills and personal qualities necessary for Industry 4.0 in respect of three subjects, robotics, machine-tools/manufacturing systems and logistics, registered by undergraduate students at a Romanian university. The model consists of five dimensions: self-actualisation; conscientiousness; agreeableness; maturity; and extroversion. Additionally, it comprises soft skills such as interpersonal skills; asserting; respect; strength of self; perseverance; empathy; will spirit of perfection; self-discipline; intellectual curiosity; refining; independence; and creativity. Most importantly, in this constellation, creativity is the epicentre of the top three skills needed. It is followed by emotional intelligence and proactive thinking, respectively. Robotics students scored highly in conscientiousness, whereas machine-tools/manufacturing systems students scored highly in self-actualisation.

Furthermore, Kamaruzaman et al.'s (2019) study maps out a framework consisting of 4IR skills that are essential for engineering graduates in Malaysia by 2022. Among these skills are the following: analytical thinking and innovation; creativity, originality and initiative; technology design and programming; critical thinking and analysis; complex problem solving; leadership and social influence; emotional intelligence; reasoning, problem solving and ideation; and system analysis and evaluation.

Based on the points detailed above, the current study set out to conduct a scoping review of 64 peer-reviewed journals published between 2012 and 2019 (see Appendix C). Its dual purpose was to: identify skills, competencies and literacies attributed to the fourth industrial revolution (4IR) by the 64 journal articles reviewed; and establish similarities, overlaps and differences between such skills, competencies and literacies. The 64 journal articles span 28 subject disciplines with one article's subject discipline being unspecified.

## Methodology

Conducted between January 2019 and August 2019, this study utilised a scoping review as its research design (Arksey and O'Malley, 2005; Dijkers, 2015; Levac et al., 2010; Munn et al., 2018). Among other things, a scoping review aims to provide key concepts or ideas underscoring a given area of study and some of the

principal sources pertaining to that area of study. One of the purposes it sets out to achieve is to investigate the range, nature and extent of research activity (Anderson et al., 2008; Arksey and O'Malley, 2005; Dijkers, 2015; Levac et al., 2010; Munn et al., 2018; Pham et al., 2014). To this end, the study chose and employed Arksey and O'Malley's (2005) four-stage scoping review framework for its relevance and suitability for exploring its four research stages (cf. Dijkers, 2015; Wilson et al., 2015). The four stages are: (a) identifying research questions; (b) identifying relevant studies; (c) study selection; and (d) extracting the data.

### Identifying research questions

To ensure that a wide range of studies were covered, articles related to both the expressions, *fourth industrial revolution* and *Industry 4.0*, were considered as the two expressions are often used interchangeably in most of the literature dealing with them. To this end, the following research questions (RQs) were framed to guide the study:

- RQ1: Which are the skills, competencies and literacies attributed to the fourth industrial revolution/4IR by the journal articles reviewed?
- RQ2: Are the identified skills, competencies and literacies discipline-based, generic or both?
- RQ3: What are the similarities, overlaps and differences between these skills, competencies and literacies attributed to 4IR by these journal articles?
- RQ4: Is information literacy among the skills, competencies and literacies attributed to 4IR or not, and what does this mean for the information literacy field?

### Identifying relevant studies

Journal articles used in this study were searched and identified from the following electronic databases: Scopus; Education Resources Information Center (ERIC); Web of Science, ScienceDirect; Wiley Online Library; Institute of Electrical and Electronics Engineers Xplore (IEEE Xplore); Association for Computing Machinery Digital Library (ACM Digital Library); SpringerLink; Microsoft Academic; and Semantic Scholar. In addition, both Google Scholar and ResearchGate as a search engine and as a reference manager, respectively, were employed. The idea of employing multiple databases was informed by Dallasega et al. (2018).

To ensure that a broad spectrum of studies on both the fourth industrial revolution and Industry 4.0 were covered in all the search strings, two Boolean

operators AND and OR were employed in searching the aforesaid databases (cf. Benitti and Spolaôr, 2017; Forsström and Kaufmann, 2018; Karimi et al., 2010; Munn et al., 2018). Search strings were arranged and queried in varied permutations. In addition, certain search strings or keywords were enclosed in round brackets (parentheses) and in double quotation marks, and queried as in the following example: (4IR OR “Industry 4.0” OR “the fourth industrial revolution”) AND (skills OR competencies OR “digital literacies” OR competences OR “digital literacies”).

Thereafter, the inclusion criteria were determined and applied in order to identify relevant studies. The inclusion and exclusion process was conducted iteratively and not linearly. Articles included were those published after 2011 as this year is regarded as the inaugural year for the fourth industrial revolution (4IR) – also referred to as Industry 4.0 (Caruso, 2018; Elbeck, 2018; Hariharasudan and Kot, 2018; Hirschi, 2017; Imran et al., 2018; Lasi et al., 2014; Lu 2017; Slusarczyk, 2018). Two of the inclusion criteria were: articles ought to have been published between 2012 and 2019; and only articles published in English were considered.

In this instance, all the articles yielded by the above-mentioned search strings as fed into the aforesaid electronic databases and into Google Scholar and ResearchGate, were surveyed by scanning their titles (O’Flaherty and Phillips, 2015; Saltan and Arslan, 2017). Articles deemed to be relevant according to the inclusion criteria stipulated above were downloaded and saved in an electronic Microsoft folder.

### Study selection

Using the search strings identified above, all the relevant articles retrieved from the said electronic databases and from both Google Scholar and ResearchGate were reviewed and screened by closely examining their abstracts, their keywords and their content.

The screening process involved four stages. The first stage entailed screening all the articles (1680 articles) identified from the databases and those identified from one search engine and from one reference manager. In the second stage, articles that did not meet all of the inclusion criteria were eliminated, while in the third stage, duplicate articles were excluded. These two screening stages resulted in 64 journal articles being the final articles accepted for this study. Overall, the included journal articles were selected according to a modified version of Moher et al.’s (2009) Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) model (cf. Hutton et al., 2015; Saltan and Arslan, 2017).

### Extracting the data

Data was extracted from the 64 journal articles (see Tables 1 and 2) in response to the four research questions and in response to the third inclusion criterion. The latter entailed the articles that mentioned the terms, *skills*, *competencies/competences* and *literacies* as part of the fourth industrial revolution (4IR) or the Industry 4.0 content and focus. The data extraction process followed charting which involved sifting and sorting out requisite data from the 64 selected articles according to the three aforesaid key terms (see Arksey and O’Malley, 2005; Dijkers, 2015; Levac et al., 2010). In this case, this entailed scan reading the selected articles with a view to locating the specific 4IR or Industry 4.0 skills, competencies/competences and literacies mentioned in each of them.

To ensure data extraction consistency and reliability, the data (especially the three key terms) was coded by three raters. The coding was informed by and based on Miles and Huberman’s (1994) inter-rater reliability (IRR) whose formula is as follows:

$$\text{reliability} = \frac{\text{number of agreements}}{\text{number of agreements} + \text{disagreements}}$$

Following this formula, the three raters had an IRR of more than 80% agreement between the data variables they coded. Miles and Huberman (1994) are of the view that an IRR of 80% agreement between raters is sufficient to be deemed to be reliable (also see McAlister et al., 2017). The type of data extracted from the 64 selected journal articles is reflected in Tables 1 and 2.

### Data analysis

Thematic analysis is an analytic technique that was used to analyse the data extracted for this review study. This entailed searching for and locating from the extracted data key terms as framed in the research questions and as captured in the third inclusion criterion. At a general level, thematic analysis requires a meticulous identification of themes from a given data (especially written or documented data) and subjecting such data to a systematic categorisation by employing data coding scheme. It may be conducted inductively or deductively (Attride-Stirling, 2001; Chaka et al., 2017; Fereday and Muir-Cochrane, 2006). In the case of this review study, the thematic analysis conducted was inductive, and the data coding scheme utilised, followed the four stages as illustrated in Table 3.

Another part of this thematic analysis was to establish whether the identified key terms as extracted from the 64 journal articles served as *stylised facts* for 4IR in all the included journal articles. According

**Table 1.** Authors, journals and types of skills/competencies.

Authors	Journals	Types of Skills/Competencies
1. Alemi (2016, pp. 14 and 20)	International Journal on Integrating Technology in Education	(English) language skills (e.g. reading, speaking, listening, and writing); digital skills; (English) communication skills; and e-literacy skills.
2. Anggraeni (2018, pp. 13 and 14)	Metathesis (Journal of English Language, Literature and Teaching)	Critical thinking; problem solving; and speaking skills.
3. Benešová and Tupa (2017: 2198, 2199, 2200)	Procedia Manufacturing	Data analysis; business intelligence data analytics; language skills; autonomy; responsibility; flexibility; communicativeness; reliability; analytical/logical thinking; problem solving; creativity; organisational skills; ability and willing to learn new things; ability to plan and lead a small team; knowledge to simulate; knowledge of security standards and communication standards; knowledge of servers; basic knowledge statistically; manual skills; media skills; technical skills; knowledge of technical documentation; cooperation; communication skills; ability to learn how to maintain new machines; and basic knowledge of electronics, hydraulics, and service of the pressure cylinders.
4. Brettel et al. (2014: 37, 39, 43)	International Journal of Information and Communication Engineering	Product innovation; technological innovation; collaboration; and problem-solving.
5. Caruso (2018: 380, 381, 383, 384, 388, 390)	AI & Society	Problem-solving abilities; creativity; cognitive, linguistic and social skills; communication; technological innovation; horizontal decision making; diffusion of responsibilities; autonomy; collaboration; innovation; manual dexterity; intelligence; general knowledge; social skills (e.g. sharing, negotiating, empathy and cooperation); mathematical and interpersonal skills; applicative skills tied to specific situations, technologies, and work processes; digital innovation; collective participation; high technical, informatics and computational skills; and relational and communicative skills.
6. Coşkun et al. (2019, pp. 2, 3, 4 and 5)	Technologies	Interdisciplinary thinking; decision and problem solving; cultural and intercultural competency; flexibility (interdisciplinary collaboration, soft skills); big data analysis; and programming skills.
7. Damian and du Plessis (2015: 533, 534, 539, 540)	Education + Training	Soft skills; skills in the specific industry; employability skills; foundational skills (e.g. basic skills, thinking skills and personal qualities); five competencies (e.g. use of resources, interpersonal skills, information, systems and technology); technical knowledge and skills; critical thinking; communication; learning and innovation skills; information, media and technology skills; life and career skills; 21st-century skills; (in-depth) technical skills.
8. Demartini and Benussi (2017: 5)	IT Professional	21st-century skills or lifelong learning; adaptability; the ability to find, organise and retrieve information; management critical thinking; teamwork; and communication, problem-solving, self-management, planning, organising, technology management, life-long learning and entrepreneurship competencies.

(continued)

**Table 1.** (continued)

Authors	Journals	Types of Skills/Competencies
9. Eguchi (2014: 6)	Journal of Automation, Mobile Robotics & Intelligent Systems	Thinking skills (e.g. observation, estimation and manipulation); science process skills/problem-solving skills; social interaction/teamwork skills; and critical academic skills (e.g. writing, reading, research, creativity, collaboration, critical thinking, decision making, problem solving, and communication skills).
10. Elbeck (2018: 113, 116, 117)	e-Journal of Business Education & Scholarship of Teaching	Decision-making innovation; social (emotional) skills; varying scholarly skills; critical thinking; and creativity.
11. Elbestawi et al. (2018: 250)	Procedia Manufacturing	Interdisciplinary skills; abilities of synthesis; and adaptation to various situations.
12. Erol et al. (2016: 14, 15)	Procedia CIRP	Personal competencies; social/interpersonal competencies; action-related competencies; and domain-related competencies.
13. Forsström and Kaufmann (2018: 18, 19)	International Journal of Learning, Teaching and Educational Research	Competencies for the 21st-century skills/21st-century skills (e.g. problem solving, creativity and logical thinking); programming skills; and mathematical thinking.
14. Hecklau et al. (2016: 3, 4)	Procedia CIRP	Technical competencies (e.g. technical skills, media skills and coding skills); methodological competencies (e.g. creativity, problem solving, decision making, and analytical skills); social competencies (e.g. intercultural skills, language skills, communication skills, networking skills, the ability to transfer knowledge, and leadership skills); and personal competencies (e.g. flexibility, ambiguity tolerance, motivation to learn, ability to work under pressure, and sustainable mindset).
15. Hirschi (2018: 196, 197, 198, 200)	Career Development Quarterly	Personal flexibility; high self-efficacy; adaptability; and professional skills.
16. Hussin (2018: 94)	International Journal of Education & Literacy Studies	Social and cultural awareness; leadership skills; adaptive, persistence and initiative; problem-solving/critical thinking skills; creativity; communication; and collaboration.
17. Janssen et al. (2016: 22, 23)	International Journal of Advanced Corporate Learning	Creativity; teamwork; specific skills; decision making; problem solving; and psychomotoric skills.
18. Jones and Pimdee (2017: 12, 15, 22)	Asian International Journal of Social Sciences	Analytical-thinking skills; labour skills; innovation; creativity; critical thinking skills; and communication skills.
19. Kivunja (2015: 226–229, 233)	Creative Education	4Cs super skills (e.g. critical thinking and problem solving; communicating; collaborating; creating and innovating).
20. Kortuem et al. (2013: n.p.)	Computer	Creativity; sharing; and collaboration.
21. Krpálek and Krelová (2016: 120–122, 126)	Economics and Sociology	Creativity; independent thinking; entrepreneurial skills; analytical skills; group work; problem solving; information-communication skills; professional competencies; and social competencies.
22. Lavallo et al. (2017: 30, 31, 32, 35, 38, 40)	Formamente	Managing complexity; problem solving; acting autonomously; possessing communication skills; soft skills; flexibility; entrepreneurial competence; competences for the digital society; research competencies; transversal knowledge (a mix of pedagogical and digital skills); Industry 4.0

(continued)



**Table 1.** (continued)

Authors	Journals	Types of Skills/Competencies
		knowledge and skills; business competences; basic digital skills; mathematical and vertical technological competences; social skills; technical competences; and soft skills.
23. Li et al. (2017: 627, 628, 629, 630, 634)	Chinese Geographical Science	Innovation; studying, reasoning, thinking and planning; communication; cognitive ability; efficient and high-quality skills; innovative talent; high-tech innovation ability; creativity; and technical and technological innovation.
24. Magruk (2016: 279, 283, 287)	Business, Management and Education	Skills (e.g. design, service processes, customer data management); interdisciplinary thinking; design thinking; communication; software programming, and data analysis or scientific computing.
25. Mohamed (2018: 259)	International Journal of Supply and Operations Management	Problem-solving skills; failure analysis; the ability to deal with constant change and completely new tasks; processing and visualisation of manufacturing process data; and innovation.
26. Morrar et al. (2017: 13, 14, 16, 17)	Technology Innovation Management Review	High-skills; social innovation; technological innovation; industrial innovation; people skills; workforce skills; skills for managing complex projects; and novel solutions.
27. Pedron (2018: 22, 23, 27)	On Research (Journal of EU Business School)	Social and emotional competences; creativity; mental agility; 4Cs (e.g. critical thinking, collaboration, communication and creativity); and complex skills.
28. Peters (2017: 3)	Educational Philosophy and Theory	Technical innovation; abstraction; formalisation; and mathematisation.
29. Peters and Heraud (2017: 7–8, 10, 11, 14)	Journal of Self-Governance and Management Economics	Social innovation; collective intelligence; peer production; collaboration; and co-creation.
30. Pfeiffer (2017: 108, 118)	Nanoethics	Technical skills; creative problem solving; and collaboration.
31. Prisecaru (2016: 59, 60)	Knowledge Horizons – Economics	Communication; innovation; interdisciplinarity; networking; higher skills (e.g. creativity); big data analysis; empathy; sensitivity; creativity; and (huge) problem solving.
32. Puncreobutr (2016: 4)	St Theresa Journal of Humanities and Social Sciences	Design and selective thinking; productive and problem-solving thinking; entrepreneurial thinking; responsible thinking; social-consciousness thinking; and scenario thinking.
33. Rahman et al. (2017: 111, 112, 113, 115, 119)	Perintis eJournal	Innovation; creativity; problem solving (identifying new problems and solutions); and disruptive innovation.
34. Razak et al. (2018: 91)	Asia-Pacific Journal of Information Technology and Multimedia	Curiosity; communication; and long-term and short-term learning.
35. Roblek et al. (2016: 3, 5)	Sage Open	Digital thinking; information sharing; and collaboration.
36. Schiuma (2017: 1, 2, 3,4, 7, 9)	Journal of Open Innovation: Technology, Market, and Complexity	Creativity/creative thinking; creative dimensions (e.g. empathy, curiosity and imagination); innovation/disruptive innovation; resilience; agility; problem solving; flexibility; diversity; risk taking; artistic skills; adaptability; and communication.
37. Shahroom and Hussin (2018: 315)	International Journal of Academic Research in Business and Social Sciences	Creative approaches; and educational innovation.

(continued)

**Table 1.** (continued)

Authors	Journals	Types of Skills/Competencies
38. Ślusarczyk (2018: 232, 236)	Polish Journal of Management Studies	Innovation; digitisation; and communication.
39. Tvenge et al. (2016: 102)	Procedia CIRP	Collaboration; communication; and critical thinking.
40. Wilkesmann and Wilkesmann (2018: 241, 242, 243, 245, 250)	VINE Journal of Information and Knowledge Management Systems	Innovation(s); digitalisation; communication; decision making or information process; and complex problem solving.
41. Zain (2017: 2259, 2260, 2261, 2263, 2265)	Universal Journal of Educational Research	Creativity; innovation; 4Cs (e.g. critical thinking, communication, collaboration and creativity); and information, media and technology skills.

**Table 2.** Authors, journals and types of literacies and skills/competencies.

Authors	Journals	Types of Literacies & Skills/Competencies
42. Abdullah et al. (2017: 2)	eBangi Journal of Social Sciences and Humanities	Technology skills; and Internet literacy.
43. Afrianto (2018: 8, 9)	English Language Teaching and Research	Soft skills; empathic communication skills; responsibility; open thinking; digital literacy; technology literacy; human literacy; critical thinking skills; problem-solving skills; communication skills; collaboration skills; and creativity.
44. Ahmad et al. (2018: 223, 224, 225)	Journal for Studies in Management and Planning	High IT competence; practical engineering and programming skills; technical, methodological, social and personal competencies; flexibility; tacit knowledge; adaptability; unlimited variability of behaviour; multi-purpose skills; digital competences; human-robot collaboration (cobot); communication; technical literacy; learning ability; creativity; collaboration; open culture; data-driven decisions; interdisciplinary skills; and flexibility to perform adaptive abilities.
45. Ansari et al. (2018: 117, 118, 119, 121)	Procedia Manufacturing	Self-learning solutions; self-direction capabilities; information-processing skills (e.g. literacy, numeracy and problem-solving skills); collaboration; and multi- and interdisciplinary skills.
46. Astutik and Prahani (2018: 409, 410, 418)	International Journal of Instruction	Creativity; critical thinking; problem solving; innovation; literacy; communication; responsibility; collaboration; scientific creativity; and high level-thinking skills.
47. Balyer and Öz (2018: 812, 821, 822, 826, 827)	International Online Journal of Education and Teaching	Communication; technical knowledge skills; digital skills; and digital literacy skills.
48. Contreras and Michael (2015: 388, 389, 390, 391, 393)	Procedia - Social and Behavioral Sciences	Computer programming; (fundamental literacy); digital literacy; and programming skills;
49. Edwards-Schachter (2018:67, 68–74, 75)	International Journal of Innovation Studies	Heterogeneous skills; marketing skills; innovation (product, process, service, business model, disruptive, radical design-driven, social and responsible innovation); people skills; technical skills; and science literacy.
50. Flogie et al. (2018: 268, 269, 275)	Journal of Baltic Science Education	Digital literacy 4.0; communication competence 4.0 (e.g. skills of human-human communication and skills of and the understanding of human-machine communication); complex/critical decision making; complex problem solving; critical judgement; visualisation and processing of large amounts of data; collaboration; social competences; and competences for Industry 4.0.

(continued)

**Table 2.** (continued)

Authors	Journals	Types of Literacies & Skills/Competencies
51. Gray et al. (2018: 1, 2, 3, 9, 10)	Big Data & Society	Data literacy/data literacies; technical, computational and statistical competencies; statistical literacy; information literacy; technical skills; data infrastructure literacy; critical inquiry; and technical and statistical skills.
52. Hariharasudan and Kot (2018: 7; cf. Puncreobutr, 2016: 3)	Social Sciences	Leadership, collaboration; creative, digital literacy; effective communication; emotional intelligence; entrepreneurship; global citizenship; problem solving and teamwork; critical thinking; creativity and innovation, cross-cultural understanding; information and media literacy, and career and learning skills.
53. Lee et al. (2014: 4 and 5)	Procedia CIRP	Data management; servitisation; product and service innovation; and intelligent decision making.
54. Longmuß and Höhneb (2017: 263, 264, 265, 275)	Procedia Manufacturing	Solving complex problems; competencies (e.g. thinking in interconnected systems); digital literacy
55. Mihalcea (2017: 289, 295, 297, 298, 299)	Management Dynamics in the Knowledge Economy	Digital skills; advanced skills in problem solving, decision making, and design thinking; new skills through continuous learning; innovative thinking/innovation; adaptability; creativity; high-performance computing skills and user experience design skills; coding/software engineering/app building skills; software testing skills; and Internet literacy skills.
56. Motyl et al. (2017: 1502, 1503)	Procedia Manufacturing	Transferrable skills; hard skills (e.g. numerical and higher mathematical knowledge, problem solving, creativity and design skills, investigative and experimental skills, information processing, computer programming, and knowledge of specific software tools); soft skills (e.g. analytical thinking, communication skills, teamwork and leadership skills); and digital skills (e.g. digital literacy skills, digital skills for the general workforce and specific digital skills for the ICT professionals).
57. Nordin and Norman (2018: 2, 3)	Journal of Sustainable Development Education and Research	Technical-based skills (e.g. engineering); and digital literacies.
58. Robandi et al. (2019: 40, 41, 43, 44)	Advances in Social Science, Education and Humanities Research	Communication; digital and Internet competency; specific competencies (e.g. intelligence, personality and abilities); technology literacy competency; technology literacy (e.g. the understanding of the operation of the technology); digital literacy; and literacy skills.
59. Romero (2015: 116, 118)	Procedia – Social and Behavioral Sciences	Digital literacy; 21st-century skills/competences (e.g. ICT literacy, communication, collaboration, social and cultural skills, creativity, critical thinking, problem solving, and productivity); self-direction; planning; risk taking; conflict management
60. Sackey et al. (2017: 115)	South African Journal of Industrial Engineering	Inquiry/problem-solving skills; adaptability; creativity; collaboration; communication; innovation; global awareness; digital literacy; and critical stance.
61. Seufert and Meier (2016: 28, 29, 32)	International Journal of Advanced Corporate Learning	Digital competences; critical thinking abilities; social competences; communication; collaboration; digital literacy; general skills; basic skills; analytical competence; innovation; and creativity.
62. Thoben et al. (2017: 6, 7)	International Journal of Automation Technology	Innovation; communication; and data processing.
63. Umachandran et al. (2018: 7306, 7307, 7308, 7309)	International Journal of Computers & Technology	Digital literacy; innovation; participatory learning; data science; solving social problems.
64. Yamin (2018: 402, 403, 409)	International Journal of Pedagogy and Teacher Education	Literacy competence; innovativeness; creativeness; productiveness; and critical writing competence.

**Table 3.** A tabular representation of the stages of the data coding system (adapted and modified from Attride-Stirling, 2001: 391; Chaka et al., 2017; Fereday and Muir-Cochrane, 2006: 5).

Step 1: Identification of initial themes
(a) Extract/Abstracting basic themes from coded data segments
(b) Refining themes as needed
Step 2: Identification of final themes
(a) Building final themes from initial themes
Step 3: Constructing categories
(a) Establishing basic categories from themes
(b) Selecting final categories
Step 4: Establishing theoretical constructs
(a) Building theoretical constructs from final categories
(b) Linking theoretical constructs to the study's theoretical framework

to Helfat (2007) stylised facts are observations that are widely accepted as either empirical regularities or empirical truths in a given scholarly discipline.

## Findings

The findings presented in this part of the review study are based on the data extracted from the 64 journal articles and are informed by how the data was codified as indicated in the preceding section. Additionally, these findings are in response to the four research questions mentioned earlier.

To contextualise this part of the findings, the 64 journal articles belonged to 28 subject disciplines which were inferred from the titles or from the focus of the journal articles, or from the journals in which these journal articles were published. One article's subject discipline is unspecified (see Table 4). To this effect, 10 articles belonged to education; and seven articles were classified under manufacturing, business, management and education, and cross-disciplines, respectively. By contrast, four articles were linked with humanities and social sciences, while two articles were each identified under the following subject disciplines: language and literature; information technology; human resources; corporate learning; and computer science/computer and technology. Lastly, one article was assigned to each of the remaining subject disciplines.

In terms of the skills, competencies and literacies attributed to the fourth industrial revolution/Industry 4.0 by the reviewed journal articles' two categories emerged from the extracted data: skills or competencies attributed to 4IR (see Table 1) and literacies and skills or competencies attributed to 4IR (see Table 1).

**Table 4.** Subject disciplines and the numbers assigned to journal articles.

Subject disciplines	Numbers assigned to journal articles
Technology in education	1
Language & literature	2, 43
Manufacturing	3, 11, 22, 39, 45, 54, 56
Information and communication engineering	4
Artificial intelligence	5
Technologies (Engineering education)	6
Education	7, 13, 16, 19, 28, 41, 46, 47, 50, 64
Information technology	8, 34
Automation, mobile robotics & intelligent systems	9
Business, management & education	10, 24, 26, 27, 29, 38, 44
Production	12
Human resources	14, 55
Career development	15
Corporate learning	17, 61
Economics	31
Marketing	36
Supply & operations management	25
Humanities and social sciences	18, 32, 42, 52,
Computer science/Computer & technology	20, 63
Disruptive technologies	33
Innovation studies	49
Geographical science	23
Data science	51
Information & knowledge management	40
Sustainable development education	57
Industrial engineering	60
Automation technology	62
Cross-disciplines	21, 30, 37, 48, 53, 58, 59
Unspecified	35
Total: 28 disciplines and 1 unspecified	

## *Skills, competencies and literacies attributed to the fourth industrial revolution/Industry 4.0 by the journal articles reviewed*

On the one hand, 41 of the 64 reviewed articles (articles 1 to 41) frame core issues related to 4IR in terms of skills and competencies (see Table 1). These skills or competencies were wide-ranging and covered a broad spectrum of both academic disciplines and employment domains. For example, five articles (3, 5, 7, 14 and 22) mention most instances of such skills or competencies, and four articles (8, 9, 23 and 36)

provide average cases of such skills or competencies. In contrast, the rest of the other articles cite few and fewest skills or competencies attributed to 4IR.

On the other hand, 23 of the 64 reviewed articles (articles 42 to 64) articulate core issues related to 4IR in terms of a wide range of skills, competencies and literacies (see Table 2) pertaining to academic disciplines and workplace domains. Of these articles, four of them (44, 50, 55 and 56) cite most instances of skills, competencies and literacies, and a further four of them (43, 52, 58 and 59) reference average instances of such skills, competencies and literacies. In comparison, the remaining articles cite few and fewest skills, competencies and literacies attributable to 4IR.

### *Skills/competencies category*

Skills featuring predominantly – as extracted verbatim from the related reviewed articles (see Table 1 and Appendix A) - in this sub-category are skills often attributed to the 21st-century skills (Forsström and Kaufmann, 2018; Marope et al., 2017; Romero, 2015) or to the 4C skills (Kivunja, 2015; Pedron, 2018; Zain, 2017). As such, they are generic skills or competencies in this skill set. They include problem solving, communication (skills), creativity, collaboration, critical thinking and decision making. Of these skills, the first three feature most: they feature 22, 21 and 20 times, respectively, with the first two appearing in 21 journal articles each, and the third one in 17 journal articles. In contrast, the last three types of skills in this skill set feature less – they feature 12, 11 and 7 times, apiece, in the same number of journal articles. The other types of skills associated with this sub-category are innovation and technical skills, competencies or competences. Of these two types of skills, innovation (as a standalone word and with other words) occurs 26 times – marginally more than the first three 21st-century skills identified above – in 17 articles. Digital skills as a skill set appears far less frequently than all the other skills. Skills featuring in this sub-category are traditionally referred to as soft skills.

Skills or competencies based on specific aspects of the fourth industrial revolution (4IR) technologies are as indicated in the second sub-category in Appendix A. These are also Industry 4.0-specific skills as opposed to the generic skills spelt out above. They are cited by 10 of the reviewed journal articles. Among these skills or competencies are the following: data analytics; computational skills; big data analysis; programming skills, coding skills or software programming; Industry 4.0 knowledge and skills; and processing and visualisation of manufacturing process data. The eight journal

articles citing them fall within the following subject disciplines: manufacturing; artificial intelligence; technologies; education; human resources; geographical science; business, management and education; supply and operations management; and economics (see Table 4). Featuring mostly among these skills are programming skills.

The next sub-category comprises what the paper classifies as outliers. This refers to those skills that are eccentric or unusual in nature, or in the manner in which they have been framed. Among them are: horizontal decision making; interdisciplinary thinking; ambiguity tolerance and sustainable mindset; transversal knowledge; and design and selective thinking; scenario thinking (see Appendix A). Another sub-category is of skills classified as pedestrian skills. This sub-category includes skills such as manual dexterity, general knowledge, 21st-century skills, self-management, planning and organising, critical academic skills and risk taking (see Appendix A). Moreover, there are skills codified as unclear or vague in this category. They are so codified because their framing from the relevant reviewed articles reflects ambiguity. Examples of such skills in this case are employability skills; five competencies; life and career skills; varying scholarly skills; personal competencies; interpersonal competencies; action-related competencies; labour skills; workforce skills; and productive thinking, responsible thinking and social-consciousness thinking. Lastly, information-related skills are mentioned seven times by six journal articles (see Appendix A).

### *Skills/competencies and literacies category*

Again, in this category, skills featuring mostly are those classified as the 21st-century skills (see Appendix B). As pointed out earlier, these are generic skills. Included in this sub-category are communication (skills/competence), creativity, collaboration, problem solving and critical thinking. The first three types of skills occur 13, 10, and 10 times, apiece, with the first appearing in 12 journal articles and the last two featuring in nine articles, each. Problem solving and critical thinking are cited 6 and 5 times in the same number of journal articles, respectively. In this sub-category of skills are four more types of skills: decision making, technical skills, innovation and digital literacy. Of these, decision making appears three times in tandem with other words (see Appendix B) in three journal articles. These four sets of skills also conventionally known as soft skills.

Technical skills as a skill set appears 5 times as technical skills and once each as technical competencies, technical competences and technical literacy. Alongside it are three variations of technology –

technology skills, technology literacy and technology literacy competency – each appearing once in three journal articles. Both innovation and digital literacy appear 10 times apiece in nine and 10 journal articles, singly. In this regard, the former also appears in tandem with other phrases such as product and service innovation and radical design-driven, social and responsible innovation. The latter (digital literacy) has its three related permutations: digital literacy skills, digital skills and digital competences. The first and the last of these feature twice each in two journal articles, respectively, while the middle one (digital skills) occurs 5 times in three journal articles. Finally, there are other literacies, skills and competences that appear once. Examples here are: literacy skills; literacy competence; fundamental literacy; digital literacy 4.0; data literacy/data literacies; information literacy; data infrastructure literacy; and Internet literacy skills (see Appendix B).

Pertaining to skills, competencies and literacies related to the 4IR technologies as displayed in the second sub-category in Appendix B, the following stand out: practical engineering and programming skills; data-driven decisions; computer programming; programming skills; digital literacy 4.0; communication competence 4.0; visualisation and processing of large amounts of data; competences for Industry 4.0; data literacy/data literacies; data management; servitisation; coding/software engineering/app building skills; software testing skills; and computer programming and knowledge of specific software tools. All of these literacies, skills and competences are also Industry 4.0 literacies, skills and competences. All together, they are cited by seven journal articles that fall within six subject disciplines: business, management and education; cross-disciplines; education; data science; human resources; and manufacturing (see Table 4). As is the case with Appendix A, programming skills feature predominantly in this sub-category.

Outliers are the next sub-category classified in this appendix. As is the case with Appendix A, they are so classified because of the eccentric manner in which they have been articulated. They include design thinking; new skills through continuous learning; user experience design skills; and investigative and experimental skills. This sub-category is followed by pedestrian literacies, skills and competences sub-category of which the following are classic examples: tacit knowledge; self-direction capabilities; literacy skills; people skills; career and learning skills; Internet literacy skills; risk taking; conflict management; and basic skills and critical writing competence. Finally, there are vaguely framed skills and competences. Among them are unlimited variability of behaviour; multi-purpose skills;

interdisciplinary skills; flexibility to perform adaptive abilities; multi- and interdisciplinary skills; heterogeneous skills; transferrable skills; digital skills for the general workforce; and specific competencies. In this category, information-related skills are mentioned four times by four journal articles (see Appendix B).

### *Big Eleven, skill/competency dimensions, skills/competencies/literacies and journal article numbers*

This section deals with the manner in which the skills, competencies and literacies identified in the 64 journal articles (see Tables 1 and 2) and as represented in Appendixes A and B were benchmarked against a competency framework as adopted and modified from Bartram (2005) and Prifti et al. (2017). In its original sense and as conceptualised by Bartram (2005), the framework has the Great Eight competencies (*the Great Eight*) which articulate work performance domains. It also has competency dimensions (20 such dimensions) and competency components (112 such dimensions) (also see Hecklau et al., 2016; Kusmin et al., n.d.; Prifti et al., 2017). Prifti et al. (2017) modified Bartram's (2005) competency framework by clustering it into information systems (IS), computer science (IT) and engineering competencies. The current framework used in this paper added three clusters to the Great Eight, making it have 11 clusters of main generic competencies (the Big Eleven). These three additional clusters are: displaying and demonstrating job-related skills/competencies; mastering and displaying language-specific skills/competencies; and demonstrating inter-/cross-disciplinary skills/literacies (see Table 5). The reason for the additions was to cater for all the types of skills, competencies and literacies extracted from the 64 journal articles. In addition, the framework did away with the IS, IT and engineering competencies trichotomy as the types of skills, competencies and literacies culled from the 64 journal articles were more than this trichotomy could accommodate (see Table 5). Moreover, the framework has the skill/competency dimensions, skills, competencies and literacies, and specific journal article numbers.

For example, in terms of the current competency framework (see Table 5), the first cluster of the 11 main generic competency clusters (the Big Eleven) is *Leading & Deciding* with *deciding, initiating action & leading*, which is its key skill/competency dimension. Among its associated skills are autonomy; reliability; organisational skills; leadership skills; persistence and initiative; and decision making. Thirteen journal articles cite and reference these skills in varying degrees with decision making among the most highly cited. This cluster is followed by

**Table 5.** Big Eleven, skill/competency dimensions, skills/competencies/literacies and journal article numbers.

Big Eleven	Skill/Competency Dimensions	Skills/competencies/literacies	Journal Article Numbers
Leading & Deciding	Deciding, initiating action & leading & supervising	Autonomy; reliability; organisational skills; ability to plan and lead a small team; responsibility; horizontal decision making; diffusion of responsibilities; leadership skills; adaptive, persistence and initiative; independent thinking; acting autonomously; and responsible thinking; decision making.	3, 5, 16, 17, 21, 22, 32, 40, 46, 52, 53, 55, and 56. Total: 13
Supporting & Cooperation	Working with people	Cooperation; collaboration; social skills (e.g. sharing, negotiating, empathy and cooperation); collective participation; teamwork; social interaction/teamwork skills; social and cultural awareness; group work; social competencies; people skills; collective intelligence; peer production; co-creation; networking; empathy; sensitivity; social-consciousness thinking; information sharing; creative dimensions (e.g. empathy, curiosity and imagination); diversity; empathic communication skills; open thinking; open culture; social competences; global citizenship; cross-cultural understanding; social and cultural skills; conflict management; global awareness; social competences; participatory learning; and solving social problems.	3, 4, 5, 8, 9, 16, 17, 19, 20, 21, 22, 26, 27, 29, 30, 31, 32, 33, 35, 36, 39, 41, 43, 44, 45, 46, 49, 50, 52, 56, 59, 60, 61, and 63. [Collaboration = 20] [Information related skills = 1] Total: 34
	Persuading & influencing	Social (emotional) skills; social and emotional competences; and emotional intelligence.	10, 27 and 52. Total: 3
	Applying expertise & technology	Business intelligence; data analytics; knowledge of security standards and communication standards; knowledge of servers; technical skills; knowledge of technical documentation; ability to learn how to maintain new machines; basic knowledge of electronics, hydraulics, and service of the pressure cylinders; high technical, informatics and computational skills; programming skills; technical knowledge and skills; information, media and technology skills; (in-depth) technical skills; technology management; programming thinking; mathematical thinking; technical competencies (e.g. technical skills, media skills and coding skills); information-communication skills; mathematical and vertical	3, 5, 6, 7, 8, 13, 14, 21, 22, 24, 30, 31, 41, 42, 44, 46, 47, 48, 49, 50, 51, 53, 55, 56, 57, 62, and 63. [Programming skills = 6] [Information related skills = 1] Total: 27

(continued)

**Table 5.** (continued)

Big Eleven	Skill/Competency Dimensions	Skills/competencies/literacies	Journal Article Numbers
		<p>technological competences; processing and visualisation of manufacturing process data; technical competences; software programming, and data analysis or scientific computing; big data analysis; technology skills; high IT competence; technical literacy; scientific creativity; computer programming; science literacy; technical, computational and statistical competencies; statistical literacy; visualisation and processing of large amounts of data; data infrastructure literacy; technical and statistical skills; data management; high-performance computing skills and user experience design skills; coding/software engineering/app building skills; software testing skills; hard skills (e.g. numerical and higher mathematical knowledge, problem solving, creativity and design skills, investigative and experimental skills, information processing, computer programming, and knowledge of specific software tools); technical-based skills (e.g. engineering); data processing; and data science.</p>	
Analysing		<p>Problem solving; analytical/logical thinking; problem solving; science process skills/problem-solving skills; abilities of synthesis; competencies for the 21st-century skills/21st-century skills (e.g. problem solving and logical thinking); abstraction; formalisation; mathematisation; (huge) problem solving; problem solving (identifying new problems and solutions); high level-thinking skills; and analytical competence.</p>	<p>2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 16, 17, 18, 19, 21, 22, 25, 28, 30, 31, 33, 36, 43, 46, 52, 55, 56, 59, 60, and 61. [Problem solving = 26] Total: 30</p>
Creating & Conceptualising	Learning & researching	<p>Ability and willingness to learn new things; knowledge to stimulate; the ability to find, organise and retrieve information; 21st-century skills or lifelong learning; research competencies; studying, reasoning, thinking and planning; cognitive ability; curiosity; long-term and short-term learning; tacit knowledge; learning ability; career and learning skills; and new skills through continuous learning.</p>	<p>3, 8, 22, 23, 34, 44, 52, and 55. [Information related skills = 1] Total: 8</p>

(continued)



**Table 5.** (continued)

Big Eleven	Skill/Competency Dimensions	Skills/competencies/literacies	Journal Article Numbers
	Creating & innovating	Critical thinking; creativity; product innovation; technological innovation; innovation; digital innovation; learning and innovation skills; decision making innovation; competencies for the 21st-century skills/21st-century skills (e.g. creativity); innovative talent; high-tech innovation ability; technical and technological innovation; social innovation; technological innovation; industrial innovation; novel solutions; creative problem solving; disruptive innovation; creative approaches; educational innovation; innovation (product, process, service, business model, disruptive, radical design-driven, social and responsible innovation); critical judgement; critical inquiry; creative, digital literacy; product and service innovation; critical stance; critical thinking abilities; innovativeness; creativeness; and critical writing competence.	2, 3, 4, 5, 7, 10, 13, 16, 17, 18, 19, 20, 21, 23, 25, 26, 27, 28, 29, 30, 31, 33, 36, 37, 38, 39, 40, 41, 43, 44, 46, 49, 50, 51, 52, 53, 55, 59, 60, 61, 62, 63, and 64. [Innovation = 19] [Creativity = 21] [Critical thinking = 11] Total: 43
	Formulating strategies & concepts	Managing complexity; skills for managing complex projects; complex skills; complex problem solving complex/critical decision making; complex problem solving; and solving complex problems	22, 26, 27, 40, 50 and 54. Total: 6
Organising & Executing	Planning & organising	Self-management; planning; organisation; action-related competencies; high self-efficacy; self-learning solutions; and self-direction capabilities	8, 12, 15, 45, and 59. Total: 5
Adapting & Coping	Adapting & responding to change	Flexibility; adaptability; adaptation to various situations; personal flexibility; the ability to deal with constant change and completely new tasks; mental agility; agility; resilience; risk-taking; and flexibility to perform adaptive abilities.	3, 8, 10, 15, 22, 25, 27, 36, 44, 55, 59, and 60. Total: 12
	Entrepreneurial & commercial thinking	Entrepreneurship competencies; entrepreneurial skills; entrepreneurial competence; entrepreneurial thinking; and entrepreneurship.	8, 21, 22, 32, and 52. Total: 5
Displaying & Demonstrating Job-related Skills/Competencies	Possessing & applying job-related skills/competencies	Applicative skills tied to specific situations, technologies, and work processes; skills in the specific industry; employability skills; management critical thinking; domain-related competencies; professional skills;	5, 7, 8, 10, 15, 17, 18, 21, 22, 23, 24, 26, 31, 32, 36, 44, 49, 50, 53, 55, 56, 59, and 64. Total: 23

(continued)

Table 5. (continued)

Big Eleven	Skill/Competency Dimensions	Skills/competencies/literacies	Journal Article Numbers
		specific skills; labour skills; professional competencies; Industry 4.0 knowledge and skills; business competences; efficient and high-quality skills; skills (e.g. design, service processes, customer data management); design thinking; failure analysis; high-skills; workforce skills; higher skills (e.g. creativity); design and selective thinking; productive and problem solving thinking; scenario thinking; artistic skills; practical engineering; human-robot collaboration (cobot); data-driven decisions; marketing skills; digital literacy 4.0; communication competence 4.0 (e.g. skills of human-human communication and skills of and the understanding of human-machine communication); competences for Industry 4.0; servitisation; digital skills for the general workforce and specific digital skills for the ICT professionals); ICT literacy; productivity; and productivity.	
Mastering and Displaying Language-specific Skills/Competencies	Demonstrating & applying language-specific skills/competencies	Language skills (e.g. reading, speaking, listening, and writing skills); communication skills; communicativeness; communication; literacy; effective communication; literacy skills.	1, 2, 3, 5, 7, 8, 14, 16, 18, 19, 22, 23, 24, 31, 34, 36, 38, 39, 40, 41, 43, 44, 46, 47, 52, 56, 58, 59, 60, 61, and 62. [Communication = 19] [Communication skills = 7] Total: 31
Demonstrating Inter/Multi/Transdisciplinary Skills/Literacies	Applying inter/multi/transdisciplinary skills	Digital skills; e-literacy skills; data analysis; basic knowledge statistically; manual skills; media skills; cognitive, linguistic and social skills; mathematical and interpersonal skills; relational and communicative skills; interdisciplinary thinking; soft skills; cultural and intercultural competency; flexibility (interdisciplinary collaboration, soft skills); foundational skills (e.g. basic skills, thinking skills and personal qualities); five competencies (e.g., use of resources, interpersonal skills, information, systems and technology); life and career skills; 21st-century skills; thinking skills(e.g. observation, estimation, and manipulation); critical academic skills (e.g. writing, reading, research, creativity,	1, 3, 5, 6, 7, 9, 10, 11, 12, 14, 17, 22, 24, 31, 35, 38, 40, 42, 43, 44, 45, 47, 48, 49, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 63, and 64. [Digital skills = 7] [Information related skills = 5] Total: 36

(continued)

**Table 5.** (continued)

Big Eleven	Skill/Competency Dimensions	Skills/competencies/literacies	Journal Article Numbers
		<p>collaboration, critical thinking, decision making, problem solving, and communication skills); varying scholarly skills; interdisciplinary skills; personal competencies; social/interpersonal competencies; methodological competencies (e.g. creativity, problem solving, decision making, and analytical skills); social competencies (e.g. intercultural skills, language skills, communication skills, networking skills, the ability to transfer knowledge, and leadership skills); personal competencies (e.g. flexibility, ambiguity tolerance, motivation to learn, ability to work under pressure, and sustainable mindset); psychomotoric skills; competences for the digital society; transversal knowledge (a mix of pedagogical and digital skills); basic digital skills; interdisciplinarity; digital thinking; digitisation; digitalisation; information process; Internet literacy; digital literacy; technology literacy; human literacy; technical, methodological, social and personal competencies; unlimited variability of behaviour; multi-purpose skills; digital competencies; interdisciplinary skills; information-processing skills (e.g. literacy, numeracy and problem-solving skills); multi- and interdisciplinary skills; digital literacy skills; fundamental literacy; digital literacy; heterogeneous skills; data literacy/data literacies; information literacy; information and media literacy; competencies (e.g. thinking in interconnected systems); Internet literacy skills; transferrable skills; digital literacies; digital and Internet competency; specific competencies (e.g. intelligence, personality and abilities); technology literacy competency; technology literacy (e.g. the understanding of the operation of the technology); digital competences; general skills; basic skills; and literacy competence.</p>	

*Supporting & Cooperation* which has *working with people* as its key skill/competency dimension. Some of the skills/competencies it has are: cooperation; collaboration; social skills; teamwork; people skills; co-creation; networking; social competencies/social competences; open thinking; global citizenship; and global awareness. All together, the skills/competencies under this cluster are mentioned by 34 journal articles with collaboration as the most cited, as it is cited by 20 journal articles. In this case, information-related skills appear once in this cluster.

The fourth cluster of the Big Eleven in this framework is *Analysing & Interpreting*. Its two skill/competency dimensions are *applying expertise & technology* and *analysing*. Some of the skills, competencies and literacies subsumed under the first skill/competency dimension are: business intelligence; data analytics; knowledge of security standards and communication standards; knowledge of servers; high technical, informatics and computational skills; programming skills; software programming; high IT competence; technical literacy; computational and statistical competencies; data infrastructure literacy; coding/software engineering/app building skills; software testing skills; and data processing. Of these, programming skills as a skill-set is cited by 6 journal articles, while the other skills, competencies and literacies under this dimension are referenced by 27 journal articles. In this skills mix, information related skills appear once. Some of the skills classified under the second dimension in this cluster include the following: problem solving; analytical/logical thinking; abstraction; formalisation; high level-thinking skills; and analytical competence. These skills are cited by 30 journal articles with problem solving as the most cited skill set by 26 journal articles. Problem solving is also the most cited of all skill sets in all the Big Eleven clusters. Moreover, put together, the two skill/competency dimensions under this cluster have the most cited skills and competencies (at 57 combined frequency counts) when compared to the other skills and competencies classified under the other 10 clusters in this competency framework.

*Creating & Conceptualising* is the fifth cluster in this competency framework. Its three skill/competency dimensions are *learning & researching*, *creating & innovating*, and *formulating strategies & concepts*. *Creating & innovating* has skills such as critical thinking, creativity, innovation, technical and technological innovation, and product and service innovation. These skills, together with others subsumed in this dimension, feature in 43 journal articles. Of these, creativity, innovation and critical thinking have a high occurrence frequency with creativity being the most cited by 21 journal articles. In contrast,

the last two are cited by 19 and 11 journal articles, respectively. In this context, the other two skill/competency dimensions have the least occurring and cited skills by journal articles in this cluster (see Table 5). Furthermore, information-related skills appear once under *learning & researching*.

Another cluster of the Big Eleven, *Displaying & Demonstrating Job-related Skills/Competencies*, has *possessing & applying job-related skills/competencies* as its actual skills/competencies. Some of the skills, competencies or literacies classified under it are: applicative skills tied to specific situations; skills in the specific industry; employability skills; domain-related competencies; labour skills; Industry 4.0 knowledge and skills; business competencies; communication competence 4.0; and ICT literacy. In all, the skills, competencies or literacies listed in this cluster are cited by 23 journal articles in varying degrees. Following the above-mentioned cluster is *Mastering and Displaying Language-specific Skills/Competencies* whose skill/competency dimension is *demonstrating & applying language-specific skills/competencies*. The skills listed under this cluster feature in 31 journal articles with communication as the most cited skill.

The last of the clusters with the most skills, competencies and literacies in the Big Eleven is *Demonstrating Inter/Multi/Transdisciplinary Skills/Literacies* whose skill/competency dimension is *applying inter/multi/transdisciplinary skills*. As its name indicates, there are transversal skills, competencies and literacies itemised under it such as digital skills, e-literacy skills, interdisciplinary thinking, foundational skills, personal competencies, information literacy and literacy competence. Put together, all the skills, competencies and literacies in this cluster are cited by 36 journal articles in varying degrees. Under this cluster, information-related skills feature five times (see Table 5).

Finally, there are four more clusters with fewer skills and competencies listed under them as extracted from the journal articles concerned. These are – with their respective skill/competency dimensions in brackets: *Adapting & Coping* (*adapting & responding to change*); *Organising & Executing* (*planning & organising*); *Enterprising & Performing* (*entrepreneurial & commercial thinking*); and *Interacting & Presenting* (*persuading & influencing*). The first two clusters have, each, skills such as flexibility, adaptability and resilience, and such as self-management, planning and self-direction capabilities listed under them. Skills classified under each of them are cited by 12 and 5 journal articles, respectively. To this effect, *Enterprising & Performing*, under which skills like entrepreneurship competencies, entrepreneurial skills and entrepreneurial thinking are subsumed, also

has its skills cited by five journal articles, while *Interacting & Presenting* has the least cited skills of all the other 10 clusters in this Big Eleven.

## Discussion

This section discusses the findings of the current scoping review study as presented in the preceding section. Moreover, the discussion of the findings is framed to respond to the four research questions (RQ1, RQ2, RQ3 and RQ4) of the study. Underscoring these four research questions is the study's dual purpose: identifying skills, competencies and literacies attributed to the fourth industrial revolution (4IR) by the 64 peer-reviewed journal articles scoped; and establishing similarities, overlaps and differences between such skills, competencies and literacies.

### *Subject disciplines of the reviewed journal articles*

As described in the findings presented in the preceding section, the 64 journal articles reviewed in this study were drawn from 28 subject disciplines, with one journal article's subject discipline recorded as unspecified. Of these articles, 31 (almost half the journal articles reviewed) belonged to four subject areas: education; manufacturing; business, management and education; and cross-disciplines. The first subject discipline had 10 articles, while the last three subject areas had 7 articles, apiece. The other remaining subject disciplines had 2 articles and 1 article, except for humanities and social sciences which had 4 articles. While the subject disciplines identified for the reviewed journal articles are not in any way exhaustive, a competency model by Prifti et al. (2017) which analysed employee competencies with higher education in what it calls I4.0 (Industry 4.0), focused on only three subject disciplines: information systems (IS), computer science (IT) and engineering. In addition, Erol et al.'s (2016) paper proposes competencies for the future of production by focusing on engineering and management practice.

In the same vein, Cotet et al.'s (2017) study proposes a model for a constellation of skills and personal qualities required for Industry 4.0 at a Romanian university for three subjects: robotics, machine-tools/manufacturing systems and logistics. Furthermore, Bermúdez and Juárez's (2017) and Hecklau et al.'s (2016) papers argue for the types of competencies to be adopted for Industry 4.0 by operations management personnel and for strategic competencies needed for the future workforce by human resource management, respectively. Finally, Kamaruzaman et al.'s (2019) study proposes a framework consisting of 4IR skills that are essential for engineering graduates in Malaysia.

### *Skills, competencies and literacies the 64 reviewed journal articles attribute to 4IR/Industry 4.0*

As pointed out under the findings section, of the 64 reviewed journal articles, 41 articulate key issues pertaining to 4IR by referencing skills and competencies. Such skills and competencies entail a broad spectrum spanning academic disciplines and workplace or employment domains. In this context, 5 articles (3, 5, 7, 14 and 22) (see Table 4) cite more skills and competencies than the other articles. These articles belong to the following four subject disciplines, respectively: manufacturing; artificial intelligence; education; and human resources (with 3 and 22 sharing the same subject area). As such, 3 and 22 have a mix of hard and soft skills/competencies, whereas 5, 7 and 14 depict skills and competencies highly skewed to soft skills. All the 5 articles share communication skills in common. Both problem solving and creativity are shared by 4 and 3 articles, singly, out of the 5 articles. This means that communication is a similar skill shared by and that overlaps all 5 articles. Likewise, problem solving and creativity are two similar types of soft skills shared by and which overlap 2 articles. Creativity and problem solving also feature in Kamaruzaman et al.'s (2019) competency framework for 4IR skills, even though communication does not. Similarly, in Cotet et al.'s (2017) study that proposes skills and personal qualities required for Industry 4.0, creativity is at the core of the top three skills needed, in which case it tops both emotional intelligence and proactive thinking, respectively. Nonetheless, communication and problem solving are not listed in the constellation of skills and personal qualities required for Industry 4.0 in their study.

By contrast, the remaining 23 reviewed journal articles frame core issues about 4IR by citing skills, competencies and literacies related to several subject disciplines or workplace domains. For example, 4 articles belonging to business, management and education, education, human resources, and manufacturing, cite the most skills, competencies and literacies relative to the other articles in Table 2. In this regard, human resources, manufacturing and education are the three subject disciplines or workplace domains in both Appendixes A and B with the most cited instances of skills, competencies (and literacies) attributable to 4IR/Industry 4.0. Two of the 4 articles (44 and 50) in Table 2 have skills, competencies and literacies skewed to soft skills, while the other 2 articles have a mix of hard and soft skills. Communication, creativity and problem solving are three similar types of soft skills shared by and which overlap 3 of the 4 articles. As pointed out in the preceding paragraph, creativity and

problem solving are listed as 4IR skills in Kamaruzaman et al.'s (2019) study, while Cotet et al.'s (2017) study lists creativity as a core Industry 4.0 skill (also cf. Bermúdez and Juárez, (2017). However, both studies, unlike the 64 journal articles reviewed in the current study, do not have communication as one of the 4IR/Industry 4.0 skills.

Needless to say that, in both Tables 1 and 2, communication and creativity (and collaboration in the case of Table 2) are part of the so-called 4C's (Pedron, 2018; Zain, 2017), whereas the three of them form part of the 21st-century skills (Damian and du Plessis, 2015; Demartini and Benussi, 2017; Forsström and Kaufmann, 2018; Romero, 2015; Schleicher, 2012). In this case, communication, creativity and problem (and collaboration as identified above) serve as stylised facts – accepted empirical regularities or empirical truths in line with Helfat's (2007) view as pointed out earlier. While this is the case for the journal articles identified above, soft skills do feature predominantly in the 64 reviewed journal articles as they consistently appear in each one of them in varying degrees. The same seems to hold true for Prifti et al.'s (2017) work: the competencies it attributes to Industry 4.0 and to both its concomitant Big Eight competency model and its related competency dimensions are all slanted toward soft skills. Similarly, the Industry 4.0 competencies identified by Benešová and Tupa (2017), Cotet et al. (2017), Fitsilis et al. (2018), Hecklau et al. (2016), and Kusmin et al. (n.d.) are dominated by soft skills. This particular observation makes soft skills (in whatever permutations and variations) the most dominant and the most occurring skills/competencies for 4IR. Additionally, soft skills, in this instance, need to be seen as stylised facts. If this is the case, the hype about the primacy of new skills for 4IR is unwarranted as soft skills have been in existence prior to 4IR – with its 2011 launch (Afrianto, 2018; Schwab, 2016). Even more so, they predate the equally much-hyped 21st-century skills (Damian and du Plessis, 2015; Hariharasudan and Kot, 2018; Hussin, 2018; Kivunja, 2015; Messias et al., 2018; Zain, 2017).

In terms of the two categories into which skills extracted from the 64 reviewed articles were classified, the pattern noted above played itself out as outlined. For example, in the first category represented in Appendix A, skills that feature preponderantly under the first sub-category (Miscellaneous skills) are those dubbed the 21st-century skills (Eguchi, 2014; Forsström and Kaufmann, 2018; Marope et al., 2017; Puncreobutr, 2016; Romero, 2015; Schleicher, 2012) or those that go by the monicker, the 4Cs (Kivunja, 2015; Pedron, 2018; Schleicher, 2012; Zain, 2017). Known conventionally as generic skills

or as soft skills, there are six of them featuring in this skill set: problem solving; communication (skills); creativity; collaboration; critical thinking; and decision making. In this context, the first three types of skills have the highest consecutive occurrence frequency in this sub-category. This means that these three types of skills are similar skills shared by and which overlap in this skill set. In this regard, creativity, problem solving and critical thinking are listed as 4IR skills in Kamaruzaman et al.'s (2019) study, whereas only creativity features as an Industry 4.0 skill in Cotet et al.'s (2017) study (also cf. Bermúdez and Juárez, (2017). Equally, in Category Two (see Appendix B) the skills classified as 21st-century skills feature mostly in the corresponding first sub-category. These are communication (skills/competence), creativity, collaboration, problem solving and critical thinking, with the first three types of skills having the highest occurrence frequency in their sub-category. Again, this indicates that these three types of skills are similar skills shared by and which overlap in this skill set. Moreover, this underscores the fact that all of these skills are instances of stylised facts since they are essentially both soft skills and 21st-century skills.

Viewed together, these two sets of 21st-century skills and competencies not only have the highest occurrence frequency both in their respective sub-categories and in the two categories overall, but they feature prominently as skills and competencies attributed to 4IR by 54 of the 64 reviewed journal articles. Each of these 54 articles mentions them comprehensively or in varying degrees. In this case, these 21st-century skills and competencies are similar skills and competencies shared by and which overlap in 54 journal articles. Even of the 10 other journal articles that do not mention any of these skill sets, 6 of them do cite interdisciplinary skills, personal competencies, social/interpersonal competencies, professional skills, people skills, critical inquiry among their collage of skills they attribute to 4IR (see Tables 1 and 2). To this effect, Cotet et al. (2017) cite personal qualities (e.g. self-actualisation) and interpersonal skills (e.g. empathy) as necessary for robotics, machine-tools/manufacturing systems and logistics students at a Romanian university in the Industry 4.0 era. Again, in this context, this particular trend makes 21st-century skills or soft skills the most dominant and the most occurring skills/competencies for 4IR. Most importantly, this underlines their status as stylised (Helfat, 2007) skills/competencies and not as new skills/competencies for 4IR. This, once more, makes the hype about the new skills for 4IR uncalled for as both 21st-century skills and soft skills predate the 4IR era.

Referring to Education 4.0, specifically, Afrianto (2018) urges that for teachers to be effective in the 4IR era, they need to hone four core skills: critical thinking and problem-solving skills; communication skills; collaboration skills; and the ability to create new things (creativity). However, these four core skills have been there as part of soft skills, or as stylised skills even in the 20th century. In the same vein, the warning by the World Economic Forum (WEF) (Afrianto, 2018) is that in 2015, the skills priority sequence was: (1) complex problem solving; (2) cooperation (coordinating with others); (3) people management; (4) critical thinking; and (10) creativity, but that in 2020, this sequence would be as follows: (1) complex problem solving; (2) critical thinking; (3) creativity; (4) people management; and (5) cooperation (coordinating with others) (also see Hussin, 2018). Besides the switching of positions, the skills mentioned in these two skills priority sequences are not new. Nor are they peculiar to the 4IR era: they have been in existence as part of soft skills before the 4IR epoch, a factor making them stylised facts (Helfat, 2007).

For skills/competencies related to 4IR technologies, and for skills/competencies and literacies related to the 4IR technologies, programming skills feature in their respective sub-categories in the two categories represented in Appendixes A and B. Other germane skills are Industry 4.0 knowledge and skills (Appendix A) and digital literacy 4.0, communication competence 4.0, competences for Industry 4.0, and data literacy/data literacies (Appendix B). In the case of Category One, such germane 4IR-specific skills are cited by 8 journal articles belonging to 9 subject disciplines, while concerning Category Two, such skills and literacies are cited by 7 journal articles belonging to six subject disciplines. In their study, Bermúdez and Juárez (2017) found that hard skills such as knowledge and management of software and interfaces intended to support operations management and knowledge and management of simulation systems, were ranked highly in their respective dimensions. In the same vein, Kamaruzaman et al. (2019) cite technology design and programming as one of the key 4IR skills for engineering graduates in Malaysia.

Despite the fact that Industry 4.0 knowledge and skills, digital literacy 4.0, communication competence 4.0 and competences for Industry 4.0 are both imprecise and nebulous as framed by the journal articles from which they were extracted, data literacy is touted as the ‘most important new skill of the 21st century’ (Gray et al., 2018: 4), especially when it is seen as part of ‘datafication’ (pp. 1 and 3). In this sense, it is construed as being at the epicentre of information literacy, statistical literacy and technical skills (Gray et al., 2018). To this end, Bhargava et al. (2015) define data

literacy as ‘the desire and ability to engage constructively in society through and with data’, while Ridsdale et al. (2015: 11) define it as ‘the ability to collect, manage, evaluate, and apply data, in a critical manner’. The current review study aligns itself with the view that data literacy is one of the literacies needed for 4IR. However, narrower conceptions of data literacy that reduces it purely to technicism should be avoided (Bhargava et al., 2015; Farrell and Corbel, 2017; Gray et al., 2018; Ridsdale et al., 2015).

With reference to outlier skills and competencies in both categories (Category One and Category Two), for example, on the one hand, Coşkun et al. (2019) argue that interdisciplinary thinking is one of the skills engineering education students in the Slovakian higher education system will require in the Industry 4.0 era. Likewise, in their study, Bermúdez and Juárez (2017) argue that transdisciplinarity is one of the required Industry 4.0 skills for operations management personnel. Comparably, Magruk (2016) contends that companies will put more emphasis on interdisciplinary skills in the Industry 4.0 era. He pairs this with design thinking, pointing out that the latter will be prized over production thinking for Industry 4.0. On the other hand, Hecklau et al. (2016) opine that one of the essential skills for Industry 4.0 is ambiguity tolerance, by which they refer to accepting change in a workplace. It is not convincing that interdisciplinary thinking, design thinking and ambiguity tolerance are uniquely and exclusively 4IR/Industry 4.0 skills. These skills are reminiscent of Pink’s (2006) conceptual age which valourises, among other things, design, story, symphony, empathy and meaning, all of which are interdisciplinary soft skills, or are interpersonal skills as suggested by Cotet et al. (2017). In this context, it is worth pointing out that interdisciplinary thinking and design thinking are two similar skills shared by and which overlap in these two categories.

In respect of outliers for Category Two, user experience design skills and investigative and experimental skills stand out. For instance, Mihalcea (2017) maintains that the former will remain onshored by companies among Industry 4.0 skills as opposed to skills such as ‘coding/software engineering/ app building skills and software testing skills’ (p. 298). In contrast, Motyl et al. (2017) argue that the latter (investigative and experimental skills) will be among the hard skills needed by mechanical engineers for Industry 4.0. Again, here, user experience design skills are no different from conceptual skills as articulated by Pink (2006), while investigative and experimental skills as part of hard skills predate the 4IR era. In this sense, they can be regarded as stylised facts (Helfat, 2007). All of this, including the points

highlighted above, apply to each of the remaining sub-categories in both Appendixes A and B. For example, skills and literacies represented as pedestrian and unclear/vague are as classified in these two appendixes, and overall, do not reflect anything new or exceptional in terms of 4IR skills.

In both appendixes, little is said about information literacy. As such, information literacy is not only under-represented and under-cited as a skill or literacy for 4IR in these two appendixes, but it is also under-represented and under-cited as a skill or literacy for 4IR in the 64 reviewed journal articles. For instance, it is mentioned scantily 11 times as information literacy or as its permutations by 10 journal articles. This flies in the face of Gray et al.'s (2018) argument that information literacy is part of the Industry 4.0 tri-literacy (comprising information literacy, statistical literacy and technical skills) at whose concentric point data literacy is located. This is also inconsonant with the generally stylised fact that information literacy is one of the 21st-century skills, and especially one of the 21st-century tools for work as articulated by, for example, Schleicher (2012).

Pertaining to the competency framework and its attendant competency clusters, its related skill/competency dimensions and the corresponding skills/competencies represented in this framework (see Table 5), again, soft skills or 21st-century skills are the most highly cited in these 11 main competency clusters (Great Eleven). For example, decision making and collaboration top the first two clusters as the most highly cited skills in these two clusters, respectively. Unless these tried and tested soft skills are re-oriented and are assigned new meanings that resonate with 4IR such as real-time decision making (Rüßmann et al., 2015) and virtual collaboration (Bermúdez and Juárez, 2017; Mourtzis and Boli, 2018), or human-robot collaboration (cobot) (Ahmad et al., 2018), they simply remain prosaic or stylised skills (Helfat, 2007).

The fifth and tenth clusters are two more clusters under whose competency dimensions two types of soft skills, creativity and communication, are the highly cited skills, apiece. Caruso (2018) frames these two soft skills, together with others, within Industry 4.0 and 4IR as follows: 'Representations on the consequences of Industry 4.0 and the "Fourth industrial revolution" . . . herald changes in which 'fast problem-solving abilities, creativity, cognitive, linguistic and social skills' will be 'affected by the current centrality of information, knowledge, communication and data' (p. 380). Caruso's (2018) framing of these soft skills represents, in a way, re-orienting them within the Industry 4.0 and 4IR context. In a different but related context, Benitti and Spolaôr's (2017) literature review study investigated

the state-of-the-art robotics applications for supporting STEM teaching in 60 reviewed papers. It discovered that, in addition to mathematical skills, soft skills such as teamwork, problem solving, critical thinking, creative thinking (creativity) and communication were among the most cited in the 60 reviewed papers. To some extent, this development in which soft skills feature as some of the flagship skills for 4IR dovetails with the current scoping review study's findings since robotics is taken to be one of the key areas of 4IR. Moreover, this development emphasises the status of these soft skills as stylised facts (Helfat, 2007).

Similarly, the 11th cluster, even though it has miscellaneous transversal skills, has the majority of skills listed under it as soft skills such as communicative skills, interpersonal skills/competencies, intercultural competency, flexibility, ability to work under pressure, and intelligence. In this regard, Erol et al. (2016) are of the view that interpersonal competencies such as 'the ability to understand relations between processes' and 'cooperative decision processes' (p. 14) will be important for Industry 4.0 workers. Above all, they contend that 'managers, engineers and workers will have to show literacy with the different flavors of technical communication and cooperation systems' (p. 14). Nonetheless, they caution against 'a naïve technology devoutness' (p. 14) and suggest viewing technology critically, a point which the current study supports. Overall, the skills and competencies listed in this cluster lend themselves as stylised facts in line with Helfat's (2007) view.

In contrast, in the fourth cluster, programming skills and problem solving are the highly cited skills in their respective competency dimensions, with skills and competencies in these two competency dimensions having the highest frequency count vis-à-vis the other competency dimensions in this cluster. Programming skills have emerged as some of the skills that are in demand in the 4IR era alongside data literacy. Forsström and Kaufmann (2018) opine on this point by drawing the link between programming skills and problem solving and logical thinking:

[P]rogramming skills have become increasingly important core competencies for 21st-century skills . . . Many countries have recognized that programming needs to be integrated into school curricula to equip students with skills such as problem solving and logical thinking, which are important in today's digital society. (pp. 18–19)

This view is supported by Coşkun et al. (2019: 5) who maintain that 'syllabi for programming courses in engineering . . . should . . . introduce not only low level



programming languages, but also new programming languages that are more common in artificial intelligence and data science . . . like Python and R'. To this end, Bermúdez and Juárez (2017) maintain that problem solving will be one of the required skills for Industry 4.0 (also see Kazancoglu and Ozkan-Ozen, 2018).

The remaining four clusters have skills such as flexibility, adaptability, self-direction and entrepreneurial skills under their ambit. Referring to the significance of flexibility in the Industry 4.0 era, Lavelle et al. (2017: 30) have this to say:

It is very clear that this revolution [Industry 4.0] will generate a deep modification of the geography of the labour market. Certainly, from the point of view of general tasks, soft skills and flexibility, the landscape is going to change if not to completely turn upside-down.

Equally, Romero (2015) articulates the view that flexibility, self-direction, risk-taking and planning are among the skills that will be needed in the 21st-century context. This assertion tends to dovetail with Cotet et al.'s (2017) study in which strength of self and self-discipline feature as some of the Industry 4.0 interpersonal skills for robotics, machine-tools/manufacturing systems and logistics students. Lastly, Puncreobutr (2016) echoes the same sentiment by pointing out that entrepreneurial thinking is one of the important skills that students will require for them to be able to live in the Education 4.0 era.

## Implications and conclusion

As mentioned earlier on, this scoping review study had a dual purpose: to identify skills, competencies and literacies attributed to the fourth industrial revolution (4IR) by the 64 journal articles reviewed; and to establish similarities, overlaps and differences between such skills, competencies and literacies. The 64 reviewed journal articles covered 28 subject disciplines - with one unspecified subject discipline - formed part of this scoping review study. Of these journal articles 31 pertained to four subject areas: education; manufacturing; business, management and education; and cross-disciplines. In all, the reviewed journal articles attribute a range of skills, competencies and literacies spanning a wide spectrum of academic disciplines and workplace domains to 4IR or to Industry 4.0. The journal articles that cited the most skills and competencies attributable to 4IR from Tables 1 and the journal articles that cited the most skills, competencies and literacies linked to 4IR and 2 were from human resources, manufacturing and education.

Skills and competencies attributed to 4IR by 54 of the 64 reviewed journal articles were generic soft

skills classified as the 21st-century skills such as communication (skills), innovation, creativity, problem solving, collaboration, critical thinking, and decision making. These skills had the highest occurrence frequency and featured predominantly in the 54 journal articles and in the two categories (see Appendixes A and B) under which they were classified. Four of these skills, excluding problem solving and decision making are dubbed the 4C skills (the 4Cs). Overall, of these 21st-century skills, the first five skills were the most cited, respectively. In addition, all of these soft skills were similar skills shared by and that overlapped in 54 of the 64 reviewed journal articles. The current scoping review study has referred to all of these highly cited soft skills as stylised skills in keeping with Helfat's (2007) notion of *stylised facts* as they predate the 4IR era and, therefore, as they are not necessarily new skills. Alongside the soft skills attributed to 4IR or to Industry 4.0 are interdisciplinary skills, which were cited by 6 of the 64 reviewed journal articles. However, this scoping review study has argued that interdisciplinary thinking (together with design thinking and ambiguity tolerance with which it overlapped in this study) is not a uniquely and exclusively 4IR/Industry 4.0 skill given that it has the aura of Pink's (2006) conceptual age to it. This age, too, like 21st-century skills, predates the 4IR era.

With reference to the hard skills attributed to 4IR by the reviewed journal articles, programming skills featured predominantly. Even though programming skills have been in existence for some time, the current paper is of the view that given their reconceptualising by scholars such as Coşkun et al. (2019) and Forsström and Kaufmann (2018), there is a case to be made for programming skills to be regarded as 4IR skills, especially if they are seen in conjunction with big data and data literacy. Moreover, certain skills attributed to 4IR by the reviewed journal articles are vaguely articulated.

In respect of information literacy, it is the view of this paper that this particular skill is both under-represented and under-cited by the 64 reviewed journal articles, notwithstanding the fact that it is sporadically mentioned 11 times by 10 journal articles. This development, as pointed out earlier, flies in the face of scholars such as Gray et al. (2018) and Schleicher (2012) who see it as being central to the 4IR era. The current paper aligns itself with these two scholars' views despite information literacy's under-citation in the journal articles reviewed. The implication of the under-representation and under-citation of information literacy is that information literacy scholars have to do more to promote this skill as one of the core skills and literacies for 4IR.

One more implication emerging from this scoping review study is that 21st-century skills, which are essentially generic soft skills, were attributed more to 4IR skills by 54 of the 64 reviewed journal articles than discipline-based hard skills. Of these 21st-century skills, the 4C skills, collectively had the highest occurrence frequency and the highest citation count if these two variables are used as comparative metrics.

Another point worth highlighting is the limitations of this scoping review study. First, the study utilised only online databases and online search engines to harvest journal articles that formed part of its review. Thus, it was biased toward online publications and against non-online publications in its review focus. However, this decision was informed by the understanding that there are more online publications on 4IR/Industry 4.0 than non-online publications. Second, the search strings or keyword combinations employed for a vast area such as 4IR/Industry 4.0 are not exhaustive. Besides, some of the electronic databases used have in-built search syntaxes that respond optimally to some keyword combinations and not to others (cf. Alammary et al., 2019). Given this, multiple combinations of search strings were employed in order to extract optimal search results from all the specified databases. Third, the study had a bias toward peer-reviewed journal articles as opposed to non-peer-reviewed journal articles. When searching for information on 4IR during the course of this review, the researcher realised that there was also more information on 4IR provided by grey literature. But, the decision to focus only on peer-reviewed journal articles was to try and delimit the scope of the study by using peer reviewing as a distinguishing parameter. Last, future research needs to engage the competency framework employed in this scoping review study with a view to enhancing, improving, interrogating and critiquing it.

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### References

Abdelrazeq A, Janssen D, Tummel C, et al. (2016) Teacher 4.0: Requirements of the teacher of the future in context of the fourth industrial revolution. Available at: <https://library.iated.org/view/ABDELRAZEQ2016TEA> (accessed 17 February 2019).

- Aberšek B (2017) Evolution of competences for new era or Education 4.0. The XXV. In: *Conference of Czech Educational Research Association (CERA/ČAPV)*, 13–14 September 2017. Available at: <http://cpvuhk.cz/wp-content/uploads/2017/09/Aber%C5%A1ek.pdf> (accessed 17 February 2019).
- Afrianto A (2018) Being a professional teacher in the era of industrial revolution 4.0: Opportunities, challenges and strategies for innovative classroom practices. *English Language Teaching and Research* 2(1): 1–13.
- Ahmad N, Shamsuddin A and Abu Seman NA (2018) Industry 4.0 implications on human capital: A review. *Journal for Studies in Management and Planning* 4(13): 221–235.
- Alammary A, Alhazmi S, Almasri M, et al. (2019). Blockchain-based applications in education: A systematic review. *Applied Sciences* 9: 1–18.
- Anderson S, Allen P, Peckham S, et al. (2008) Asking the right questions: Scoping studies in the commissioning of research on the organisation and delivery of health services. *Health Research Policy and Systems* 6: 7.
- Arksey H and O'Malley L (2005) Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology: Theory & Practice* 8(1): 19–32.
- Attride-Stirlin J (2001) Thematic networks: An analytic tool for qualitative research. *Qualitative Research* 1(3): 385–405.
- Bartram D (2005) The great eight competencies: A criterion-centric approach to validation. *Journal of Applied Psychology* 90(6): 1185–1203.
- Benešová A and Tupa J (2017) Requirements for education and qualification of people in Industry 4.0. *Procedia Manufacturing* 11: 2195–2202.
- Benitti FBV and Spolaôr N (2017) How have robots supported STEM teaching? In: Khine MS (ed.) *Robotics in STEM Education: Redesigning the Learning Experience*. Cham, Switzerland: Springer, pp. 103–129.
- Bermúdez MD and Juárez BF (2017) Competencies to adopt Industry 4.0 for operations management personnel at automotive parts suppliers in Nuevo Leon. Available at: <http://ieomsociety.org/bogota2017/papers/117.pdf> (accessed 30 May 2019).
- Bhargava R, Deahl E, Letouzé E, et al. (2015) Beyond data literacy: Reinventing community engagement and empowerment in the age of data. Available at: <https://datapopalliance.org/wp-content/uploads/2015/11/Beyond-Data-Literacy-2015.pdf> (accessed 24 March 2019).
- Botha J (2019) Is your job safe from smart computers? *Finweek*, 30 July: 26–27.
- Brettel M, Friederichsen N, Keller M, et al. (2014) How virtualization, decentralization and network building change the manufacturing landscape: An Industry 4.0 perspective. *International Journal of Information and Communication Engineering* 8(1): 37–44.
- Caruso L (2018) Digital innovation and the fourth industrial revolution: Epochal social changes? *AI & Society* 33(3): 379–392.

- Chaka C (2019) Re-imagining literacies and literacies pedagogy in the context of semio- technologies. *Nordic Journal of Digital Literacy* 14(1–2): 54–69.
- Chaka C, Lephallala M and Ngesi N (2017) English studies: Decolonisation, deparochialising knowledge and the null curriculum. *Perspectives in Education* 35(2): 208–229.
- Cotet GB, Balgiu BA and Zaleschi V-C (2017) Assessment procedure for the soft skills requested by Industry 4.0. *MATEC Web of Conferences* 121: 1–8.
- Coşkun S, Kayıkçı Y and Gençay E (2019) Adapting engineering education to Industry 4.0 vision. *Technologies* 7(10): 1–13.
- Dallasega P, Rauch E and Linder C (2018) Industry 4.0 as an enabler of proximity for construction supply chains: A systematic literature review. *Computers in Industry* 99: 205–225.
- Damian CC and du Plessis HK (2015) Employability skills: Perspectives from a knowledge- intensive industry. *Education + Training* 57(5): 532–559.
- Davie N (2019) Smart speakers: Virtual teaching assistants of the future? In: *Conference: Blended learning congress 2019*, Fachhochschule Südwestfalen, Meschede, Germany. Available at: [https://www.researchgate.net/publication/330959082\\_Smart\\_Speakers\\_Virtual\\_Teaching\\_Assistants\\_of\\_the\\_Future](https://www.researchgate.net/publication/330959082_Smart_Speakers_Virtual_Teaching_Assistants_of_the_Future) (accessed 20 March 2019). doi:10.13140/RG.2.2.29038.46400
- Demartini C and Benussi L (2017) Do Web 4.0 and Industry 4.0 imply Education X.0? *IT Professional* 19(3): 4–7.
- Dijkers M (2015) What is a scoping review. *KT Update* 4(1): 1–5.
- Drath R and Horch A (2014) Industrie 4.0 – Hit or hype? *IEEE Industrial Electronics Magazine* 8(2): 56–58.
- Eguchi A (2014) Educational robotics for promoting 21st century skills. *Journal of Automation, Mobile Robotics & Intelligent Systems* 8(1): 5–11.
- Elbeck M (2018) The fourth industrial revolution's potential influence on marketing education. *e-Journal of Business Education & Scholarship of Teaching* 12(1): 112–119.
- Erol S, Jäge A, Hold P, et al. (2016) Tangible Industry 4.0: A scenario-based approach to learning for the future of production. *Procedia CIRP* 54: 13–18.
- Farrell L and Corbel C (2017) The Literacy 4.0 project: Literacy practices in the gig economy. Available at: [https://education.unimelb.edu.au/\\_\\_data/assets/pdf\\_file/0003/2541423/gig-economy-literacy-working-paper-170802.pdf](https://education.unimelb.edu.au/__data/assets/pdf_file/0003/2541423/gig-economy-literacy-working-paper-170802.pdf) (accessed 10 February 2019).
- Fereday J and Muir-Cochrane E (2006) Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods* 5(1): 80–92.
- Fitsilis P, Tsoutsas P and Gerogiannis V (2018) Industry 4.0: Required personnel competences. *International Scientific Journal 'Industry 4.0'* 3(3): 130–133.
- Forsström SE and Kaufmann OT (2018) A literature review exploring the use of programming in mathematics education. *International Journal of Learning, Teaching and Educational Research* 17(12): 18–32.
- Frey CB and Osborne M (2013) The future of employment: How susceptible are jobs to computerisation. *Technological Forecasting and Social Change* 114: 254–280.
- Goksel-Canbek N and Mutlu ME (2016) On the track of artificial intelligence: Learning with intelligent personal assistants. *International Journal of Human Sciences* 13(1): 592–601.
- Gray J, Gerlitz C and Bounegru L (2018) Data infrastructure literacy. *Big Data & Society* 5(2): 1–13.
- Grzelczak A, Kosacka M and Werner-Lewandowska L (2017) Employees competences for industry 4.0 in Poland: Preliminary research results. In: *24th International conference on production research*. Available at: <https://pdfs.semanticscholar.org/e974/a9fea6ac4ca545448a2c1f66de82edd88694.pdf> (accessed 28 August 2019).
- Hariharasudan A and Kot S (2018) A scoping review on digital English and Education 4.0 for Industry 4.0. *Social Sciences* 7(227): 1–13.
- Hartmann D and Hattingh TS (2018) In dis tree – 4 what? *South African Journal of Industrial Engineering* 29(3): 1–11.
- Hecklau F, Galeitzke M, Flachs S, et al. (2016) Holistic approach for human resource management in Industry 4.0. *Procedia CIRP* 54: 1–6.
- Helfat CE (2007) Stylized facts, empirical research and theory development in management. *Strategic Organization* 5(2): 185–192.
- Hirschi A (2017) The fourth industrial revolution: Issues and implications for career research and practice. *Career Development Quarterly* 66(3): 192–204.
- Hussin AA (2018) Education 4.0 made simple: Ideas for teaching. *International Journal of Education & Literacy Studies* 6(3): 92–98.
- Hutton B, Calden DM, Chaimani A, et al. (2015) The PRISMA extension statement for reporting of systematic reviews incorporating network meta-analyses of health care interventions: Checklist and explanations. *Annals of Internal Medicine* 162:777–784.
- Imran M, ul Hameed W and ul Haque A (2018) Influence of Industry 4.0 on the production and service sectors in Pakistan: Evidence from textile and logistics industries. *Social Sciences* 7(246): 1–21.
- Janssen D, Tummel C, Richert A, et al. (2016) Virtual environments in higher education: Immersion as a key construct for Learning 4.0. *International Journal of Advanced Corporate Learning* 9(2): 20–26.
- Kamaruzaman FM, Hamid R, Mutalib AA, et al. (2019) Conceptual framework for the development of 4IR skills for engineering graduates. *Global Journal of Engineering Education* 21(1): 54–61.
- Karimi S, Pohl S, Scholer F, et al. (2010) Boolean versus ranked querying for biomedical systematic reviews. *BMC Medical Informatics and Decision Making* 10(58): 1–20.
- Kazancoglu Y and Ozkan-Ozen YD (2018) Analyzing Workforce 4.0 in the fourth industrial revolution and proposing a road map from operations

- management perspective with fuzzy DEMATEL. *Journal of Enterprise Information Management* 31(6): 891–907.
- Kivunja C (2015) Exploring the pedagogical meaning and implications of the 4cs 'super skills' for the 21st century through Bruner's 5E lenses of knowledge construction to improve pedagogies of the new learning paradigm. *Creative Education* 6: 224–239.
- Korean Educational Development Institute (2017) Educating for the 4th Industrial Revolution. Available at: [https://teams.unesco.org/ORG/fu/bangkok/public\\_events/Shared%20Documents/IQE/2017/09-KEDI/docs/unesco-kedi-policy-seminar-2017-concept-note.pdf](https://teams.unesco.org/ORG/fu/bangkok/public_events/Shared%20Documents/IQE/2017/09-KEDI/docs/unesco-kedi-policy-seminar-2017-concept-note.pdf) (accessed 17 February 2019).
- Kusmin K-L, Ley T and Normak P (n.d.) Towards a data driven competency management platform for Industry 4.0. Available at: [http://ceur-ws.org/Vol-2025/paper\\_hci\\_4.pdf](http://ceur-ws.org/Vol-2025/paper_hci_4.pdf) (accessed 30 May 2019).
- Lasi H, Fettke P, Kemper H-G, et al. (2014) Industry 4.0. *Business & Information Systems Engineering* 6: 239–42.
- Lavalle A, Schumann C-A, Pucher R, et al. (2017) Meeting Industry 4.0 training needs: E-learning sets out the way to move forward. *Formamente XII*: 27–46.
- Levac D, Colquhoun H and O'Brien KK (2010) Scoping studies: Advancing the methodology. *Implementation Science* 5(69): 1–9.
- Liao Y, et al. (2017) The impact of the fourth industrial revolution: A cross-country/region comparison. *Production* 28: e20180061.
- Lu Y (2017) Industry 4.0: A survey on technologies, applications and open research issues. *Journal of Industrial Information Integration* 6: 1–10.
- McAlister AM, Lee DM, Ehlert KM, et al. (2017) Qualitative coding: An approach to assess inter-rater reliability. Available at: <https://peer.asee.org/qualitative-coding-an-approach-to-assess-inter-rater-reliability.pdf> (accessed 08 May 2019).
- Magruk A (2016) Uncertainty in the sphere of the Industry 4.0: Potential areas to research. *Business, Management and Education* 14(2): 275–291.
- Marope M, Griffin P and Gallagher C (2017) Future competences and the future curriculum: A global reference for curricula transformation. Geneva: UNESCO IBE. Available at: [http://www.ibe.unesco.org/sites/default/files/resources/02\\_future\\_competences\\_and\\_the\\_future\\_of\\_curriculum\\_30oct.v2.pdf](http://www.ibe.unesco.org/sites/default/files/resources/02_future_competences_and_the_future_of_curriculum_30oct.v2.pdf) (accessed 21 May 2019).
- Messias G, Rodrigues U, Braga L, et al. (2018) Education 4.0 and 21st century skills: A case study with robotics activities in classroom. In: *VII Congresso Brasileiro de Informática na Educação (CBIE 2018)*, pp. 715–724. Available at: <https://pdfs.semanticscholar.org/23ce/3e5fd6a08c5469222bb0aea49a03fd2c7076.pdf> (accessed 07 April 2019).
- Mihalcea AD (2017) Employer branding and talent management in the digital age. *Management Dynamics in the Knowledge Economy* 5(2): 289–306.
- Miles MB and Huberman AM (1994) *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, CA: SAGE.
- Moher D, Liberati A, Tetzlaff J and Altman DG (2009) Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *PLoS Medicine* 6(7): 1–6.
- Motyl B, Baronio G, Uberti S, et al. (2017) How will change the future engineers' skills in the Industry 4.0 framework? A questionnaire survey. *Procedia Manufacturing* 11: 1501–1509.
- Mourtzis D and Boli N (2018) Skills and competences in the new digital era. Available at: [http://www.bestpatras.gr/wp-content/uploads/2018/08/03.-BEST\\_Skills-Competences.pdf](http://www.bestpatras.gr/wp-content/uploads/2018/08/03.-BEST_Skills-Competences.pdf) (accessed 19 April 2019).
- Munn Z, Peters MDJ, Stern C, et al. (2018) Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology* 18(143): 1–7.
- O'Flaherty J and Phillips C (2015) The use of flipped classrooms in higher education: A scoping review. *The Internet and Higher Education* 25: 85–95.
- Oranye N (2018) App-solute empowerment. *Destiny Man* (November/December): 98–99.
- Otonicar SLC, Nascimento NMD and Mosconi E (2018) Information literacy and digital disruption in Industry 4.0. In: *XIX Encontro de Pesquisadores: Pesquisa Científica e Desenvolvimento, Uni-FACEF*, Centro Universitário Municipal de Franca, Franca-SP, 2018, pp. 631–638. Available at: [https://www.researchgate.net/publication/328368535\\_INFORMATION\\_LITERACY\\_AND\\_DIGITAL\\_DISRUPTION\\_IN\\_INDUSTRY\\_40](https://www.researchgate.net/publication/328368535_INFORMATION_LITERACY_AND_DIGITAL_DISRUPTION_IN_INDUSTRY_40) (accessed 17 February 2019).
- Pedron Z (2018) The skills revolution of the 21st century: It's time to re-calibrate. *On Research (Journal of EU Business School)* 1: 20–28.
- Penprase BE (2018) The fourth industrial revolution and higher education. In: Gleason NW (ed.) *Higher Education in the Era of the Fourth Industrial Revolution*. Singapore: Palgrave Macmillan, pp. 207–229. [https://doi.org/10.1007/978-981-13-0194-0\\_9](https://doi.org/10.1007/978-981-13-0194-0_9) (accessed 11 December 2019).
- Pereira AC and Romero F (2017) A review of the meanings and the implications of the Industry 4.0 concept. *Procedia Manufacturing* 13: 1206–1214.
- Peters MA (2018) Deep learning, education and the final stage of automation. *Educational Philosophy and Theory* 50(6-7): 549–553.
- Peters MA and Heraud R (2015) Toward a political theory of social innovation: Collective intelligence and the co-creation of social goods. *Journal of Self-Governance and Management Economics* 3(3): 7–23.
- Pham MT, Rajic A, Greig JD, et al. (2014) A scoping review of scoping reviews: Advancing the approach and enhancing the consistency. *Research Synthesis Methods* 5: 371–385.
- Pink DH (2006) *A Whole New Mind: Why Right-Brainers Will Rule the Future*. London: Penguin.

- Prifti L, Knigge M, Kienegger H, et al. (2017) A competency model for 'Industrie 4.0' employees. In: Leimeister JM and Brenner W (eds) *13. Internationalen Tagung Wirtschaftsinformatik (WI 2017)*, St Gallen, Switzerland, pp. 46–60. Available at: <https://www.wi2017.ch/images/wi2017-0262.pdf> (accessed 16 February 2019).
- Puncreobutr V (2016) Education 4.0: New challenge of learning. *St Theresa Journal of Humanities and Social Sciences* 2: 92–97.
- Razak NA, Alakrash H and Sahboun Y (2018) English language teachers' readiness for the application of technology towards fourth industrial revolution demands. *Asia-Pacific Journal of Information Technology and Multimedia* 2(2): 89–98.
- Ridsdale C, Rothwell J, Smit M, et al. (2015) Strategies and best practices for data literacy education: Knowledge synthesis report. Available at: [http://www.mikesmit.com/wp-content/papercite-data/pdf/data\\_literacy.pdf](http://www.mikesmit.com/wp-content/papercite-data/pdf/data_literacy.pdf) (accessed 22 April 2019).
- Romero M (2015) Work, games and lifelong learning in the 21st century. *Procedia – Social and Behavioral Sciences* 174: 115–121.
- Rußmann M, Loren M, Gerbert P, et al. (2015) Industry 4.0: The future of productivity and growth in manufacturing industries. Available at: [https://www.bcgperspectives.com/content/articles/engineered\\_products\\_project\\_business\\_industry\\_40\\_future\\_productivity\\_growth\\_manufacturing\\_industries/](https://www.bcgperspectives.com/content/articles/engineered_products_project_business_industry_40_future_productivity_growth_manufacturing_industries/) (accessed 20 March 2019).
- Sackey SM, Bester A and Adams D (2017) Industry 4.0 learning factory didactic design parameters for industrial engineering education in South Africa. *South African Journal of Industrial Engineering* 28(1): 114–124.
- Saltan F and Arslan Ö (2017) The use of augmented reality in formal education: A scoping review. *EURASIA Journal of Mathematics Science and Technology Education* 13(2): 503–520.
- Schleicher A (2012) *Preparing Teachers and Developing School Leaders for the 21st Century: Lessons from around the World*. Paris: OECD.
- Schwab K (2016). The fourth industrial revolution. Available at: <https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab> (accessed 17 February 2019).
- Shorey S and Howard PN (2016) Automation, big data, and politics: A research review. *International Journal of Communication* 10: 5032–5055.
- Ślusarczyk B (2018) Industry 4.0 – Are we ready? *Polish Journal of Management Studies* 7(1): 232–248.
- Smithers RW and Gray JW (n.d.) Future considerations for business English classes based on the fourth industrial revolution. Available at: [http://www.academia.edu/36485492/Future\\_Considerations\\_for\\_Business\\_English\\_Classes\\_Based\\_on\\_the\\_Fourth\\_Industrial\\_Revolution](http://www.academia.edu/36485492/Future_Considerations_for_Business_English_Classes_Based_on_the_Fourth_Industrial_Revolution) (accessed 17 February 2019).
- Wallner T and Wagner G (2016) Academic Education 4.0. In: *International conference on education and new developments*, Ljubljana, Slovenia, 12–14 June, pp. 155–59. Available at: [https://www.researchgate.net/publication/304115292\\_ACADEMIC\\_EDUCATION\\_40](https://www.researchgate.net/publication/304115292_ACADEMIC_EDUCATION_40) (accessed 16 February 2019).
- Welsh BL (2018) Education 4.0: How we will learn in the fourth industrial revolution. Available at: [https://medium.com/@brianna\\_91610/education-4-0-how-we-will-learn-in-the-fourth-industrial-revolution-e17206b73016](https://medium.com/@brianna_91610/education-4-0-how-we-will-learn-in-the-fourth-industrial-revolution-e17206b73016) (accessed 16 February 2019).
- Wilson E, Kenny A and Dickson-Swift V (2015) Using blogs as a qualitative health research tool: A scoping review. *International Journal of Qualitative Methods*: 1–12.
- Wittenstein Group (2019) Media Literacy 4.0: 'Smart' employees for the smart factory. *Move*: 7–8. Available at: <https://www.wittenstein.de/download/wittenstein-move-17-en.pdf> (accessed 17 February 2019).
- Xing B and Marwala T (2017) Implications of the fourth industrial age on higher education. Available at: <https://arxiv.org/pdf/1703.09643> (accessed 17 February 2019).
- Zain IM (2017) The collaborative instructional design system (CIDS): Visualizing the 21st century learning. *Universal Journal of Educational Research* 5(12): 2259–2266.

### Author biography

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### Appendix A

#### Miscellaneous skills

- Communication skills = 7 (1, 3, 9, 14, 18, 21, 22); communication = 14 (5, 7, 8, 16, 23, 24, 27, 31, 34, 36, 38, 39, 40 & 41)
- Critical thinking = 11 (2, 7, 8, 9, 10, 16, 18, 19, 27, 39 & 41)
- Problem solving = 22 (problem solving = 2, 3, 4, 6, 8, 9, 13, 14, 16, 17, 19, 21, 22, 30, 31, 33, 36, 40; problem solving skills (abilities/thinking) = 5, 9, 25, 32)
- Creativity = 20 (3, 5, 9, 10, 13, 14, 16, 17, 18, 20, 21, 23, 27, 27, 31, 31, 33, 36, 41, 41)
- Collaboration = 12 (4, 5, 6, 9, 16, 20, 27, 29, 30, 35, 39, 41)
- Decision making = 7 (5, 6, 9, 10, 14, 17, 40).
- Technical skills = 3(3, 7, 30); technical knowledge and skills (7); technical competencies – e.g. technical skills (14); technical

competences (22); technical and technological innovation (23); technical innovation (28)

- Innovation (stand-alone & with other words) = 26 (4, 4, 5, 5, 5, 7, 10, 18, 23, 23, 23, 25, 26, 26, 26, 28, 29, 31, 33, 33, 36, 36, 37, 38, 40, 41)
- Digital skills = 3 (1, 22, 22).; digitisation = 1 (38); digitalisation = 1 (40)

#### *Skills/Competencies based on specific aspects of 4IR technologies*

- Data analytics; knowledge to simulate; knowledge of security standards and communication standards; knowledge of servers; ability to learn how to maintain new machines (3); applicative skills tied to specific situations, technologies, and work processes; high technical, informatics and computational skills (5); big data analysis; and programming skills (6); programming skills (13); technical competencies (e.g. technical skills, media skills and coding skills) (14); Industry 4.0 knowledge and skills (22); high-tech innovation ability (23); software programming; data analysis or scientific computing (24); processing and visualisation of manufacturing process data (25); and big data analysis (31).

**Outliers:** horizontal decision making (5); relational and communicative skills (5); interdisciplinary thinking (6); ambiguity tolerance and sustainable mindset (14); transversal knowledge (a mix of pedagogical and digital skills); interdisciplinary thinking (24); mental agility (27); and design and selective thinking; scenario thinking (32).

**Pedestrian:** manual dexterity; intelligence; general knowledge (5); personal qualities; twenty-first century skills (7); 21st-century skills of lifelong learning; self-management, planning and organising (8); critical academic skills (9); high self-efficacy (15); and risk-taking (36).

**Unclear/Vague:** employability skills; personal qualities; five competencies (e.g., use of resources, interpersonal skills, information, systems and technology); life and career skills (7); varying scholarly skills (10); interdisciplinary skills; abilities of synthesis (11); personal competencies; social/interpersonal competencies; action-related competencies (12); labour skills (18); social competencies (21); efficient and high-quality skills (23); workforce skills (26); peer production (29); and productive thinking, responsible thinking and social-consciousness thinking (32).

Information skills/competencies or Information related skills/competencies = 7 (information, systems

and technology (7); information, media and technology skills (7); the ability to find, organise and retrieve information (8); information-communication skills (21); information sharing (35); information process (40); information, media and technology skills (41)).

## **Appendix B**

### *Miscellaneous skills/competencies and literacies*

Communication = 9 (44, 46, 47, 52 (effective communication), 58, 59, 60, 61, 62); Communication skills = 3 (43, 43, 56); communication competence = 1 (50); critical thinking (skills) = 5 (43, 46, 52, 59, 61); problem solving = 6 (problem solving = (46, 50 (complex problems solving), 52, 54 (solving complex problems), 59, 63 (solving social problem); problem solving skills = 3 (43, 55, 60); creativity = 10 (43, 44, 46, 46, 52, 55, 56, 59, 60, 61); collaboration = 10 (43, 44 (human-robot collaboration (cobot), 44, 45, 46, 50, 52, 59, 60, 61); decision making = 3 (decision making innovation), 50 (complex/critical decision making), 53 (intelligent decision making), 55; technical skills = 2 (49, 51); technical-based skills = 1 (57); technical knowledge skills = 1 (47); technical and statistical skills = 1 (51); technical, computational and statistical competencies = 1 (51); technical literacy = 1 (44); technical competences =; technical, methodological, social and personal competencies = 1 (44); technology skills = 1 (42); technology literacy = 3 (43, 58 (technology literacy competency), 58); innovation = 10 (46, 49, 49 (radical design-driven, social and responsible innovation), 52, 53, (product and service innovation), 55, 60, 61, 62, 63); digital literacy = 10 (43, 48, 50 (Digital literacy 4.0), 52, 54, 58, 59, 60, 61, 63); digital literacy skills = 2 (47, 56); (digital skills = 5 (47, 55, 56, 56, 56); digital competences = 2 (44, 61); literacy = 2 (45 (literacy as part of information processing skills), 46); literacy skills = 1 (58); literacy competence = 1 (64); other types of literacy appearing once = human literacy 43), fundamental literacy (48), science literacy (49), Digital literacy 4.0 (50); data literacy/data literacies (51), statistical literacy (51), information literacy (51), data infrastructure literacy (51), information and media literacy (52), Internet literacy skills (55),

### *Skills/Competencies and literacies based on or specific to 4IR technologies:*

- High IT competence; practical engineering and programming skills; data-driven decisions (44); computer programming; programming skills (48); digital literacy 4.0; communication competence 4.0; visualisation and processing of

large amounts of data; competences for Industry 4.0 (50); data literacy/data literacies; technical, computational and statistical competencies (51); data management; servitisation (53); high-performance computing skills; coding/software engineering/app building skills; software testing skills (55); computer programming, and knowledge of specific software tools) (56)

**Outliers:** fundamental literacy (48); disruptive, radical design-driven, social and responsible innovation (49); data infrastructure literacy (51); design thinking; new skills through continuous learning; user experience design skills (55); investigative and experimental skills (56)

**Pedestrian:** tacit knowledge (44); self-learning solutions; self-direction capabilities (45); responsibility (46); literacy skills (47); people skills (49); career and learning skills (52); Internet literacy skills (55); 21st century skills/competences; self-direction; planning; risk taking; conflict management (59); critical stance (60); basic skills (61); critical writing competence (64)

**Unclear/Vague:** unlimited variability of behaviour; multi-purpose skills; interdisciplinary skills; flexibility to perform adaptive abilities (44); multi- and interdisciplinary skills (45); heterogeneous skills (49); transferrable skills; digital skills for the general workforce (56); specific competencies (58); global awareness (60); general skills (61); productiveness (64).

Information skills/competencies or Information related skills/competencies = 4 (information-processing skills (45); information literacy (51); information & media literacy (52); hard skills (e.g., numerical and higher mathematical knowledge, problem solving, creativity and design skills, investigative and experimental skills, information processing, computer programming, and knowledge of specific software tools) (56)).

## Appendix C

### Sixty-four reviewed articles

1. Abdullah DB, Abdullah MY and Salleh MAM (2017) A review on the concept of fourth industrial revolution and the government's initiatives to promote it among youths in Malaysia. *eBangi Journal of Social Sciences and Humanities* (Special Articles). 1–8.
2. Afrianto A (2018) Being a professional teacher in the era of industrial revolution

- 4.0: Opportunities, challenges and strategies for innovative classroom practices. *English Language Teaching and Research* 2(1): 1–13.
3. Ahmad N, Shamsuddin A and Abu Seman NA (2018) Industry 4.0 implications on human capital: A review. *Journal for Studies in Management and Planning* 4(13): 221–235.
4. Alemi M (2016) General impacts of integrating advanced and modern technologies on teaching English as a foreign language. *International Journal on Integrating Technology in Education* 5(1): 13–26.
5. Anggraeni CW (2018) Promoting Education 4.0 in English for survival class: What are the challenges? *Metathesis (Journal of English Language, Literature and Teaching)* 2(1): 12–24.
6. Ansari F, Erol S and Sihm W (2018) Rethinking human-machine learning in Industry 4.0: how does the paradigm shift treat the role of human learning. *Procedia Manufacturing* 23 117–122.
7. Astutik S and Prahani BK (2018) The practicality and effectiveness of collaborative creativity learning (CCL) model by using PhET simulation to increase students' scientific creativity. *International Journal of Instruction* 11(4): 409–424.
8. Balyer A and Öz Ö (2018) Academicians' views on digital transformation in education. *International Online Journal of Education and Teaching* 5(4): 809–830.
9. Benešová A and Tupa J (2017) Requirements for education and qualification of people in Industry 4.0. *Procedia Manufacturing* 11 2195–2202.
10. Brettel M, Friederichsen N, Keller M, et al. (2014) How virtualization, decentralization and network building change the manufacturing landscape: An Industry 4.0 perspective. *International Journal of Information and Communication Engineering* 8(1): 37–44.
11. Caruso L (2018) Digital innovation and the fourth industrial revolution: Epochal social changes? *AI & Society* 33(3): 379–392.
12. Contreras GJ and Michael KW (2015) Computer programming for all: A case-study in product design education. *Procedia - Social and Behavioral Sciences* 182: 388–394.
13. Coşkun S, Kayıkcı Y and Gençay E (2019) Adapting engineering education to Industry 4.0 vision. *Technologies* 7(10): 1–13.
14. Damian CC and du Plessis HK (2015) Employability skills: Perspectives from a knowledge-intensive industry. *Education + Training* 57(5): 532–559.

15. Demartini C and Benussi L (2017) Do Web 4.0 and Industry 4.0 imply Education X.0? *IT Professional* 19(3): 4–7.
16. Edwards-Schachter M (2018) The nature and variety of innovation. *International Journal of Innovation Studies* 2: 65–79.
17. Eguchi A (2014) Educational robotics for promoting 21st century skills. *Journal of Automation, Mobile Robotics & Intelligent Systems* 8(1): 5–11.
18. Elbeck M (2018) The fourth industrial revolution's potential influence on marketing education. *e-Journal of Business Education & Scholarship of Teaching* 12(1): 112–119.
19. Elbestawi M, Centea D, Singh I, et al. (2018) SEPT learning factory for Industry 4.0 education and applied research. *Procedia Manufacturing* 23: 249–254.
20. Erol S, Jäge A, Hold P, et al. (2016) Tangible Industry 4.0: A scenario-based approach to learning for the future of production. *Procedia CIRP* 54: 13–18.
21. Flogie A, Lakota AB and Aberšek B (2018) The psychosocial and cognitive influence of ICT on competences of STEM students. *Journal of Baltic Science Education* 17(2): 267–276.
22. Forsström SE and Kaufmann OT (2018) A literature review exploring the use of programming in mathematics education. *International Journal of Learning, Teaching and Educational Research* 17(12): 18–32.
23. Gray J, Gerlitz C and Bounegru L (2018) Data infrastructure literacy. *Big Data & Society*: 1–13.
24. Hariharasudan A and Kot S (2017) A scoping review on digital English and Education 4.0 for Industry 4.0. *Social Sciences* 7(227): 1–13.
25. Hecklau F, Galeitzke M, Flachs S, et al. (2016) Holistic approach for human resource management in Industry 4.0. *Procedia CIRP* 54: 1–6.
26. Hirschi A (2018) The fourth industrial revolution: Issues and implications for career research and practice. *Career Development Quarterly* 66(3): 192–204.
27. Janssen D, Tummel C, Richert A, et al. (2016) Virtual environments in higher education: Immersion as a key construct for Learning 4.0. *International Journal of Advanced Corporate Learning* 9(2): 20–26.
28. Jones C and Pimdee P (2017) Innovative ideas: Thailand 4.0 and the fourth industrial revolution. *Asian International Journal of Social Sciences* 17(1): 4–35.
29. Kivunja C (2015) Exploring the pedagogical meaning and implications of the 4cs 'super skills' for the 21st century through Bruner's 5E lenses of knowledge construction to improve pedagogies of the new learning paradigm. *Creative Education* 6: 224–239.
30. Kortuem G, Bandara A, Smith N, et al. (2013) Educating the Internet-of-Things generation. *Computer* 46(2): 53–61.
31. Krpálek P and Krelová KK (2016) Possibilities for developing business potential in economic education. Examples of implementation in Slovakia and the Czech Republic. *Economics and Sociology* 9(4): 119–133.
32. Lavallo A, Schumann C-A, Pucher R, et al. (2017) Meeting Industry 4.0 training needs: E-learning sets out the way to move forward. *Formamente XII*: 27–46.
33. Lee J, Kao H-A and Yang S (2014). Service innovation and smart analytics for Industry 4.0 and big data environment. *Procedia CIRP* 16: 3–8.
34. Li G, Hou Y and Wu A (2017) Fourth industrial revolution: Technological drivers, impacts and coping methods. *Chinese Geographical Science* 27(4): 626–637.
35. Longmuß J and Höhneb BP (2017) Agile learning for vocationally trained expert workers. Expanding workplace-based learning one sprint at a time. *Procedia Manufacturing* 9: 262–268.
36. Magruk A (2016) Uncertainty in the sphere of the Industry 4.0: Potential areas to research. *Business, Management and Education* 14(2): 275–291.
37. Mihalcea AD (2017) Employer branding and talent management in the digital age. *Management Dynamics in the Knowledge Economy* 5(2): 289–306.
38. Mohamed M (2018) Challenges and benefits of Industry 4.0: An overview. *International Journal of Supply and Operations Management* 5(3): 256–265.
39. Morrar R, Arman H and Mousa S (2017) The fourth industrial revolution (Industry 4.0): A social innovation perspective. *Technology Innovation Management Review* 7(11): 12–20.
40. Motyl B, Baronio G, Uberti S, et al. (2017) How will change the future engineers' skills in the Industry 4.0 framework? A questionnaire survey. *Procedia Manufacturing* 11: 1501–1509.



41. Nordin N and Norman H (2018) Mapping the fourth industrial revolution global transformations on 21st century education on the context of sustainable development. *Journal of Sustainable Development Education and Research* 2(1): 1–7.
42. Pedron Z (2018) The skills revolution of the 21st century: It's time to re-calibrate. *On Research (Journal of EU Business School)* 1: 20–28.
43. Peters MA (2017) Technological unemployment: Educating for the fourth industrial revolution. *Educational Philosophy and Theory* 49(1): 1–6.
44. Peters MA and Heraud R (2015) Toward a political theory of social innovation: Collective intelligence and the co-creation of social goods. *Journal of Self-Governance and Management Economics* 3(3): 7–23.
45. Pfeiffer S (2017) The Vision of 'Industrie 4.0' in the making: A case of future told, tamed, and traded. *Nanoethics* 11: 107–121.
46. Prifti L, Knigge M, Kienegger H, et al. (2017) A competency model for 'Industrie 4.0' employees. In: *Proceedings der 13. Internationalen Tagung Wirtschaftsinformatik (WI 2017)* (eds JM Leimeister and W Brenner W), St Gallen, Switzerland, pp. 46–60. Available at: <https://www.wi2017.ch/images/wi2017-0262.pdf> (accessed 16 February 2019).
47. Prisecaru P (2016) Challenges of the fourth industrial revolution. *Knowledge Horizons – Economics* 8(1): 57–62.
48. Puncreobutr V (2016) Education 4.0: New challenge of learning. *St Theresa Journal of Humanities and Social Sciences* 2: 92–97.
49. Rahman AA, Hamid UZA and Chin TA (2017) Emerging technologies with disruptive effects: A review. *Perintis eJournal* 7(2): 111–128.
50. Razak NA, Alakrash H and Sahboun Y (2018) English language teachers' readiness for the application of technology towards fourth industrial revolution demands. *Asia-Pacific Journal of Information Technology and Multimedia* 2(2): 89–98.
51. Robandi B, Kurniati E and Sari RP (2019) Pedagogy in the era of Industrial Revolution 4.0. *Advances in Social Science, Education and Humanities Research* 239: 38–46.
52. Roblek V, Meško M and Krapež A (2016) A complex view of Industry 4.0. *Sage Open*, April/June: 1–11.
53. Romero M (2015) Work, games and lifelong learning in the 21st century. *Procedia - Social and Behavioral Sciences* 174: 115–121.
54. Sackey SM, Bester A and Adams D (2017) Industry 4.0 learning factory didactic design parameters for industrial engineering education in South Africa. *South African Journal of Industrial Engineering* 28(1): 114–124.
55. Schiuma G (2017) Arts catalyst of creative organisations for the fourth industrial revolution. *Journal of Open Innovation: Technology, Market, and Complexity* 3(20): 1–12.
56. Seufert s and Meier C (2016) From elearning to digital transformation: A framework and implications for L&D. *International Journal of Advanced Corporate Learning* 27–33.
57. Shahroom AA and Hussin N (2018) Industrial revolution 4.0 and education. *International Journal of Academic Research in Business and Social Sciences* 8(9): 314–319.
58. Ślusarczyk B (2018) Industry 4.0 – Are we ready? *Polish Journal of Management Studies* 7(1): 232–248.
59. Thoben K-D, Wiesner S and Wuest T (2017) 'Industrie 4.0' and smart manufacturing: A review of research issues and application examples. *International Journal of Automation Technology* 11(1): 4–16.
60. Tvenge N, Martinsen K and Kolla SSVK (2016) Combining learning factories and ICT- based situated learning. *Procedia CIRP* 54: 101–106.
61. Umachandran K, Jurcic I, Ferdinand-James D, et al. (2018) Gearing up education towards Industry 4.0. *International Journal of Computers & Technology* 17(2): 7305–7312.
62. Wilkesmann M and Wilkesmann U (2018) Industry 4.0 – Organizing routines or innovations? *VINE Journal of Information and Knowledge Management Systems* 48(2): 238–254.
63. Yamin M (2018) Enhancing teachers' literacy competence through critical writing in the digital era. *International Journal of Pedagogy and Teacher Education* 2(2): 401–412.
64. Zain IM (2017) The collaborative instructional design system (CIDS): Visualizing the 21st century learning. *Universal Journal of Educational Research* 5(12): 2259–2266.

## Abstracts

### قتطفات

#### Privacy literacy instruction in academic libraries: Past, present, and possibilities

التثقيف بشأن الخصوصية في المكتبات الأكاديمية: الماضي والحاضر والاحتمالات

سارة هارتمان كافرلي، الإسكندرية تشيشولم

مجلة الإفلا، 46–4

مستخلص: تستكشف هذه المقالة الماضي والحاضر واحتمالات تعليم الخصوصية والتثقيف بشأن الخصوصية (PL) في المكتبات الأكاديمية. تستعرض المقالة الدراسات البحثية بشأن الخصوصية والتثقيف بشأن الخصوصية في مجالات الفلسفة والأنثروبولوجيا والتاريخ والقانون والتعليم وتم اقتراح نموذج مفاهيمي للخصوصية يوضح مناطق تركز مؤسسات المعلومات التي تحافظ عليها الخصوصية، والجدول الزمني للخصوصية والمكتبات التي توثق التطورات الرئيسية في ثقافة الخصوصية في الولايات المتحدة. تتم مناقشة النتائج المستخلصة من مسح استكشافي أصلي لممارسات تعليم PL في المكتبات الأكاديمية. يحدد الاستطلاع الأسباب المنطقية، والموضوعات، والسياقات، والأساليب، والتقييمات التي يستخدمها أمناء المكتبات الأكاديمية في تقديم الإرشادات الخاصة بالتثقيف بشأن الخصوصية (PL)، بالإضافة إلى المعوقات التي تحول دون تطبيق إرشادات التثقيف بشأن الخصوصية التي يواجهونها. تختتم المقالة بدراسة حالة تشرح خبرات إرشادات التثقيف بشأن الخصوصية الخاصة بالمؤلفين، وتوصيات محددة للتغلب على المعوقات التي تحول دون تقديم إرشادات التثقيف بشأن الخصوصية في المكتبات الأكاديمية المحددة في نتائج المسح.

#### Public libraries and the UN 2030 Agenda for Sustainable Development

المكتبات العامة وخطة الأمم المتحدة للتنمية المستدامة 2030

مارك كوسيجيو

مجلة الإفلا، 46–4

مستخلص: تعتبر المكتبات العامة، باعتبارها محركات للتغيير تقود التنمية، من خلال التزامها بتوفير المعلومات والوصول إليها، ذات أهمية قصوى لتحقيق خطة الأمم المتحدة للتنمية المستدامة لعام 2030. تساهم هذه المقالة في المنحة الدراسية الناشئة في علم المكتبات والمعلومات في جدول أعمال الأمم المتحدة لعام 2030

للتنمية المستدامة من خلال مناقشة الأدوار المركزية التي تلعبها المكتبات العامة في تحقيق أهدافها. الغرض ذو شقين. أولاً، يلقي نظرة عامة على تاريخ جدول الأعمال مقترناً ببداية مراجعة الأدبيات لأبحاث علم المكتبات والمعلومات حوله. ثانياً، يقدم إطاراً مفاهيمياً يمكن من خلاله التعامل مع أهداف جدول الأعمال والأهداف المرتبطة بها في سياق المكتبات العامة. الهدف النهائي هو إنشاء قاعدة وتوسيع نطاق الوعي بجدول أعمال الأمم المتحدة 2030 ضمن تخصص علم المكتبات والمعلومات، بالإضافة إلى تعزيز أهمية المكتبات العامة في دفع جهود التنمية المستدامة بشكل عام وجدول الأعمال على وجه التحديد.

#### Libraries as promoters of environmental sustainability: Collections, tools and events

المكتبات كداعم للاستدامة البيئية: المجموعات والأدوات والأحداث

ليزا بيوتلسباتشير، كريستين ميشيد ميشيد

مجلة الإفلا، 46–4

مستخلص: السعي لتحقيق توازن بين التنمية الاقتصادية وحماية البيئة هو هدف طموح يتطلب معلومات كافية من جانب جميع الجهات الفاعلة. يمكن أن تلعب المكتبات العامة دوراً مهماً في العمل كداعمين للمعرفة حول الاستدامة البيئية. قام الباحثون بتحليل وضع المكتبات العامة الألمانية وجهودهم نحو مجتمع مستدام. درسنا مجموعات المكتبات وأنشأنا استبياناً نطلب من أمناء المكتبات تقييم الوضع الحالي في مكتبتهم. تُظهر النتائج أن العديد من المكتبات تعزز الاستدامة البيئية من خلال تسليط الضوء على الكتب والوسائط الأخرى في العديد من الموضوعات الفرعية من خلال اتفاقيات أو رفوف خاصة. كانت عدادات الطاقة energy meters هي أكثر الأدوات التي يتم ذكرها بشكل متكرر للتوعية بالموضوع. علاوة على ذلك، تنظم المكتبات العديد من الأحداث الإعلامية. لذلك، فإن الشراكات مع المنظمات والمدارس الأخرى لها أهمية قصوى. إلى جانب هذه الجهود، لا تزال هناك إمكانية أكبر لتعزيز الاستدامة البيئية. في كثير من الأحيان، يشكل نقص الميزانية والموظفين تحدياً.

#### Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage

قدرات المكتبات العامة الإيرانية في الحفاظ على التراث الثقافي غير المادي ونشره

ليلى سيفي، مرزبة سلطانبيدي

شاكسا شاكسا

مجلة الإفلا، 46-4

مجلة الإفلا، 46-4

مستخلص: بما أن المكتبات العامة في إيران تمتلك تراثاً ثقافياً غنياً وقوياً غير مادي، فمن المهم دراسة قدرات هذه المكتبات. لهذا الغرض، كانت الطريقة المطبقة للدراسة هي تقنية دلفي. يتكون مجتمع الدراسة من 30 خبيراً وباحثاً تم اختيارهم من خلال أخذ العينات المستهدفة. بناءً على نتائج هذه الدراسة، تمثلت أدوار المكتبات العامة الإيرانية في توفير التراث الثقافي غير المادي من خلال التجميع من المناطق المحلية، وإقامة المعارض للجمهور، وإعادة سرد التراث الثقافي غير المادي. تؤكد هذه الدراسة كذلك على تطبيق حقوق الملكية الفكرية وتوفير البنية التحتية لتكنولوجيا المعلومات من قبل المكتبات العامة الإيرانية للحفاظ على التراث الثقافي غير المادي ونشره. فيما يتعلق بنتائج البحث، تعتبر المكتبات العامة الإيرانية واحدة من مراكز المعرفة الثقافية للتنوع داخل المجتمع والتي من خلال الحفاظ على التراث الثقافي غير المادي ونشره، يمكن أن تلعب دوراً مهماً في تعزيز وعي الأفراد

مستخلص: لقد قبل الكثير عن الثورة الصناعية الرابعة 4IR أو الصناعة 4.0 منذ إطلاقها في عام 2011. بالإضافة إلى ذلك، تم وصف مهارات معينة على أنها مهارات الثورة الصناعية الرابعة 4IR أو الصناعة 4.0 على وجه التحديد. وسط كل هذا، لم يتم إنجاز الكثير من العمل الذي يبرز ويحدد ماهية تلك المهارات من منظور متعدد التخصصات. تم إعداد دراسة مراجعة النطاق الحالية لتحديد المهارات والكفاءات ومعرفة القراءة والكتابة المنسوبة إلى الثورة الصناعية الرابعة 4IR أو الصناعة 4.0 من خلال 64 مقالاً في المجالات تمت مراجعتها من قبل الأقران مستمدة من تخصصات متنوعة. ثلاثة من النتائج التي توصلت إليها جديرة بالذكر. أولاً، المهارات والكفاءات المنسوبة إلى الثورة الصناعية الرابعة 4IR بواسطة مقالات المجالات التي تمت مراجعتها هي مهارات عامة يطلق عليها غالباً مهارات القرن الحادي والعشرين مثل الاتصال والإبداع وحل المشكلات. ثانياً، من بين المهارات الصعبة، تظهر مهارات البرمجة في الغالب على أنها مهارات الثورة الصناعية الرابعة 4IR من المقالات التي تمت مراجعتها. ثالثاً، يتم تمثيل محور الأمية المعلوماتية تمثيلاً ناقصاً والاستشهاد به كمهارة للثورة الصناعية الرابعة 4IR في المقالات التي تمت مراجعتها.

#### Skills, competencies and literacies attributed to 4IR/Industry 4.0: Scoping review

المهارات والكفاءات ومعرفة القراءة والكتابة المنسوبة إلى الثورة الصناعية الرابعة 4IR / الصناعة 4.0: مراجعة النطاق

#### 摘要

#### Privacy literacy instruction in academic libraries: Past, present, and possibilities

大学图书馆中的隐私素养教学：过去、现在和未来

Sarah Hartman-Caverly, Alexandria Chisholm

IFLA Journal, 46-4, 305-327

摘要：本文探讨了大学图书馆中关于隐私和隐私素养教学的历史、现状和未来发展趋势，调研了哲学、人类学、历史、法律、教育和图书馆情报学领域的隐私和隐私素养研究成果，并提出了一种隐私概念模型，用于展示负责隐私保护的信息机构所处的区域，以及展示美国隐私文化不同发展阶段的主要成就的时间表。本文还探讨了大学图书馆中隐私素养教学实践的原始调查结果，介绍了大学图书馆员在提供隐私素养指导时采用的原则、主题、情境、方法和评估方式，以及他们遇到的关于隐私素养的障碍。最后，本文以案例研究作为总结，阐述了

作者自己的隐私素养教学经验，并提出了克服文中提到的障碍的具体建议。

#### Public libraries and the UN 2030 Agenda for Sustainable Development

公共图书馆与联合国《2030年可持续发展议程》

Marc Koscieljew

IFLA Journal, 46-4, 328-346

摘要：公共图书馆是推动发展的引擎，并致力于提供信息内容和获取方式，因此对于实现联合国《2030年可持续发展议程》至关重要。本文通过提出公共图书馆在实现其目标中所发挥的核心作用，为《2030年可持续发展议程》中有关新兴图书馆和图书馆情报学领域的研究做出贡献。本文有两个目标。首先，文中概括了该议程的历史发展，提供了图书馆情报学领域的文献综述。其次，本文提出了一个概念框架，其中将该议程的目标与公共图书馆所处的发展情境结合起来。本文的最终目的是在图书馆情报学科范围内为该议程奠定基础，并提高人们的意识，进一步提高公

共图书馆在实现联合国可持续发展目标和《2030年可持续发展议程》方面的重要作用。

### **Libraries as promoters of environmental sustainability: Collections, tools and events**

图书馆对环境可持续性发展的推动作用：馆藏、工具和活动

Lisa Beutelspacher, Christine Meschede-Meschede

IFLA Journal, 46—4, 347—358

摘要：在经济发展与环境保护之间寻求平衡是一个远大的目标，需要各方提供充足的信息。公共图书馆在传播有关环境可持续性的知识方面发挥着重要作用。本文分析了德国公共图书馆的现状，及其为实现可持续社会所做的努力。我们针对图书馆馆藏开展调研，并设计了一份调查表，要求图书馆馆员评估所在图书馆的当前状况。结果表明，许多图书馆通过召开专题会议或出借相关馆藏、重点推广某些子主题的图书和媒体内容，促进了环境可持续性。电表是图书馆最常用的工具，可以提高民众对这个话题的敏感度。此外，图书馆还组织了一些信息活动。与其他组织和学校开展合作也非常重要。图书馆具有较大潜力，可以采用更多手段来促进环境的可持续性。预算和人员的缺乏是两个主要挑战。

### **Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage**

伊朗公共图书馆保护和传播非物质文化遗产的能力

Leili Seifi, Marziyeh Soltanabadi

IFLA Journal, 46—4, 359—368

摘要：伊朗的公共图书馆拥有大量丰富的非物质文化遗产，因此研究这些图书馆的能力非常重要。为此，本文采用了德尔菲法(专家意见征询法, Delphi technique)。参与研究的人员包括30位专家和研究员，均通过目标抽样法选出。研究结果显示，伊朗公共图书馆的职责是通过从当地收集资源、举办展览和向公众讲故事来推广非物质文化遗产。这项研究进一步强调了伊朗公共图书馆为保护和传播非物质文化遗产而申请的知识产权和建立的信息技术基础设施的重要性。从研究结果来看，伊朗公共图书馆是保障社会多样性的一个知识文化中心，通过保存和传播非物质文化遗产，在提高公民意识方面发挥重要作用。

### **Skills, competencies and literacies attributed to 4IR/Industry 4.0: Scoping review**

工业4.0时代的技能、能力与素养：文献综述

Chaka Chaka

IFLA Journal, 46—4, 369—400

摘要：“第四次工业革命”(4IR)或“工业4.0”的说法自从2011年首次出现以来已大范围普及。此外，某些技能是专门针对工业4.0时代开发的，但很少有人从跨学科的视角关注和探索这些技能。本文旨在通过研究不同主题学科的64篇同行评审期刊文章来探索专为工业4.0时代开发的技能、能力和素养。我们得出了三个比较重要的结论。首先，文中研究的同行评审文章提到的工业4.0时代技能和能力均为普遍的软性能力，一般称为21世纪技能，例如沟通、创造力和解决问题的能力等。其次，硬性能力中的编程技能在这些文章中被视为最主要的工业4.0时代技能。第三，这些文章极少将信息素养视为工业4.0时代技能。

## **Sommaires**

### **Privacy literacy instruction in academic libraries: Past, present, and possibilities**

Formation consacrée à la protection de la vie privée dans les bibliothèques universitaires: situation passée et présente et possibilités

Sarah Hartman-Caverly, Alexandria Chisholm

IFLA Journal, 46—4, 305—327

Résumé: Cet article s'intéresse à la situation passée et présente ainsi qu'aux possibilités d'une formation proposée dans les bibliothèques universitaires et consacrée à la protection de la vie privée et aux

compétences en rapport. Il étudie les connaissances disponibles en la matière dans différentes disciplines: philosophie, anthropologie, histoire, droit, enseignement et bibliothéconomie. L'article propose un modèle conceptuel de protection de la vie privée, indiquant les zones d'action informationnelle que garantit la protection de la vie privée, ainsi qu'un calendrier des principaux développements en matière de protection de la vie privée et des documents bibliothécaires sur la culture ambiante aux États-Unis à ce sujet. Il aborde également les conclusions d'une étude exploratoire initiale sur les pratiques de formation à la protection de la vie privée dans les bibliothèques universitaires. Cette étude identifie les motifs, sujets, contextes, méthodes et évaluations utilisés par les bibliothécaires universitaires pour dispenser une formation à la protection de la vie privée, ainsi que les obstacles qu'ils rencontrent dans ce cadre. L'article conclut avec une étude de cas consacrée aux propres expériences des auteurs à l'égard d'une telle formation et fait des recommandations spécifiques pour surmonter ces obstacles, afin de proposer cette formation dans les bibliothèques universitaires identifiées dans les conclusions de l'étude.

#### **Public libraries and the UN 2030 Agenda for Sustainable Development**

#### **Les bibliothèques publiques et l'Agenda 2030 des Nations Unies pour le développement durable**

Marc Koscieljew

IFLA Journal, 46–4, 328–346

Résumé: En tant que moteurs de changement favorisant le développement, les bibliothèques publiques ont une importance cruciale pour permettre d'atteindre les objectifs de l'Agenda 2030 des Nations Unies pour le développement durable, dans la mesure où elles fournissent des informations et permettent d'y accéder. Cet article contribue à mettre le savoir bibliothéconomique à cet Agenda, en défendant le rôle central joué par les bibliothèques publiques pour atteindre ses objectifs. L'article est axé sur deux thèmes. En premier lieu, il s'intéresse à l'historique de cet agenda en même temps qu'il commence par examiner les documents de recherche bibliothéconomique à ce sujet. En second lieu, il propose un cadre conceptuel pour considérer les objectifs de l'agenda et les cibles visées dans le contexte des bibliothèques publiques. Le but ultime est de fournir une base solide et de mieux sensibiliser à l'Agenda 2030 des Nations Unies dans le cadre de la bibliothéconomie, en plus de promouvoir l'importance des bibliothèques publiques pour faire avancer les efforts

de développement durable en général et cet agenda en particulier.

#### **Libraries as promoters of environmental sustainability: Collections, tools and events**

#### **Le rôle des bibliothèques dans la promotion du développement durable: collections, outils et événements**

Lisa Beutelspacher, Christine Meschede Meschede

IFLA Journal, 46–4, 347–358

Résumé: Vouloir équilibrer le développement économique et la protection de l'environnement est un objectif ambitieux, qui exige que les parties prenantes disposent de suffisamment d'informations. Les bibliothèques publiques peuvent jouer un rôle important en se faisant le promoteur des connaissances en matière de développement durable. Les chercheurs ont analysé le statut des bibliothèques publiques allemandes et leurs efforts en vue d'une société durable. Ils ont examiné les collections des bibliothèques et ont établi un questionnaire, demandant aux bibliothécaires d'évaluer la situation actuelle de leur bibliothèque. Les résultats montrent que de nombreuses bibliothèques font la promotion du développement durable en attirant l'attention sur des livres et d'autres médias consacrés à des sujets en rapport par le biais de réunions spéciales ou de présentations sur les rayonnages. Les compteurs énergétiques sont l'instrument le plus fréquemment cité pour sensibiliser à cette problématique. En outre, les bibliothèques organisent divers événements informatifs. Par conséquent, des partenariats avec d'autres organisations et des établissements scolaires sont particulièrement déterminants. En plus de ces efforts, il existe encore d'autres possibilités pour promouvoir le développement durable. Généralement, c'est le manque de budget et de personnel qui pose problème.

#### **Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage**

#### **Capacités des bibliothèques publiques iraniennes à conserver et diffuser le patrimoine culturel intangible**

Leili Seifi, Marziyeh Soltanabadi

IFLA Journal, 46–4, 359–368

Résumé: Comme les bibliothèques publiques iraniennes possèdent un patrimoine culturel intangible riche et important, il est bon de s'intéresser aux capacités dont elles disposent. Pour ce faire, cette étude a

appliquée la méthode dite « technique de Delphes ». La population de l'étude se composait de 30 experts et chercheurs sélectionnés par échantillonnage ciblé. Selon les conclusions de cette étude, le rôle des bibliothèques publiques iraniennes est de transmettre un patrimoine culturel intangible en le rassemblant localement, en organisant des expositions à l'intention du public et en restituant ensuite ce patrimoine. Cette étude met aussi l'accent sur l'application des droits de propriété intellectuelle et la mise à disposition d'infrastructures informatiques par les bibliothèques publiques iraniennes, afin de conserver et de diffuser le patrimoine culturel intangible. En ce qui concerne les conclusions de l'étude, les bibliothèques publiques iraniennes sont considérées comme des centres culturels de connaissances au sein de la société qui, en conservant et diffusant le patrimoine culturel intangible, pourraient jouer un rôle de premier plan pour y sensibiliser les individus.

#### **Skills, competencies and literacies attributed to 4IR/Industry 4.0: Scoping review**

##### **Aptitudes, compétences et connaissances attribuées à la 4<sup>e</sup> révolution industrielle/l'Industrie 4.0: un examen de leur portée**

Chaka Chaka

IFLA Journal, 46–4, 369–400

Résumé: Beaucoup de choses ont été dites à propos de la 4<sup>e</sup> révolution industrielle, appelée aussi Industrie 4.0, depuis le lancement de ce concept en 2011. De plus, certaines aptitudes ont été vantées comme appartenant spécifiquement à cette 4<sup>e</sup> révolution industrielle/Industrie 4.0. Mais dans ce cadre, on ne s'est pas beaucoup intéressé à identifier ce que sont ces aptitudes d'un point de vue pluridisciplinaire. La présente étude de synthèse sur la portée s'est consacrée à identifier les aptitudes, compétences et connaissances attribuées à la 4<sup>e</sup> révolution industrielle/Industrie 4.0 par 64 articles de revues savantes, portant sur diverses disciplines. Trois des constatations valent la peine d'être mentionnées. Premièrement, les aptitudes et compétences attribuées à la 4<sup>e</sup> révolution industrielles dans les articles examinés sont des compétences fondamentales d'ordre général, souvent désignées comme étant les aptitudes du 21<sup>e</sup> siècle, par exemple communication, créativité et résolution des problèmes. Deuxièmement, pour ce qui concerne les compétences techniques, les aptitudes de programmation occupent une place prédominante dans les articles examinés comme étant des aptitudes de la 4<sup>e</sup> révolution industrielle. Troisièmement, la maîtrise de l'information est sous-représentée et rarement citée dans les articles examinés en tant qu'aptitude pour la 4<sup>e</sup> révolution industrielle.

## **Zusammenfassung**

### **Privacy literacy instruction in academic libraries: Past, present, and possibilities**

#### **Vermittlung von Datenschutzkompetenz in Universitätsbibliotheken: Vergangenheit, Gegenwart und Ausblick**

Sarah Hartman-Caverly, Alexandria Chisholm

IFLA-Journal, 46–4, 305–327

Zusammenfassung: Dieser Artikel untersucht Datenschutz und die Vermittlung von Datenschutzkompetenzen in Universitätsbibliotheken in der Vergangenheit und heute sowie Möglichkeiten für die Zukunft. Er bietet einen Überblick über die Forschung zu Datenschutz und Datenschutzkompetenz vor dem Hintergrund der Bereiche Philosophie, Anthropologie, Geschichte, Recht, Erziehung und Bibliotheks- und Informationswissenschaft (BI). Der Artikel enthält einen Vorschlag für ein konzeptionelles Modell zum

Schutz der Privatsphäre, das die Zonen der Informationsvermittlung aufzeigt, in denen die Privatsphäre gewahrt wird; eine Zeitleiste zum Thema Privatsphäre und Bibliotheken dokumentiert wichtige Entwicklungen in der Datenschutzkultur in den USA. Ferner werden die Ergebnisse einer originellen explorativen Umfrage über die Vermittlungspraxis von Datenschutzkompetenzen in akademischen Bibliotheken werden diskutiert. Die Umfrage stellt die Begründungen, Themen, Kontexte, Methoden und Beurteilungen heraus, die Bibliothekare akademischer Bibliotheken bei der Vermittlung von Datenschutzkompetenzen verwenden, sowie die Hindernisse, auf die sie dabei stoßen. Der Artikel schließt mit einer Fallstudie, in der die Autoren ihre eigenen Erfahrungen mit der Vermittlung von Datenschutzkompetenzen erläutern, sowie mit spezifischen Empfehlungen zur Überwindung der in den Umfrageergebnissen identifizierten Hindernisse bei der Vermittlung von Datenschutzkompetenzen in akademischen Bibliotheken.

**Public libraries and the UN 2030 Agenda for Sustainable Development**  
**Öffentliche Bibliotheken und die UN-Agenda für nachhaltige Entwicklung bis 2030**

Marc Kosciejew

IFLA-Journal, 46–4, 328–346

Zusammenfassung: Als Motoren des Wandels, die die Entwicklung vorantreiben, sind öffentliche Bibliotheken mit ihrem Engagement für die Bereitstellung und den Zugang zu Informationen entscheidend für die Umsetzung der Agenda der Vereinten Nationen für nachhaltige Entwicklung bis 2030. Dieser Artikel leistet einen Beitrag zur neu entstehenden Bibliotheks- und Informationswissenschaft (BI) in Bezug auf die Agenda der Vereinten Nationen für nachhaltige Entwicklung bis 2030, indem er für die zentrale Rolle der öffentlichen Bibliotheken bei der Verwirklichung ihrer Ziele plädiert. Der Zweck ist ein zweifacher. Zunächst gibt er einen Überblick über die Geschichte der Agenda, verbunden mit dem Beginn einer Literaturübersicht über die BI-Forschung zu dieser Agenda. Zweitens stellt er einen konzeptionellen Rahmen dar, in dem die Ziele der Agenda und die damit verbundenen Vorgaben im Kontext der öffentlichen Bibliotheken angegangen werden können. Das letztendliche Ziel ist es, eine Grundlage für die UN-Agenda 2030 zu schaffen und das Bewusstsein für diese Agenda innerhalb des BI-Bereichs zu erweitern, zusätzlich zur Förderung der Bedeutung der öffentlichen Bibliotheken in ihren Bemühungen um nachhaltige Entwicklung im Allgemeinen und der Agenda im Besonderen.

**Libraries as promoters of environmental sustainability: Collections, tools and events**

**Bibliotheken als Förderer ökologischer Nachhaltigkeit: Sammlungen, Instrumente und Veranstaltungen**

Lisa Beutelspacher, Christine Meschede

IFLA-Journal, 46–4, 347–358

Zusammenfassung: Das Streben nach einem Gleichgewicht zwischen wirtschaftlicher Entwicklung und Umweltschutz ist ein ehrgeiziges Ziel, das ausreichende Informationen von allen Akteuren erfordert. Öffentliche Bibliotheken können eine wichtige Rolle spielen, indem sie als Förderer des Wissens über ökologische Nachhaltigkeit auftreten. Die Wissenschaftlerinnen analysierten den Status der öffentlichen Bibliotheken in Deutschland und ihre Bemühungen um eine nachhaltige Gesellschaft. Sie prüften die

Bestände der Bibliotheken und erstellten einen Fragebogen, in dem die Bibliothekare gebeten wurden, die aktuelle Situation in ihrer Bibliothek zu bewerten. Die Ergebnisse zeigen, dass viele Bibliotheken die ökologische Nachhaltigkeit fördern, indem sie Bücher und andere Medien zu mehreren Unterthemen durch spezielle Thementische oder Regale hervorheben. Energiemessgeräte waren die am häufigsten genannten Instrumente, die zur Sensibilisierung für das Thema zur Verfügung gestellt wurden. Darüber hinaus organisieren die Bibliotheken zahlreiche Informationsveranstaltungen. Daher sind Partnerschaften mit anderen Organisationen und Schulen von größter Bedeutung. Neben diesen Bemühungen gibt es noch weiteres Potenzial zur Förderung der ökologischen Nachhaltigkeit. Oftmals stellt der Mangel an Finanzmitteln und Personal eine Herausforderung dar.

**Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage**

**Die Kapazitäten der iranischen öffentlichen Bibliotheken bei der Bewahrung und Verbreitung des immateriellen Kulturerbes**

Leili Seifi, Marziyeh Soltanabadi

IFLA-Journal, 46–4, 359–368

Zusammenfassung: Da öffentliche Bibliotheken im Iran über ein reiches und starkes immaterielles Kulturerbe verfügen, ist es wichtig, die Kapazitäten dieser Bibliotheken zu untersuchen. Zu diesem Zweck wurde für die Studie die Delphi-Technik eingesetzt. Die Studienpopulation bestand aus 30 Experten und Forschern, die durch gezielte Stichproben ausgewählt wurden. Basierend auf den Ergebnissen dieser Studie waren die Aufgaben der iranischen öffentlichen Bibliotheken die Bereitstellung des immateriellen Kulturerbes durch das Sammeln aus lokalen Gebieten, das Abhalten von Ausstellungen für die Öffentlichkeit und die Neuerzählung des immateriellen Kulturerbes. Diese Studie betont ferner die Bedeutung der Anwendung von Rechten des geistigen Eigentums und der Bereitstellung einer IT-Infrastruktur durch iranische öffentliche Bibliotheken zur Erhaltung und Verbreitung des immateriellen Kulturerbes. Was die Forschungsergebnisse betrifft, so gelten die iranischen öffentlichen Bibliotheken als ein wichtiger Vertreter kultureller Wissenszentren für die Vielfalt innerhalb der Gesellschaft, die durch die Erhaltung und Verbreitung des immateriellen Kulturerbes eine bedeutende Rolle bei der Förderung des Bewusstseins eines jeden Einzelnen spielen könnten.

### **Skills, competencies and literacies attributed to 4IR/Industry 4.0: Scoping review**

#### **Fertigkeiten, Kompetenzen und Literalität, die der vierten industriellen Revolution/Industrie 4.0 zugeschrieben werden: ein Scoping Review**

Chaka Chaka

IFLA-Journal, 46–4, 369–400

Zusammenfassung: Seit ihrer Einführung im Jahr 2011 ist viel über die vierte industrielle Revolution (4IR) oder Industrie 4.0 gesagt worden. Darüber hinaus wurden bestimmte Fähigkeiten speziell als 4IR- oder Industrie 4.0-Fähigkeiten angepriesen. Die Frage allerdings, was diese Fähigkeiten aus einer interdisziplinären Perspektive gesehen genau sind, wurde kaum bearbeitet. Die aktuelle Scoping-Review-Studie hatte zum

Ziel, die Fähigkeiten, Kompetenzen und Literalität, die 4IR/Industrie 4.0 zugeschrieben werden, anhand von 64 begutachteten Zeitschriftenartikeln aus verschiedenen Fachbereichen zu identifizieren. Drei seiner Ergebnisse sind erwähnenswert. Erstens sind Fähigkeiten und Kompetenzen, die 4IR in den rezensierten Zeitschriftenartikeln zugeschrieben werden, generische Soft Skills, die oft als Fähigkeiten des 21. Jahrhunderts bezeichnet werden, wie Kommunikation, Kreativität und Problemlösung. Zweitens sind aus den rezensierten Artikeln von den harten Fertigkeiten überwiegend Programmierkenntnisse als 4IR-Fertigkeiten zu nennen. Und drittens ist festzustellen, dass die Informationskompetenz als Fähigkeit für 4IR in den rezensierten Artikeln unterrepräsentiert und zu wenig zitiert ist.

### **Аннотация**

#### **Privacy literacy instruction in academic libraries: Past, present, and possibilities**

#### **Обучение грамотности в области конфиденциальности в академических библиотеках: прошлое, настоящее и возможности в будущем**

Сара Хартман-Каверли, Александрия Чисхолм

Журнал ИФЛА, 46–4, 305–327

Аннотация: В данной статье исследуются прошлое, настоящее и возможности обучения конфиденциальности и грамотности в области защиты личных данных в академических библиотеках. В нем рассматриваются исследования по вопросам конфиденциальности и защиты личных данных из областей философии, антропологии, истории, права, образования и библиотечно-информационной науки. Предложена концептуальная модель конфиденциальности, демонстрирующая зоны информационного агентства, которое сохраняет конфиденциальность, а также хронологию конфиденциальности и ключевые события библиотечных документов в культуре конфиденциальности в США. Обсуждаются результаты оригинального экспериментального исследования практики преподавания предмета защиты личных данных в академических библиотеках. В ходе опроса выявляются обоснования, темы, контексты, методы и оценки, которые академические библиотекари

используют при обучении защите личных данных, а также трудности, с которыми они при этом сталкиваются. Статья завершается тематическим исследованием, в котором отражается собственный опыт авторов по обучению защите личных данных, а также конкретными рекомендациями по преодолению выявленных в ходе опроса трудностей в процессе обучения защите личных данных в академических библиотеках.

#### **Public libraries and the UN 2030 Agenda for Sustainable Development**

#### **Публичные библиотеки и повестка дня ООН в области устойчивого развития на период до 2030 года**

Марк Кошечев

ИФЛА, 46–4, 328–346

Аннотация: Будучи движущей силой развития, публичные библиотеки с их приверженностью предоставлению информации и обеспечению доступа к ней имеют решающее значение для реализации Повестки дня Организации Объединенных Наций в области устойчивого развития на период до 2030 года. Эта статья вносит свой вклад в становление библиотечно-информационной науки в области повестки дня Организации Объединенных Наций по устойчивому развитию на период до 2030 года, аргументируя центральную роль публичных библиотек в реализации данных целей. Задача здесь двоякая. Во-первых, в статье дается обзор истории повестки дня в сочетании с



началом обзора литературы исследований библиотечно-информационной науки по ней. Во-вторых, статья представляет собой концептуальную основу для подхода к целям повестки дня и связанными с ними задачам в контексте публичных библиотек. Конечная цель состоит в том, чтобы создать основу для расширения осведомленности о повестке дня ООН на период до 2030 года в рамках дисциплины библиотечно-информационной науки, а также пропагандировать важность публичных библиотек в продвижении усилий по устойчивому развитию в целом и повестки дня в частности.

### **Libraries as promoters of environmental sustainability: Collections, tools and events**

#### **Библиотеки как пропагандисты экологической устойчивости: коллекции, инструменты и мероприятия**

Лиза Бютельспахер, Кристина Мешедде Мешедде

Журнал ИФЛА, 46–4, 347–358

Аннотация: Стремление к достижению баланса между экономическим развитием и охраной окружающей среды является амбициозной целью, требующей достаточной информированности со стороны всех участников процесса. Публичные библиотеки могут играть важную роль в распространении знаний об устойчивости экологической ситуации. Исследователи проанализировали состояние немецких публичных библиотек и предпринимаемые усилия по созданию устойчивого общества. Мы рассмотрели фонды библиотек и составили анкету, обратившись с просьбой к библиотекарям оценить текущую ситуацию в их библиотеке. Результаты подтверждают, что многие библиотеки способствуют экологической устойчивости, используя книги и средства массовой информации по нескольким подтемам, организуя специальные собрания или создавая отдельные полки. Счетчики энергии были наиболее часто упоминаемыми инструментами, предоставляемыми для повышения осведомленности по этой теме. Кроме того, библиотеки организуют ряд информационных мероприятий. Поэтому партнерство с другими организациями и школами имеет первостепенное значение. Помимо упомянутых мероприятий, существует еще больший потенциал для содействия экологической устойчивости. Зачастую проблема заключается в нехватке бюджета и персонала.

### **Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage**

#### **Потенциал иранских публичных библиотек в области сохранения и распространения нематериального культурного наследия**

Лейли Сейфи, Марзия Солтанабади

Журнал ИФЛА, 46–4, 359–368

Аннотация: Поскольку публичные библиотеки Ирана обладают богатым и сильным нематериальным культурным наследием, важно изучить возможности этих библиотек. С этой целью для исследования был применен метод Дельфи. В данном исследовании принимали участие 30 экспертов и исследователей, которые были отобраны с помощью целевой выборки. Исходя из результатов этого исследования, роль иранских публичных библиотек заключалась в предоставлении нематериального культурного наследия путем сбора данных на местных территориях, проведения публичных выставок и пересказа примеров нематериального культурного наследия. В этом исследовании также подчеркивается важность применения прав интеллектуальной собственности и обеспечения инфраструктуры информационных технологий иранскими публичными библиотеками для сохранения и распространения нематериального культурного наследия. Что касается результатов исследований, то иранские публичные библиотеки считаются одним из центров культуры знаний для всех слоев общества, который, благодаря сохранению и распространению нематериального культурного наследия, может сыграть значительную роль в повышении осведомленности каждого человека в отдельности.

### **Skills, competencies and literacies attributed to 4IR/Industry 4.0: Scoping review**

#### **Навыки, компетенции и грамотность, предоставленные к 4IR/Индустрия 4.0: аналитическое исследование**

Чака Чака

Журнал ИФЛА, 46–4, 369–400

Аннотация: С момента запуска в 2011 году было много сказано о четвертой промышленной революции (4IR) или Индустрии 4.0. Кроме того, некоторые навыки рекламировались как специальные навыки 4IR или Industry 4.0. Несмотря на все это, было проделано не так уж много работы, которая фокусировалась бы на том, что представляют

собой эти навыки с междисциплинарной точки зрения. Нынешнее обзорное исследование было направлено на выявление навыков, компетенций и грамотности, приписываемых 4IR/Industry 4.0, с помощью 64 рецензируемых журнальных статей, взятых из различных предметных дисциплин. Три из его выводов заслуживают упоминания. Во-первых, навыки и компетенции, предоставленные 4IR рецензируемыми журнальными статьями, являются

общими мягкими навыками, часто называемыми навыками 21-го века, такими как коммуникация, творчество и решение проблем. Во-вторых, из жестких навыков навыки программирования характеризуются преимущественно как навыки 4IR из рецензируемых статей. В-третьих, информационная грамотность недостаточно представлена и недостаточно цитируется как навык для 4IR в рецензируемых статьях.

## Resúmenes

### **Privacy literacy instruction in academic libraries: Past, present, and possibilities**

#### **Enseñanza de conocimientos básicos sobre privacidad en las bibliotecas universitarias: pasado, presente y posibilidades**

Sarah Hartman-Caverly, Alexandria Chisholm

IFLA Journal, 46–4, 305–327

Resumen: En este artículo se analiza el pasado, el presente y las posibilidades de la enseñanza de conocimientos básicos sobre la privacidad en las bibliotecas universitarias. También se analiza la investigación sobre privacidad y enseñanza de conocimientos básicos sobre la privacidad desde el punto de vista de la filosofía, la antropología, la historia, el derecho, la educación y la ByD. Se propone un modelo conceptual de privacidad que muestra las zonas de las agencias de información que preserva la privacidad, y una línea cronológica de privacidad y bibliotecas documenta los avances clave operados en la cultura de privacidad en EE. UU. Se debaten las conclusiones de un estudio exploratorio original sobre las prácticas de enseñanza de conocimientos básicos sobre la privacidad en bibliotecas universitarias. El estudio identifica las bases lógicas, los temas, los contextos, los métodos y las evaluaciones que los bibliotecarios universitarios utilizan para impartir este tipo de enseñanza, así como las barreras con las que se encuentran. El artículo concluye con un estudio de caso en el que se relatan las experiencias relacionadas con la enseñanza de conocimientos básicos sobre la privacidad de los propios autores, así como recomendaciones concretas para superar las barreras para impartir enseñanza de conocimientos básicos sobre la privacidad en bibliotecas universitarias identificadas en las conclusiones del estudio.

### **Public libraries and the UN 2030 Agenda for Sustainable Development**

#### **Las bibliotecas públicas y la Agenda 2030 de las Naciones Unidas para el Desarrollo Sostenible**

Marc Kosciejew

IFLA Journal, 46–4, 328–346

Resumen: En su calidad de motores del cambio que impulsa el desarrollo, las bibliotecas públicas, gracias a su compromiso con el suministro y el acceso a la información, son esenciales para el cumplimiento de la Agenda 2030 de las Naciones Unidas para el Desarrollo Sostenible. Este artículo contribuye a analizar las investigaciones emergentes en el ámbito de la biblioteconomía y documentación de la Agenda 2030 de las Naciones Unidas para el Desarrollo Sostenible, y a reivindicar el papel esencial que desempeñan las bibliotecas públicas en la consecución de sus objetivos. Sirve a un doble propósito. En primer lugar, ofrece una visión general de los antecedentes de la Agenda y una revisión bibliográfica de la investigación que existe sobre ella en el ámbito de la ByD. En segundo lugar, presenta un marco conceptual para situar los objetivos y las metas asociadas de la Agenda en el contexto de las bibliotecas públicas. El objetivo último consiste en establecer una base para dar a conocer la Agenda 2030 de las Naciones Unidas en el ámbito de la ByD, además de promover la importancia de las bibliotecas públicas en el fomento de las iniciativas de desarrollo sostenible en general, y de la agenda en particular.

### **Libraries as promoters of environmental sustainability: Collections, tools and events**

#### **Las bibliotecas como promotores de la sostenibilidad medioambiental: fondos, herramientas y eventos**

Lisa Beutelspacher, Christine Meschede Meschede

IFLA Journal, 46–4, 347–358

Resumen: La consecución de un equilibrio entre el desarrollo económico y la protección medioambiental es un objetivo ambiguo que requiere información suficiente por parte de todos los actores. Las bibliotecas públicas pueden desempeñar un papel importante como promotores de conocimientos sobre sostenibilidad medioambiental. Los investigadores analizamos la situación de las bibliotecas públicas alemanas y sus iniciativas para lograr una sociedad sostenible. Consideramos los fondos de las bibliotecas y creamos un cuestionario para que los bibliotecarios evaluaran la situación actual en su biblioteca. Los resultados muestran que muchas bibliotecas promueven la sostenibilidad medioambiental marcando libros y otros soportes sobre diversas submaterias por medio de convenciones especiales o colocándolos en estanterías aparte. Los contadores de energía son las herramientas que se mencionan con mayor frecuencia para sensibilizar sobre el tema. De la misma manera, las bibliotecas organizan diversos eventos informativos. Por tanto, las asociaciones con otras organizaciones y facultades revisten la máxima importancia. A pesar de los esfuerzos, aún queda mucho margen para promover la sostenibilidad medioambiental. Uno de los retos más habituales tiene que ver con la falta de presupuesto y personal.

#### **Iranian public libraries' capacities in preserving and disseminating intangible cultural heritage**

##### **Capacidades de las bibliotecas públicas iraníes para preservar y difundir el patrimonio cultural inmaterial**

Leili Seifi, Marziyeh Soltanabadi

IFLA Journal, 46–4, 359–368

Resumen: Puesto que las bibliotecas públicas iraníes disponen de un rico y diverso patrimonio cultural inmaterial, es importante estudiar sus capacidades. A tal fin, el método aplicado para el estudio fue la técnica de Delphi. La población de estudio consistió en 30 expertos e investigadores seleccionados por medio de un muestreo específico. Sobre la base de las conclusiones de este estudio, las funciones de las bibliotecas públicas iraníes fueron la provisión de patrimonio cultural inmaterial mediante la recopilación de patrimonio de zonas locales, la celebración

de exposiciones públicas, y la difusión de patrimonio cultural inmaterial. El estudio hace hincapié en la solicitud de derechos de propiedad intelectual y el suministro de infraestructura de tecnología de la información por parte de las bibliotecas públicas iraníes para la preservación y la difusión del patrimonio cultural intangible. En cuanto a las conclusiones de la investigación, las bibliotecas públicas iraníes se consideran uno de los centros culturales de conocimiento para la diversidad en la sociedad que, mediante la preservación y la difusión de patrimonio cultural intangible, podría desempeñar un papel importante en la promoción de la concienciación de los individuos.

#### **Skills, competencies and literacies attributed to 4RI/Industry 4.0: Scoping review**

##### **Habilidades, competencias y conocimientos básicos atribuidos a la 4RI/Industria 4.0: Revisión de alcance**

Chaka Chaka

IFLA Journal, 46–4, 369–400

Resumen: Mucho se ha dicho sobre la cuarta revolución industrial (4RI) o la Industria 4.0 desde su aparición en 2011. Del mismo modo, se ha pregonado la existencia de algunas habilidades específicas de la 4RI o la Industria 4.0. Lo cierto es que no existen muchos estudios en los que se describa cuáles son estas habilidades desde un punto de vista interdisciplinar. El estudio de revisión de alcance actual tiene por objeto identificar habilidades, competencias y conocimientos básicos atribuidos a la 4RI/Industria 4.0 mediante artículos periodísticos revisados por pares extraídos de diversas disciplinas. Merece la pena citar tres de sus conclusiones. Primera conclusión: las habilidades y las competencias atribuidas a la 4RI por los artículos periodísticos revisados son habilidades blandas genéricas que reproducen las habilidades del siglo XXI, como la comunicación, la creatividad y la resolución de problemas. Segunda conclusión: de las habilidades duras, las habilidades de programación destacan claramente como habilidades de la 4RI. Tercera conclusión: la alfabetización informacional está infrarrepresentada e infracitada como habilidad para la 4RI en los artículos revisados.

