Trends Report:
Snapshots of a Turbulent World

American Library Association
Policy Revolution! Initiative
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Executive Summary

“The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday’s logic.” – Peter Drucker

The speed of change related to technology and the linked policy dimensions is breathtaking. Similarly, library roles and demands are evolving, so we must review and realign our national policy priorities so that libraries may continue to provide effective public access to information for all. This is the “charge” of the Policy Revolution! initiative of the American Library Association (ALA) Office for Information Technology Policy (OITP), funded by the Bill & Melinda Gates Foundation. The three-year initiative includes three major components: establishing policy priorities, engaging decision makers and influencers to advance policy goals, and upgrading ALA policy advocacy practice and capabilities for long-term sustainability.

To ground and inform this effort, we undertook a broad-ranging scan of the horizon of emerging trends affecting communities and demanding new policy approaches. Studies, reports, and more substantive articles on major trends relevant were reviewed, categorized and analyzed in early 2014.

Key trends and challenges are presented across a total of ten trend areas. The first three trend areas connect directly with the environment libraries operate in and related shifts:

**Information technology: Fast moving and disruptive.** Information technology is a driving force of today’s network revolution, impacting the way we access, share and use information, as well as the ways we do business and live our lives. Information technology trends have impacts across many sectors – including libraries, the environment, education, and work. High-profile topics include the mobile internet, cloud computing, the Internet of Things, big data, 3D printing, algorithms, and robotics. Advancements in human computer interaction, new network architectures, and developments in artificial intelligence (AI), as well as security concerns have implications for how people will interact with information in the future.

**Information institutions: Navigating unsteady ground.** Publishing, journalism, television, music, libraries, archives, museums, and other traditional information sectors and institutions are in the midst of a period of disruption (for trends impacting education institutions, see below). As new technologies and new competitors emerge, these players are adapting and transforming in exciting, yet challenging circumstances. Among other things, they must grapple with: shifts in the way we access and interact with information, changing business and revenue models, new competitors, digital piracy and rights management including related implications for user control over media, and a vast increase in the amount of information available — often for free. The lines demarcating the roles of different institutions are blurring. In a digital world,
museums, archives and various types of libraries face similar challenges and may benefit from increased collaboration.

**Information use and consumption: Driving and opposing forces.** Drivers such as new technologies, increasing connectivity, and increasing ownership of mobile devices are pushing Americans towards a world where the virtual and the physical are increasingly integrated. At the same time other trends such as concerns over privacy and security, digital overload and the digital divide are “resisting” this motion. Additionally there is a significant overlap in the use of “old” and “new” media as well as demographic differences in media use and an increasing fragmentation of the market.

The remaining seven trends consider topics that connect with the services, which libraries offer to communities, or strongly impact the larger context in which they exist, and have policy implications:

**Global context: An interconnected world.** Global systems, from the economy to the earth’s ecosystem, are increasingly interconnected. This means that trends or events in other parts of the world have an increased potential to impact the United States, including the context in which libraries operate. Global political, social and economic trends promise to offer new opportunities to some, while economic crises, income disparity, and other challenges have the potential to contribute to unrest. At the same time, 1-3 billion citizens, mostly of developing countries, are expected to get online with implications for commerce, education and politics. Global business, finance, work and security are being reshaped by new technologies – ranging from robots and smart machines to big data, and these shifts will impact the American economy and job market. Finally, as many aspects of our lives become increasingly reliant on the internet – ranging from infrastructure operations to environmental monitoring to health care – the state of privacy, cyber security, and freedom of information are rising in significance.

**Environment: The rise of resilience.** Nations and communities are considering how people may live more sustainably and reverse or minimize environmental degradation where it occurs. Since environmental impacts are felt locally, libraries may play a role in addressing these concerns by serving as public forums for determining community-based solutions, for example, or serving as hubs during disasters. Key trends and challenges include: different groups have different views on how serious environmental issues are, and the appropriate policy responses; while the implications of environmental trends are highly significant for all other future trends, the environment is often a “blind spot”; sustainability is becoming increasingly mainstream – but it’s success is not a given; and resilience thinking is on the rise where communities are preparing for the worst, while hoping for the best.

**Demographics: Bigger, older and more diverse.** The U.S. population is on its way to becoming bigger, older and more diverse. Additionally, changing social mores are leading to increased legal recognition and support of some demographics, such as the LGBT (lesbian, gay, bisexual and transgender) community. Population growth in the
South, West and in the suburbs has characterized the past 50 to 100 years, reflecting an overall shift in population from rural to metropolitan (largely suburban) areas. Significantly, there are geographic patterns to immigration, with a high percentage of New Americans heading for certain states and metropolitan areas. While the dominant trend towards metropolitan living appears poised to continue, environmental and social pressures, as well as opportunities for working online, may lead to a re-appreciation of rural areas and regions of the country that offer assets such as clean air, clean water and abundant food. Since libraries – especially public ones – serve a wide range of people across the country, these bigger picture demographic patterns and their policy implications are significant.

**Rising economic inequality.** The demographics of poverty in the U.S. look somewhat different than in decades past, but poverty persists, particularly among some demographics. Additionally, wealth and income gaps in the U.S. have risen and continue to rise. Yet, counter trends are emerging in the form of public opinion and political critique.

**Public sector: Beware budget shortfalls.** State and local governments are poised to encounter increasing budget shortfalls as pension and healthcare costs rise for retired workers, meaning potential cuts in library and education budgets. Fiscal conservatives have gained increasing control at the local and state government level in recent years, which may mean further cuts in public sector jobs, spending cuts more generally, and privatization – including for libraries. As budgets tighten and government services increasingly move online, cost shifting to libraries and other community institutions is likely to continue to occur, as people seek help in accessing information and services.

**Education: Self-directed, collaborative and lifelong.** The education sector is in the midst of an upheaval driven by new information technologies and applications including social media, cloud computing, advanced analytics, flipped classrooms, gaming and gamification, open content and data, online education, and so on. As education becomes more self-directed, collaborative and lifelong, traditional education institutions as-we-know-them, in which school and academic libraries are embedded, will be challenged and changed. More specifically: Educators are moving from assigning to enticing with content, and from acting as content conveyors to becoming content curators; advances in online education are challenging teachers and institutions to simultaneously scale up and expand access to make learning more personalized; a shift is underway from degrees to reputation metrics and from grades to continuous feedback mechanisms; and education is moving out of lecture halls and into collaborative spaces. To meet the future, education institutions must get better at adopting new technologies, and develop agile approaches to change. Additionally, the education sector faces a number of budgetary and policy-related challenges – some of which may play a role in dampening or accelerating other trends. These include increased testing, assessment and accountability structures, the rise in charter schools.
and school vouchers for K-12 students, and, at the university level, increasing student debt.

**Work: New skills, new structures:** With information technology advances the future of work promises to be both more flexible and less secure. Everything that can be routinized, coded and dissected will eventually be done by machines, and those with skills complementary to machine intelligence are likely to thrive. There will be an increase in temporary, part-time, freelance, and contract work and a decline in “the long job.” Meanwhile, inequalities in pay and geographic disparities in jobs are apparent, and Americans are concerned about jobs, the economy and inequality. Libraries will have opportunities to support workers in this new paradigm and help them build future-ready work skills.

In sum, as libraries move into the future, it is clear that they are not the only sector facing major disruptions and new opportunities. Libraries as we know them are both threatened by these shifts, and have the capabilities to navigate these changes while helping other institutions and the American public transition more smoothly into the 21st Century.

The following report is intended to help the library community and our partners better understand these emerging trends and potential implications as a major input to developing a public policy agenda for libraries moving into the future. Comments on this discussion draft are welcome until September 15, 2014; email your comments to Larra Clark at lclark at alawash dot org or post them on District Dispatch. A final public document will be disseminated before the end of 2014.

**Introduction**

**Looking into an uncertain future**

This report provides a foundation for the Policy Revolution! initiative of the American Library Association (ALA) Office for Information Technology Policy (OITP), with the intent of helping the library community and our partners to think about how libraries may leverage emerging trends and therefore develop a public policy agenda for libraries in the future.

Research for this report began by investigating future trends studies undertaken by other library groups. As would be expected in turbulent times, a number of studies have been conducted in the U.S. and elsewhere on the future of libraries in recent years. The future of libraries has also been a popularly debated topic not only on library blogs and publications, but outside the library community as well. Few studies, however, have
looked explicitly at the potential impact of a broad range of trends outside the library sphere on libraries.

One exception is a recent research program of the Arts Council of England called “Envisioning the Library of the Future.” As part of that larger effort, researchers produced a future trends review, covering topics including: demographic trends; poverty and inequality; the economy and consumer behavior; community, engagement and participation in society; the future of public service delivery; technology; reading and literacy and libraries. Since the Arts Council trends report was U.K.-focused, some of the report’s particulars were not directly applicable to the U.S. context, but its structure offered a useful starting point. This report considers many of the same topics as the U.K.-report, as well as subjects that were not included, but are relevant for libraries – such as the future of work, the environment, and education trends. This report attempts to go beyond simply sketching the trends to consider relationships among them, and to point towards potential implications for libraries and the future of public access to information.

**Methodology and structure**

To develop this document, studies, reports, and more substantive articles on major trends relevant to developing a public policy agenda for libraries were reviewed, categorized and analyzed in early 2014. Sources published during the last five years (2010-2014) were primarily considered, with a preference for the recent items. Relevant library sector materials were reviewed, such as the International Federation of Library Associations and Institutions (IFLA) global information environment report released in summer 2013, but the large majority of resources were drawn from outside of the library community in an effort of gain a broad perspective in shifts underway. The research focused mainly on the U.S. context, though some of the trends have global implications as well.

Many of the trends reports reviewed during the research were substantial: the result of a year or more of research conducted by a team of subject area experts. Most focused on one particular topic or sector: education, jobs, demographic trends, publishing, etc., and employed a variety of methods including environmental scans, trend assessment, surveys, stakeholder consultations, and scenarios. In other words, these reports were deep and focused. This report, in contrast, builds on the research of others to offer a meta-perspective across a range of topics. It is offered with the caveat that while it is challenging enough to offer a clear view of trends in just one topic area (as seemingly clear-cut trends are rarely as simple as they might seem), it is even more challenging to do so in the bigger picture. While this report may not capture all possible factors potentially relevant to the future of libraries, it provides a guide to both obvious and less obvious – but significant – issues, ranging from technology trends, to natural disasters, to the implications of state government budget shortfalls.
Following this introduction, the first section of the report gives an overview of how a “network revolution” and associated information technologies are disrupting traditional information sectors and institutions, as well as driving shifts in information use. This discussion of network revolutions, as well as three related trends, sets the stage for the most immediate context in which libraries operate. The second part of the report gives an overview of seven additional trend areas with implications for policy and libraries. For each topic area the following sections are provided: an overview, key trends and challenges, and implications for libraries. A list of resources for further reading on each topic can be found in Appendix 1, and diagrams related to each trend topic can be found in Appendix 2.

Making use of the report

This report recognizes that there are many types of libraries (public, K-12 school, college and university, government, special, etc.), and that even libraries of the same type are embedded in a wide range of communities and institutions. An effort has been made to consider topics of relevance to all libraries, though the implications of these trends will vary for different libraries. For example, trends in K-12 and higher education are likely to be most relevant to school and college and university libraries, but are meaningful for public libraries, albeit in a different way. Wherever possible an effort has been made to call out potential implications and differences, but there are surely many cases where more could be done. Readers are invited to bring their own experience and critical eye to the data, asking: what does this mean for our library? Questions to consider while reading include:

- Given these trends, how might the role of libraries change in the future? What are the implications of these trends for libraries and public access to information?
- Given these trends, what opportunities and competitive advantages do libraries have (e.g., public good will, free to users, physical locations across the nation)?
- What “threats” are libraries facing? Who are emerging competitors to libraries – e.g., companies, community organizations, or technologies that are doing the things libraries have traditionally done?
- What implications do these trends have for policy advocacy for libraries?

Part I: Network revolutions and their impact

We are living in a time of great change. New technologies threaten to disrupt and transform many sectors, leaving a wake of creative destruction behind them. This shift is impacting society deeply, and has particular implications for how we share and make use of information. The concept of “network revolutions” (described below) helps to shed light on the bigger picture shift we find ourselves in. Each trend discussed in this report – from the future of work to the future of education – is, in essence, a part of this
bigger upheaval. Understanding the characteristics of this particular network revolution, as well as network revolutions more generally, helps us to understand the larger environment in which libraries, and many other traditional information industries and institutions, find themselves in today.

**Network revolutions**

"Amazon, Google and all of those things probably aren't the enemy. The enemy right now is simply refusing to understand that the world is changing. ...The whole point of a digital frontier right now is that it's a frontier, all the old rules are falling apart. Anyone who tells you they know what's coming, what things will be like in 10 years' time, is simply lying to you. None of the experts know - nobody knows, which is great.” 

-- Author Neil Gaiman on the future of publishing

Before Tom Wheeler joined the Federal Communications Commission as its Chairman in November 2013, the venture capitalist and former lobbyist for the cable and wireless industry was working on a book investigating the “network revolutions” in history.  

“Though my day job was to chase the future, history has been an abiding hobby. One of the ways I have tried to understand what lies beyond the next hill in the landscape of the communications revolution is to study the advent of similar periods in the past,” he wrote in a summary of the book concept. Wheeler’s analysis of network revolutions offers a useful meta-lens for thinking about technology trends.

The first major network revolution occurred around 1450 with the invention of the printing press. This led to an explosion of information, a spread of written knowledge, a growing importance of the written word, and was deeply destabilizing to the powers of the time including governments and the Catholic Church, which both tried to shut down or limit the new technology. Over the course of hundreds of years the printing press helped drive great transitions in society.

A second network revolution, in the mid-nineteenth century, was spurred by the railroad. The railroad led to the “collapse of distance” as it enabled transport and communication at previously unthinkable speeds. A third major network revolution was kick-started by the telegraph, and later telephony. These inventions allowed for instantaneous communication at great distances, condensing time, and separating information from its physical package (e.g., one no longer needed to wait for the time it took to send a letter by horse or rail, but could read or hear the information immediately). These innovations enabled the management of far-flung systems and enabled the modern corporation, as well as other institutions and relationships. The third network revolution continued with innovation in sound and image, leading to the development of radio and television. These mass communications networks allowed for people to have shared experiences across great distances.
Over the last several decades we have entered a fourth network revolution heralded by digital communication. Like past disruptions, the repercussions of this revolution are seismic: “Each of the preceding changes enabled by print, transportation and electronic communication were destabilizing and redefining. We should expect nothing less today.” The connections that today’s digital networks enable have at least three key implications:

- One, the digital network revolution represents an “end of the tyranny of place.” In other words, in the past, the consumption of information has required the user to go to it (to “go to” the book, the telegraph office, the television, the library, etc.). Today mobile and wireless technologies increasingly allow users to bring information to them, whenever they’d like it and wherever they are.

- Two, the fourth network revolution represents the next stage in a continual acceleration in the pace of information use and transmission. In other words, the railroad and telephony enabled communication, transport, and the economy to move at a pace previously unimaginable: digital technologies have vastly accelerated that pace and scope once again.

- Three, in a reversal of the centralizing effects of past network revolutions, digital communication has the power to help decentralize economic and creative activity. This includes a diffusion of control over information production and sharing, and increased autonomy or “innovation without permission.”

Finally, Wheeler observes that today’s digital information networks are the new economy: “Whereas earlier networks enabled the economic activities of their eras, our network revolution defines virtually all aspects of the current economy.”

Looking back at past network revolutions, we can see a number of common characteristics, and these patterns are also apparent today. Network revolutions are disruptive: both creative and destructive. Old industries and occupations disappear, while new industries and occupations are born. As part of the process, “immutable facts” are challenged, and institutions built on them transform or wither. With the invention of telegraphy and telephony, for example, “institutions of society, built around the immutable fact that because information moved physically it moved slowly, were hit by a seismic shift to speed.” People at that time worried about the impacts of this shift on health: medical experts asserted that the “whirl of the railways and the pelting of telegrams” caused mental illness by placing an unnatural burden on the human body. Although in retrospect those fears may seem unfounded, worries about impacts of digital technology on health, privacy and family life also characterize today’s network revolution. As Jessie L. Mannisto writes in an ALA OITP paper on the role of libraries in restoring contemplation: “With smartphones at their sides 24/7 ... [today’s
teenagers] never experience a minute free from the pressures of the high school social sphere. An increasing number express nostalgia for a disconnected past they never knew, while many of their perpetually connected parents face a similar struggle to leave work behind.” Meanwhile, scientists warn that heavy use of information and communication technologies and related behaviors, like multi-tasking, have neurological consequences.\textsuperscript{13}

Network revolutions are deeply destabilizing to powerful institutions and established structures: “In one 16th century cleric’s warning we hear the echoes of some of the gnashing worries raised about the changes being imposed today: ‘We must root out printing, or printing will root us out,’ the Vicar of Croydon thundered.”\textsuperscript{14} Incumbents, who became established as a result of previous network revolutions, often fight hard to maintain their territory through a variety of legal and moral arguments, or worse. For instance, when the advent of the railroad threatened those whose business was based on slower realities: “Every ploy known to shrewd local lawyers was used to keep things nice and cozy for local carting companies, freight forwarders, hack drivers, hotel and restaurant owners, local wholesale merchants, and anyone else” for whom the railroad represented a change from the status quo. When legal means failed, vigilantes tore up at night the track that had been laid during the day. Legislatures passed laws restricting the ability of the new network to compete with the old.\textsuperscript{15} While we can expect that some traditional industries, institutions and occupations will survive this revolution by adapting to new conditions, others will eventually decline or disappear.

\textbf{Information technology: Fast moving and disruptive}

\textit{Overview}

Today’s information technology trends are driving the latest phase in the current network revolution, promising to bring as much or more change as we have already seen over past decades. Information technology trends are particularly significant as advancements in this sector are driving huge shifts in others, including in work, education and business. The global information economy is being transformed by new technologies resulting in things like the automation of knowledge work, and a growing need for people with computer-compatible skills.\textsuperscript{16} Government, health care and education, in particular, are poised to be transformed by new technologies. This will include increased transparency for governments, as well as the disruption and democratization of global learning, the empowerment of new groups around single issues versus traditional political lines, and new forms of health monitoring and diagnostics.

Information technology also interacts in complex ways with bigger-picture topics such as the environment and inequality – with the power to both ameliorate and exacerbate problems. And, while the latest information technology offers the promise of futuristic developments such as self-driving cars and the Internet of Things, new technologies also
bring downsides – including digital overload, digital divides, job loss, and worrisome security issues. Other critical tensions include privacy concerns – increasingly, even what we choose not to share will still be digitally recorded; the tradeoff between the benefits we gain from technological assistance and augmentation versus risks associated with technological dependency; forces that portend to keep the internet open and unified versus those that push it towards fragmentation; and the human internet versus the machine internet – meaning that human interaction with computers is likely to become more humanized, allowing for interactions in more intuitive ways such as via speech and gesture. Meanwhile, the machine internet will be unleashed from many human limitations, and its workings may become incomprehensible to human beings.\(^\text{17}\)

Reflecting the complexity and scale of this topic, information technology trends reports range from the micro to the meta; from the discussion of specific emergent technologies such as 3D printing, massive online open courses (MOOCs), wearable technology, and advanced robotics developments to larger issues such as the potential impact of automation on jobs or challenges to the boundaries of privacy and data protection. Clusters of key trends drawn from a cross-section of technology futures reports are summarized below. The implications of many of these trends are elaborated on in other sections of this report.

**Key trends and challenges**

**Mobile internet and related devices have huge disruptive implications.** In a May 2013 report the McKinsey Global Institute examined 100 disruptive technologies and ranked the mobile internet as number one, with an estimated global economic impact of $3.7 to $10.8 trillion by 2025 (that is, nearly double the impact of the second most valuable technology: the automation of knowledge work).\(^\text{18}\) The mobile internet (including mobile computing devices) is so powerful because it enables many other applications and technologies. According to technology research company Gartner, at least three forces are set to shape our experience of the mobile internet: the transport of data across it and the content available on it; the government’s desire for control and people’s desire for freedom and privacy; and companies’ pursuit of profit.\(^\text{19}\) Globally, mobile now compromises 25% of web traffic, and 19% of web traffic in the U.S.\(^\text{20}\) **Cloud computing** stands to amplify the power of the mobile internet, as well as other developments such as the **Internet of Things**, by making it possible to access data, applications and other resources stored “in the cloud” (online) from anywhere.\(^\text{21}\)

**Big data promises to enable new applications, services and insights across a wide variety of sectors.** In short: “the amount of data in our world has been exploding, and analyzing large data sets—so-called big data—will become a key basis of competition, underpinning new waves of productivity growth, innovation, and consumer surplus.”\(^\text{22}\) Amazon’s Kindle devices, for instance, generate unprecedented amounts of data about consumer’s purchasing and reading habits the company makes use of, and also raise privacy issues: do we want a corporation to know what and how we’re reading? On a
daily life level, quantified self applications allow people to monitor and quantify things about their body (e.g., blood oxygen levels) or habits (e.g., mood, exercise, time spent working). Sometimes these applications incorporate the use of wearable sensors making personal data collection even more seamless. These applications hold promise for sectors such as healthcare, but raise questions like: who should have access to intimate data about one’s physical or mental state?

Integrated physical/digital experiences will increase. Enabling infrastructures such as mobile and cloud technology and augmented reality devices like Google Glass, which allow us to view the physical and virtual worlds simultaneously, will mean an increasing blending between the two (but won’t necessarily be adopted right away). This hyper-connectivity may also produce counter-reactions, intensifying people’s sense of digital overload and desire to disconnect. This trend doesn’t only mean that the physical world will become more permeated with virtual world information and applications. At the other end of the spectrum technologies like 3D printing make it possible to create a physical object based on designs shared through the internet, shifting our conceptions about how manufacturing works and the relationship between the digital and the physical. Meanwhile, The Economist asserts that digital/physical integration enabled by mobile devices will ultimately have a localizing force, drawing people into local businesses or to resources that they otherwise may not have known about or engaged with: “With a smartphone in your hand you can find out more, if you want to, about what is going on immediately around you. The next bus goes in five minutes. The coffee shop across the street, where you haven’t been for a few weeks, is offering you a free cappuccino. Those cushions you looked at online are available in the department store around the corner.” Two visions of this blended physical/digital world are offered in the popular films Minority Report (2002) and Her (2014).

The Internet of Things, in which devices and the environment are embedded with sensors that communicate with one another and with humans, is poised to grow. In other words, “the physical world itself is becoming a type of information system.” Like people’s digital actions, the Internet of Things has the potential to generate copious amounts of “digital exhaust” that could be made use of via big data applications. This evolution is in keeping with the concept that we’ve been through three computing eras and are heading for a fourth in which computers will be ubiquitous (1960s: Mainframe Era – One computer per many users; 1980s: Personal Computer Era – One computer per user; 2000s: Mobility Era – Several computers per user; 2020 and beyond: Ubiquity Era – Thousands of computers per user). One implication of this is that we increasingly will have the ability to implement change in the physical world through remote digital interfaces. For example, prototypes exist for washing machines that allow the user to start the machine or change its settings through a tablet elsewhere in the house. One could imagine relevant applications in other settings such as offices, stores, or libraries. At a larger scale, networked environments also have the potential to make “smart cities” possible by capturing and acting on often-invisible data cities provide. In Barcelona, Spain, for example, sensors alert city workers when trash cans are full,
irrigation systems monitor soil moisture and turn on sprinklers when needed, and drivers can use a smart phone app to find the nearest available parking spot.

In an e-volution of commerce, digital and mobile technologies will enable consumption in just about every form. At present Google, Facebook, Amazon and Apple take the prize for the information economy’s “fab four.” Tellingly, although each company once had a distinct area of operation, they have begun to encroach on each other’s territory. According to Fast Company, each of the four have embraced what Steve Jobs branded the “post-PC world”—“a vision of daily life that is enabled by, and comes to depend on, smartphones, tablets, and other small, mobile, easy-to-use computers.” These post-PC devices facilitate consumption in just about every form, as well as generating a wealth of data. Related to this, consumers increasingly expect online products and services to be customizable, free and easy to use (e.g., Gmail).

Digital and mobile technologies also open up possibilities for new services and the sharing economy (e.g., Zipcar, AirBNB).

Looking at a more fundamental technological level we can anticipate developments in human computer interaction, AI, robotics, and network architectures:

In the future we will interact with computers in ways more natural to humans. Future human-computer interfaces may develop in areas previously unimaginable. We may be able to, and in many cases already can, interact with devices via speech (e.g., natural language processing), biosensing (e.g., biometric sensing), action detection (e.g., touch, gesture recognition, or eye tracking), human-computer hybrids (e.g., wearable computing, implants), and even our state of mind (e.g., mood detection). Some technology groups, such as Microsoft, are pursuing an “invisible interface” future in which: “users do not need to tell their device what to do – by touching or speaking to it, for instance – and instead passively consume information that the device has already prepared in anticipation of their needs.” In some ways, this new paradigm is liberating, promising to make interaction with devices more attuned to human bodies and abilities. It also can pose ethical questions: as our devices become more and more integrated with our actions and bodies where will the boundary lie between “us” and “them”? Or, as we become increasingly reliant on computing technology to support our daily lives – ranging from individual health applications to the global food system – what happens if it falters? Some human computer interfaces, while technically possible today, like device implantation under the skin, face strong cultural aversion. Others, such as direct computer-brain communication aren’t likely in the next decade due to both biological challenges and ethical concerns. Still, many augmentations that are now routine, such as pacemakers and laser eye surgery, were once thought to be strange and risky, indicating that we may warm up to the idea, as we become tempted by the new abilities computer implantation could give us in terms of sensory enhancement, memory expansion, and work efficiency.
Advanced artificial intelligence (AI) is not yet possible without human-computer collaboration, but may be in the future. While big advances have been made in AI applications like natural language processing, some aspects of it, such as machine-based translation from one human language to another or speech recognition, are considered to be “AI-complete” – requiring all of the different types of knowledge that humans possess (semantics, grammar, facts about the real world, etc.) in order to solve with accuracy. In essence, for computers to solve these problems they must become as “intelligent” as people. While they are not there yet – but may be by 2029, innovative means of human-computer collaboration are being developed. This makes sense, as machines are already better than humans at some tasks that require a high level of repetition such as data processing.

The internet makes these machine-human collaborations possible on a huge scale. For example, Luis von Ahn, inventor of the CAPTCHA (the word or two one must type in based on a picture to prove that you’re a human on certain websites) is working on a new project that would engage humans in translating the web, something that computers currently do clumsily. In von Ahn’s prototype, users are provided with a free online foreign language-learning platform. Through the efforts of these users, as they study the language of their choice, the platform verifies and improves translations. Using this system, accurately translating all the Wikipedia pages that exist only in English into Spanish would take five weeks with 100,000 users and just 80 hours with 1 million users.

Some libraries are taking advantage of large-scale human-machine collaboration enabled by the internet. One example is the New York Public Library’s menu project where volunteers are transcribing a large historical collection of scanned restaurant menus. Beyond these relatively familiar types of translation, AI applications like natural language processing have powerful potential in terms of human-machine communication. For instance, “in the future, humans may not need to code programs, but will dictate to a computer in a human natural language, and the computer will understand and act upon the instructions.

Algorithms are powerful tools that are invisibly shaping our access to information, as well as giving rise to unpredictable, emergent properties. Algorithms, the procedures computers use to make calculations or solve problems, are increasingly being applied to a variety of contexts, ranging from guiding financial market behavior to determining which content to recommend to a particular user, to use in espionage, movie scripts, and architecture. Algorithms are increasingly shaping our experience of the internet in ways many users are not aware of. Companies such as Google, Netflix, Amazon, and Facebook employ algorithms to determine what information will be shown to you – e.g., search results, video or book recommendations, and posts in one’s news feed. In essence, this means that two different people can “google” the same thing and come up with quite different search results, based on what Google thinks they want to see. More specifically, the results the Google search shows an individual user is based on 57 signals
such as the type of computer being used, where the person is located, and what browser he or she is using to surf. This can lead to blind spots, such as seeing fewer opinions that diverge from what you think (or what an algorithm thinks you think), and missing important information or points of view.

In the past, news editors filtered access to information. While we may have the idea that the internet has freed people from this paradigm of “expert intervention,” allowing us to see and find whatever information is out there, that is not exactly true. In essence, algorithms – which, as of yet, lack a sense of human ethics – are becoming a new sort of editor. While algorithms will likely play an important role in helping us sift through the ever-growing sea of information, it is important to be aware of the extent to which they invisibly shape our information environment. In some cases technologies, like algorithms, are giving rise to emergent properties that are not only unpredictable, but also difficult or impossible for humans to understand with implications we can’t control. There is concern, for instance, about the use of algorithms in financial markets, where they can make trades at super-human speeds.

**Developments in AI, sensors and actuators, machine vision and machine-to-machine communication will allow machines to perform many tasks once done by humans.** This can bring many benefits. More widespread use of autonomous vehicles, like Google’s self-driving cars that have driven 300,000 miles without an accident under computer control, could mean greater traffic safety as well as a decrease in carbon dioxide emissions achieved with more efficient driving. Similarly, robots of the future will be able to take on more roles in tasks that are too big (e.g., lifting heavy objects) or too small for humans (e.g., some types of surgery) to perform, as well as helping out in disaster and rescue situations that are dangerous or difficult for humans to address directly. Meanwhile, AI can be used in a wide range of professions to take over human tasks. Computers may, for instance, take on some of the work of lawyers, teachers, or doctors such as radiologists, which involve accuracy in data analysis or sorting through large amounts of information. A company called Measurement Incorporated, for example, has developed technology that enables a computer to grade student-written responses, including essays, as well as a skilled human grader can.

One downside of these developments is that they are likely to put many people out of work, ranging from manual laborers to knowledge workers. Self-driving vehicles, for example, could replace millions of truck and taxi drivers. And, “AI capability may start out by being built into the productivity applications used by [knowledge] workers, but over time, it will evolve to the point that these applications can perform much of the work autonomously: AI will become a tool for managers rather than workers. The result is likely to be substantial job losses for knowledge workers and a flattening of organizational charts that will eliminate large numbers of middle managers.” Most jobs that are vulnerable to offshoring may eventually be automated. And, high-paying jobs are especially likely to be automated when possible, as there is a larger financial incentive to do so.
Google is a powerful driver when it comes of the future of information technology.
The technology company is invested in a wide swath of future technologies, pushing forward in many areas. According to one technology commentator, the following range of projects are on Google’s to do list: “free gigabit internet access for everyone for life; mastering Big Data, machine learning and quantum computing; dominating wearable – and implantable – computing; becoming a huge venture capitalist and developing new kinds of currency (a la Bitcoin); becoming the world's biggest media company; revolutionising healthcare and technologies for life extension; alternative energy technologies; and transforming transportation." While this list is almost unbelievable, Google projects reflect these ambitions, such as Loon (“balloon powered internet for everyone”), Google Glass (wearable technology), Google Now (AI that provides users with “just the right information at just the right time”), and Google Wallet (e-payment). To power these and other developments the company has invested heavily, purchasing machine learning and robotics companies, to shape “what looks like the greatest artificial intelligence laboratory on earth … designed to feast upon a resource of a kind that the world has never seen before: truly massive data [generated by Google users].” In addition, Google has hired controversial futurist Ray Kurzweil, who believes that AI will overtake human thinking, to help bring natural language understanding to the company – a cornerstone in the advancement of AI.

New network architectures will shape the future of the internet. For most users, the architecture of the internet – including transport, network, data link and physical layers – is invisible. But, how the internet is built and managed can have a big impact on how we experience it. While the internet has scaled remarkably well, adapting to uses beyond its original applications, some of its design aspects make less sense today than in the past and even put the internet at risk to things like cyber security threats. Where finance, communication, government, health, and nearly every aspect of society is becoming more reliant on the internet – a threat to the internet means a threat to everything. As Rod Beckstrom, former President of the Internet Corporation for Assigned Names and Numbers (ICANN) puts it: “Everything that is connected to the Internet can be hacked, and everything is being connected to the Internet.”

To address security issues and other challenges, the U.S. National Science Foundation is working to stimulate the design of the next generation internet through the GENI (Global Environment for Netw work Innovations) virtual laboratory, including providing related funding for the development, testing, and deployment of architectures that improve security, address emerging service challenges, and enhance scalability. Meanwhile, the U.S. Ignite Partnership aims to catalyze next-generation applications that are possible with ultra-high speed internet, which is technically possible today, but not widely deployed. In the 1970s, many doubted there were uses for even 50 kb/s internet, yet soon applications like remote login, file transfer, and email began to emerge. Faster networks have the potential to stimulate another wave of innovation with applications such as virtual reality training for surgeons, collaborative advanced
manufacturing, and disaster mitigation systems that offer first responders a simulation-driven model of a city in the event of a hazardous material release.65

Ways in which the internet could develop in the future vary significantly, and internet governance, national policies, and privacy and security concerns are significant influencers. For example, while a global, open system may seem inherent to the internet’s nature, recent developments have challenged that. Revelations about the extent to which national security organizations are influencing cyber policy and conducting espionage and attacks has led to an erosion of trust among international stakeholders, with concerns over privacy and cyber security.66 Could we see a future in which countries wall off national intranets to protect themselves and their citizens from international spying?67 Edward Snowden, the computing systems expert who revealed U.S. National Security Agency intelligence practices impacting online privacy and internet security, emphasizes that creating “walled gardens” isn’t likely to protect us from surveillance. Rather, he says, we must ensure that the internet and communications over it are fundamentally secure.68 In this vein, he says, it is essential that we “encode our values in the structure of the internet.”69 Additionally, of the billions of people slated to become connected to the internet over the next decade, many of them live in societies that have high levels of censorship, including Russia, Vietnam, Pakistan, and Ukraine, meaning that, as is already the case today, the level of openness of internet access varies around the world.70 As we move into the future, will internet censorship fade, or increase?

Policymakers must now make tough decisions that will impact the future of the internet, such as those related to security, spectrum allocation, and network neutrality. Among other things, these decisions will impact the balance of power among large established commercial interests, smaller emerging entrepreneurs, and open public access to the internet and broadband-enabled services. With market consolidations and new commercial partnerships, there also is an increased blurring of lines between content producers (or “edge providers”) and internet service providers (e.g., Comcast and NBC or AT&T and DirectTV) that may have implications for people’s ability to access the legal online content of their choosing. Among experts there is a related concern that there may not be enough competition among U.S. network operators to support innovation.71

Taking these dynamics into account, the Internet Society envisioned four possible internet futures in a scenario planning exercise: a future where the internet is open and constantly evolving, based on distributed and decentralized principles where users have power; a future where the internet would no longer be globally connected in the way it is today – but rather, a users’ experience would be characterized and limited by regulations and boundaries set by governments or other powerful players in a system of separate, regional intranets; a future where the internet would be largely controlled by a few large players – such as content providers, who have the power to determine who accesses what at what price; and a future in which internet experience is strongly tied to
what networks, applications or proprietary devices one uses, with systems becoming increasingly incompatible with each other. Somewhat differently, the World Economic Forum envisions a future worst-case scenario of “digital disintegration.” In this future, disruptions from cyber attacks would become so prevalent that the internet would no longer be a trusted medium for communication or business and would increasingly be abandoned. These different scenarios – and other possible permutations – have huge implications for the future of access to information.

Implications for libraries

- How will libraries continue to integrate new information technologies into their operations? At what point does integration stop and re-invention start?
- Do new services and applications enabled by information technologies challenge the relevance of libraries? How should libraries meet that challenge?
- With advances in technology, will providing public access to computers and the internet become an irrelevant library service? Is there a role for libraries to play in providing no-fee public access to future technologies?
- How will traditional library values such as privacy and intellectual freedom be applied or reimagined in response to new information technologies?
- How might developments in human computer interaction (e.g., gesture-based interfaces, invisible interfaces) reshape the library experience?
- What implications do algorithms have for libraries in terms of potential library applications, information access, and how librarians teach information literacy skills?
- What roles may AI and robots play in libraries of the future? Could aspects of librarians’ jobs be made obsolete and new roles emerge that demand quite different professional competencies?
- What library services could ultra-high speed internet enable or improve?
- How might the future of libraries and access to information more generally be influenced by the various future internet scenarios described above?

Information institution trends: Navigating unsteady ground

Overview

Nowhere are the impacts of the digital network revolution more apparent than in the information sector, which is undergoing a tumultuous transformation. As one publishing industry observer quipped:

Prognostications about the death of publishing, the death of print, and the end of the ‘author’ have become commonplace these days, as have the periodic ‘the death of books is greatly exaggerated’ rebuttal pieces. The sheer volume of numbers, trends, and contradictory claims made by the industry analyst
soothsayers forms into a cacophonous static. An agnostic at heart, when I tune into the publishing industry channel, I hear only the fuzzed report: ‘Things… are… changing…. how and how much… unclear….’”

Even if the “what” and “how much” are often unclear, there is no doubt that traditional information sectors are transforming. The environment in which industries like publishing and journalism and institutions like libraries, museums, and bookstores have operated is undergoing significant changes. On the one hand, we’re seeing things we used to do or consume in the physical world move online and into digital form (e.g., books to ebooks; cable TV to Hulu and Netflix). On the other hand, “immutable truths” are being challenged, and we’re seeing waves of both creative destruction and adaptation, as well as the emergence of new business models and even new sectors. While we’re probably not seeing the “death of publishing” (or libraries, museums, etc.), we may be seeing the end of these sectors as we’ve known them.

Traditional information industries and institutions disrupted by the digital network revolution include:

- Print: newspapers, books, magazines, journals, etc.
- Places: bookstores, libraries, museums, archives, research institutes, etc.
- Media: television, film, music, radio, etc.

Not only the most visible actors in these sectors are impacted, but also entire networks of related suppliers, equipment manufacturers, and professions that serve these industries and institutions. Each must adapt their associated business models, operations or practices to a new and dynamically shifting reality. Digital impacts and adaptations vary widely by sub-sector. For example, while physical newspaper subscriptions have declined as a whole and advertising revenues have plummeted, there has been a rise in free daily papers. In another example, although jobs in traditional journalism have been drastically cut, journalism schools are seeing a rise in enrollment. In other words, newspapers, or journalism as we’ve known them may be “in decline”, but there is no lack of a desire for news, or for participation in shaping it.

The transitions and disruptions in the information sector aren’t new, but rather have been building over the last decades, shifting and intensifying with new technology developments along the way. For example, in terms of the book industry (which in itself has many subsectors: trade, educational, children’s, etc.) we can chart at least four major events since the 1980s that have shifted the landscape. This includes: the arrival of mass book retailers like Borders and Barnes and Noble in the 1980s, which made use of information technology systems to better understand customer purchasing patterns (ultimately contributing to the disappearance of many small bookstores over the following decades), the entry of online retailer Amazon.com into the book market in the late 1990s, eventually contributing to the collapse of additional bookstores and even the major big box retailer Borders in 2011; improvements in digital on-demand printing technology in the early 2000s, which gave self-publishing a boost and helped grow the
number of books published each year; and the more recent advent of e-readers, tablets and ebooks. Each of these developments has shifted who controls value in the book industry and impacting traditional relationships among publishers, authors, distributors, retailers, libraries and readers.

Though the ground is moving, there is no shortage of adaptations underway. TV, magazines and newspapers, for example, have moved online even as they maintain their legacy businesses. Libraries and museums have incorporated digital technologies into their operations and offerings. The scientific publishing industry, like other academic journals, is experimenting with new revenue models such as open access and author fees, and libraries are playing a role in this emerging landscape. In 2013 academic libraries profiled in the Library Publishing Directory published 391 faculty-driven journals, 174 student-driven journals, 937 monographs, at least 8,746 conference papers and proceedings, and nearly 100,000 each of electronic theses and dissertations and technical/research reports, as well as data, audio and video offerings. A myriad of industries are taking advantage of online and emerging mobile advertising models such as banner ads and pre-roll video ads. The newspaper industry is engaging in creative (and some say, dangerous) cost cutting – fewer staff, less grand offices, cuts to costly units like investigative journalism – leading to more nimble structures. Book printers are transitioning from offset to inkjet technology, allowing them to print smaller runs at shorter notice. And, as people lose jobs in traditional information sectors, they are sometimes finding them in emerging ones, such as former publishing industry editors editing self-published works for a fee.

In short, all information institutions and related industries are impacted by today’s network revolution, and the transformations in neighboring sectors have a variety of implications for libraries. In some cases, the pressures that an industry faces and its resulting adaptations can be difficult for libraries – such as the way in which publisher concerns over digital rights management, the dominance of Amazon, and publishers’ own tenuous position in a changing landscape have contributed to library ebook lending restrictions.

Other institutions have less of an adversarial relationship to libraries, and rather, face highly similar challenges. In particular, like libraries, archives and museums must consider how to best take advantage of things like big data, digitization, and even crowdsourcing while demonstrating their public value and continued relevance. To some extent, the boundaries between these three institutions blurs in the digital world. Museums, for example, can now offer digital representations of the physical objects in their collections, which like library or archival documents, can be accessed online. By banding together there is a possibility that libraries, and/or archives and museums may be able to better compete on a “net-scale.” The Digital Public Library of America (DPLA) is one example of this sort of collaboration in that the DPLA recognizes that “many universities, public libraries, and other public-spirited organizations have digitized materials, but these digital collections often exist in silos” and is working to get them
onto a single, open access online platform.\textsuperscript{84} Yet, despite some examples of closer collaborations among museums, libraries and archives, and well as the U.S. government’s grouping of libraries and museums under the same funding agency (the Institute of Museum and Library Services) since 1996, these institutions seem poised to maintain distinct identities from one another, at least in the near term.\textsuperscript{85}

Somewhat differently, increasing collaboration – ranging from mutual aid to resource sharing to mergers – between public and school libraries seems likely, despite the relatively low levels of current collaboration\textsuperscript{86} and the challenges it can pose.\textsuperscript{87} In some cases, school/public library collaborations may be beneficial all around, expanding the availability of library services in a community. The Limitless Libraries program in Nashville, a partnership between the Nashville Public Library and the Metro Nashville Public Schools, is one example. Because of the program, student identification cards are now recognized as library cards at library branches, students can request that public library books be delivered to their school for easy pickup, and the two institutions have worked together to establish a centralized weeding and procurement program leading to a stronger collective overall. Further coordination and integration are planned.\textsuperscript{88}

Unfortunately, increased linkages between public and school libraries can also be signs of distress. Philadelphia, for instance, has seen layoffs for school librarians, as well as other school staff like nurses and counselors.\textsuperscript{89} Presently only 11 of 212 schools in the Philadelphia district are assigned a librarian from the central office. In an effort to remedy lack of library access (some of the librarian-less school libraries are still open, run as a best effort by volunteers), the school district is distributing public library cards to students who don’t already have them. While encouraging students to make use of the Free Library of Philadelphia system is valuable, critics note that it is more difficult for students to access public libraries than a library in the school they attend each day.\textsuperscript{90} The school librarian also plays a unique role in the school by connecting collections with curriculum and collaborating with other educators. With cuts to education and other public spending, communities and local officials may see cutting school libraries and referring students to public ones as a cost-saving measure. Or, alternatively, some suggest that public libraries should be relocated to school buildings.\textsuperscript{91} Academic libraries also are facing questions of (on campus) mergers and wider collaborations, driven by new information access realities.\textsuperscript{92}

**Key trends and challenges**

Key trends and challenges that traditional information sectors and institutions are facing include:

**Changes in the ways we access information:** With traditional mass communication forms and structures (e.g., television, radio) information flows tended to be: centralized – from one to many; available at a particular time; and/or available at a particular place.
For example, in the past, watching a news report meant that a viewer was required to go to a television and turn it on at a particular time. The viewer had relatively little opportunity to publically respond to the report or create and share news him or herself – at least on the same scale. Industry business models and media consumption habits became entrenched around these parameters.

Today, digital and mobile technologies are breaking these “laws” about the relationship between information, time and place. They allow decentralized information flows from many to many, at any time and in any place. Today, a person can catch a news show on his or her smart phone or tablet at the hour and place they’d like (say, at 11 a.m. at in the dentist office waiting room). Additionally, the viewer could choose to respond to the news by commenting on the video, or perhaps writing about the topic on social media. The viewer might also contribute to the news themselves by filming a local event with a mobile phone, and uploading it online.

These dynamics are disruptive of other fields, as well. In the past, for example, archives typically served a small but dedicated demographic, often scholars, who were required to travel to the archives themselves to find what they were looking for. With digital technology, traditional users can access a wide array of archival material online, broadening competition among archival sources, and reducing incentives to make a trip to the archives themselves. At the same time, archives now have the possibility of reaching out to a much larger general audience. Yet, many of these potential new users aren’t interested in a particular collection or object, but are satisfied with whatever example of an archival document they may happen to find through a Google search (e.g., pictures of old trains, an image of Ronald Reagan), regardless of the institution behind making that document available.93

While, in some ways, these old and new patterns of information access vary markedly from each other, they aren’t as divergent as they might be. For example, people today continue to spend more time each day using mobile devices at home and work than on the go.94 Additionally, major traditional news sources and channels continue to hold sway in the online market (e.g., CNN, Fox News, New York Times), and traditional television viewing continues as a main news source despite the rise of online news, especially among older people.95

**Changing business/revenue models:** The business and revenue models for many traditional information sectors are in flux, with new technologies, competitors, and changed consumer expectations. A particular challenge is that the internet has both broadened access to information products and increased the ease at which they can be shared, with or without the permission of the content owner. With few exceptions, there is an expectation that online content, such as news articles, television shows and music, be available for free or for a lower cost than in the physical world. A Pew Internet Project study found, for example, that when searching for health information online “hitting a pay wall” deterred all but the most determined of users.96 Some publications,
such as *The Wall Street Journal*, have instituted successful digital subscription models – often paid for by corporate employers, but that is currently the exception rather than the rule. Still, in this new environment companies and entrepreneurs are developing creative ways to monetize “free” content and services, including various forms of digital advertising. A somewhat different twist on this theme is the rise of the “sharing economy” in which individuals and businesses are making use of information and communication technologies to facilitate sharing physical objects (e.g., fancy dresses, video equipment, cars) or spaces (e.g., apartments). Sharing generates about $3.5 billion each year and is expected to grow to $110 billion in just a few years. While the sharing economy is perhaps less relevant to traditional information institutions in general, it has implications for libraries and museums which have physical resources that can be shared with the public.

**New competitors:** A wide array of new competitors is putting pressure on traditional information institutions and sectors. Free online services like Craigslist, for instance, “have decimated the classified advertising departments of many newspapers, some of which depended on classifieds for 70% of their ad revenue.” Amazon, Google, Netflix, Hulu, Facebook, Wikipedia, and YouTube are other examples of big-name players that have disrupted industries from encyclopedias to book publishing to video rental. Many of these companies could also be seen as “competitors” to libraries and archives, in the sense that they offer related services such as information finding tools and some access to free content. New competition is coming not just from the digital world, but includes new business forms too. The Center for the Future of Museum’s 2014 TrendsWatch report asks: “What if for-profit businesses become effective competitors in delivery of traditional museum missions?” The report details ways in which social entrepreneurs that drive for-profit businesses that also deliver social good outcomes might be able to achieve the same ends as museums more effectively and financially sustainably.

**Digital copyright and licensing:** One challenge for the information sector in the digital world is rights management: many aspects of digital technology make sharing and replication easier. Laws, lawsuits and court cases in recent years have sought to deal with emerging copyright issues in the digital age. These have ranged from the Digital Millennium Copyright Act (DCMA) of 1998, which generally criminalized the creation and dissemination of devices used to get around restrictions on digital copyrighted works, and heightened the consequences of copyright infringement on the Internet to the 2013 Supreme Court ruling in *Kirtsaeng v. Wiley*, which established that owners of legally acquired copies of works manufactured abroad can resell them in the United States (in this case, textbook publisher Wiley was suing a student over importing lower priced English-language editions of textbooks intended for foreign markets and selling them in the U.S. to help pay his education bills). The legality of mass digitization, such as undertaken in the Google Book Search and HathiTrust projects – where millions of library books have been digitized – also has been contentious. Nevertheless, Google’s scanning project was recently ruled ‘fair use’ within the bounds of U.S. copyright law. Arguing that these and other individual rulings are not enough, Maria Pallante, the 12th
United States Register of Copyrights, has called for “The Next Great Copyright Act” – i.e., a major revision in copyright law, though reform is likely to be challenging due to divisions in Congress, the complexity of the issues, entrenched interests, and the speed at which technology is evolving.

There are many examples of how copyright and rights management issues are relevant to information institutions and industries. Publishing industry fears over digital piracy played a role in big publisher restrictions on ebook lending in libraries, for instance, even though some argue that the threat of ebook piracy is over-hyped. Other challenges (or opportunities) include the emergence of practices like “guerilla digitization” where people are using digital cameras and other devices to copy library and archival materials. While this process may be relatively slow and piecemeal today, technological advancements could make it possible to scan a 200-page book in one minute using a smart phone. Some industries are beginning to work with this new paradigm rather than against it. The new economics of the music business are complex, for instance, but can be profitable. YouTube, for example, where entire music albums are often available for free, has the power to remove videos that infringe copyright. But, it also can adorn popular videos with ads and split ad revenues with the copyright holders, if they choose. In some cases, artists are making more money from “free” YouTube videos than from songs sold via iTunes.

The information deluge: New technologies and platforms are allowing people to create and share content directly with others to an extent not possible before. This has led to a flooding of the marketplace with self-published books, small magazines, blogs, films, music, etc. that formerly would have been filtered through institutional gatekeepers. A look at the publishing industry is revealing: in 1950 just 11,022 books were published; by 2010, this number rose to 328,259. There is more information available than before: quite a bit of it! Relatedly, according to Nielsen BookScan, which tracks book sales, “the average U.S. nonfiction book is now selling less than 250 copies per year and less than 3,000 copies over its lifetime.” The increasing ease at which large amounts of information – books and beyond – can be accessed has led to shifts in behavior of professional populations, at the expense of traditional information access models and relationships. As one academic librarian points out, researchers are discovering resources through net-scale platforms (e.g., Google, PubMed, Mendeley, etc.), and basing their workflows around these tools rather than libraries.

Implications for libraries and public access to information

- Because of the increased availability of information – including free sources – are libraries less relevant today? What advantages do libraries have over new “competitors”?
- Like physical bookstores, many of which have closed, libraries have been closely associated with books, so do we see a similar loss of our physical footprint? Will
the additional services and benefits of libraries beyond physical items be enough to keep them relevant?

- In a world where 300,000+ books are published per year, no one institution can capture the totality of information. How can libraries navigate this information deluge to sort the wheat from the chaff? What tools can help?
- What do new digital rights management paradigms mean for libraries? What models are on the table, and which are best for different library needs?
- How will libraries deal with “bit rot” – i.e., the difficulty in preserving digital information in the long term due to changing formats?
- How can libraries of various types (public, school, academic, etc.), museums and archives collaborate in supportive ways to address digital challenges?
- Could for-profit businesses with social missions (social enterprises) provide the same services as libraries more effectively and sustainably?
- Where do libraries fit into the sharing economy in terms of their traditional practices (e.g., book lending) and beyond (e.g., The Oakland Public Library system’s tool lending library)? What does the rise of the sharing economy mean for libraries?
- In a digital age, what differentiates libraries (“community hubs” that provide access to information and services) from community centers? What will be the library “brand” (or brands) of the future?

**Information use and consumption trends: Driving and opposing forces**

**Overview**

Technology developments, internet adoption and increased use of internet-enabled devices like computers, tablets and smart phones are driving changes in American information (and social) use habits. There are also forces “opposing” or resisting these changes and increased digital integration: privacy and security concerns; worries over technology addiction and too much screen time; and the ever-shifting digital divide. Other forces can have a driving or a delaying factor on these developments depending on the specific circumstance, for example, regulation and legislation. We can also see that there is lag time between inventions and adoption: even when people begin to use a new technology they typically continue to use older technology at least for a while. What’s more, patterns of adoption and shifting use can vary significantly by demographic. For example, a recent Pew Internet Project survey found that 25% of women use Pinterest, whereas only 5% of men do. Other research revealed that Americans of many ages continue to get their news from television, but younger Americans are now more likely to cite the internet as their primary news source, reflecting an emerging demographic difference.

**Key trends and challenges**
Increasing connectivity: In 1995 only 14% of American adults were internet users. That number grew to 36% in 1997, 50% in 2000, 73% in 2005 and 85% in 2013. Additionally, as of 2013, almost three quarters (72%) of online U.S. adults use social networking sites. In February 2005, in comparison, just 8% of online adults said they did so. Ownership of digital devices has also increased tremendously. As of spring 2013, 91% of U.S. adults had a cell phone, and 56% had a smart phone. Meanwhile tablet adoption doubled between 2012 and 2013: one-third of American adults now own a tablet computer and 43% of adults own either a tablet or an e-reader. Not surprisingly, adoption rates vary by demographic: people who own a tablet or an e-reader today, for example, are especially likely to live in upper-income households and have relatively high levels of education.

Integration of physical and digital life: Three main trends continue to unfold in this arena. One, things once done “offline” are now becoming more commonplace online. For instance: 51% of U.S. adults bank online; 35% of U.S. adults have gone online to figure out a medical condition; and one in ten have used an online dating site or mobile dating app. Two, there is an increasing integration of the physical and digital worlds. For instance, 58% of mobile phone owners used their phones for recommendations, reviews, or price comparisons in a physical store during the 2012 holiday shopping season. Three, people are increasingly participating in both content creation and consumption in the digital world. For instance, the share of online adults who upload or post videos online more than doubled from 14% in 2009 to 31% in 2013. Meanwhile, the percent of adults who watch or download videos grew from 69% of online adults in 2009 to 78% in 2013, with mobile phones playing an important role.

Overlap of old and new: When people adopt new behaviors and technologies, this doesn’t mean that they give up older ones. Changes don’t happen overnight, and adoption rates of new technologies and practices can vary significantly by demographic. These shifts are also non-exclusive, e.g., one can read ebooks and continue to enjoy physical books, and it can take some time for the “new” to encroach on the territory of the “old.” A Pew survey released in early 2014 found, for example, that while 28% of U.S. adults had read an ebook in the past year, 69% had read a print book, and just 4% of readers are “ebook only.” It is unclear how long this mix will be the case, but books aren’t likely to disappear overnight.

Still, over time, shifts do happen. A Gallup Poll from 1999, for instance, revealed that the internet did not yet play a large role in how Americans picked their books.
choosing an author whose books they like (27%). Only 6% of readers select books based on reviews they have read.

A decade and a half later, that landscape has changed and stayed the same. A Pew survey from December 2011 found that 64% of those ages 16 and older said they get book recommendations from family members, friends, or co-workers (versus 27% in 1999). Meanwhile, 28% get recommendations from online bookstores or other websites (versus 1% in 1999). Still, 23% of those ages 16 and older said they get recommendations from staffers in bookstores they visit in person, and 19% said they get recommendations from librarians or library websites.128

Demographic differences in media use and fragmentation of the market: The mix of media use can vary widely by demographic and can shift relatively quickly. In 2013, for example, the internet was the main source of national and international news for 71% of 18-29 year olds in the United States. Still, 55% cited television as a main news source, and the internet’s lead is recent: in 2009 internet and television were tied as that demographics’ go-to source. Newspapers (at 22%) and radio (at 19%) are less used, but still relevant. Meanwhile, the media picture for people 65+ looks substantially different: 84% name television as their main news source, 54% rely on newspapers, 18% prefer the internet, and 15% radio.129 Similarly, some social media platforms are more widely used by some demographics than others. For instance: only 12% of rural internet users make use of Twitter, while 20% of urban internet users do.130 Across a number of surveys, the Pew Research Center offers detailed breakdowns on media use and device adoption by age, income, race, educational attainment, and geographic location (urban, suburban, rural).

Adopters vs. adapters: Some people are enthusiastic about the changes the digital revolution is bringing, while others are less so, but adapt as necessary. This, as Seth Godin points out, has implications for company and institutional strategy: “We call tech geeks, ‘early adopters,’ and it’s worth highlighting that they are not ‘early adapters.’ Adaptation implies that people aren’t eagerly going forward, they’re merely tolerating what gets thrown at them. As a marketer, then, there’s a real choice here – to market your wares (new to this market) to people who are eager for change, or to get very good at marketing to people who would prefer not to change. As a human, the question is even more profound: What relationship with the future will you choose?”131

Digital divide: While the vast majority of American adults are internet users, 15% do not use the internet or email. Those who are not connected are often increasingly left out as the internet has become necessary to complete tasks relevant to daily life. While internet non-use is correlated with educational attainment and household income, age is especially significant: 44% of Americans ages 65 and older do not use the internet. Older Americans make up almost half (49%) of non-internet users overall. Nine percent of adults use the internet, but don’t have home access. Groups that are significantly more likely to rely on internet access outside the home include Blacks and Hispanics, as well as adults at lower levels of income and education. Notably, 10% of adults ages 18
and older say they have a smartphone, but do not have a home broadband connection, indicating that they may rely on their smartphone for a form of “home” internet access.\(^{132}\)

With the rise of mobile internet access and the fact that many internet non-users are older, one might surmise that the digital divide is on its way to closing. Yet, not all forms of access are equal (e.g., it’s pretty difficult to do some things on a mobile device\(^{133}\), and it is possible that new divides will emerge as technology develops. Some argue that the next divide is cognitive – based not so much on information and technology access, but on the ability to make use of it. Researcher John Horrigan has posited that “digital readiness” is a bigger problem than the digital divide, with nearly one-third of Americans lacking the skills needed to use next-general Internet of Things applications.\(^{134}\) When so many aspects of work and daily life are digitally mediated, this poses major issues. According to the American Library Association’s Office for Information Technology Policy’s Digital Literacy Task Force, “this skills gap constitutes a second digital divide that demands solutions to ensure that the American public is prepared for global leadership positions.” Though their role is not always recognized, libraries are important players in both formal and informal digital literacy education.\(^{135}\)

Some populations face particular challenges related to connectivity. As outlined in comments submitted by multiple Native American groups to the Federal Communications Commission, tribal schools and libraries are participating in E-rate, which provides federal assistance for broadband connections, in very low numbers. Challenges related to rural geography and inapplicable guidelines create additional issues. Studies by the Association of Tribal Archives, Libraries & Museums found that 15% of reporting tribal libraries of had received E-rate discounts, and that only 17% had ever applied for E-rate funds. Approximately 50% of respondents had never heard of E-rate, a significant number were unsure if they qualified for the program (42% in 2011; 28% in 2013), and about 12% felt that the application is too complicated. Without proactive engagement, these communities stand to fall further behind.\(^{136}\)

**Digital overload:** Americans’ lives are more and more integrated into the digital world. Many feel overloaded by technology, even “digitally addicted.” This is perhaps not surprising given the amount of time many of us spend with our devices: “college students [for example] are the heaviest users of information and communication technology and an overwhelming number of them own smart-phones and use them throughout their day – sending an average of 109.5 text messages a day, receiving just as many each day, and checking their cell phones 60 times on an average day.”\(^{137}\)

Though people – including the young – may look back to analog times with nostalgia, few are able to step away from their devices.\(^{138}\) Digital addition is an increasingly discussed topic in the news media and online health advice sites with headlines like: “For the Plugged-In, Too Many Choices”, “Are You Suffering From Digital Burnout?” or “The Five Signs Your Child is Addicted to Their iPad.”
There are additional concerns about the negative impacts of multi-tasking and information overload on productivity, impacts on social behavior (e.g., people “alone together” – staring at their screens), and on mental and physical health. Neuroscientific studies, for instance, suggest that people perform cognitively demanding tasks effectively only when they give them their full and sustained attention. When people consistently multi-task – training themselves to respond to any incoming signal – their brains become less optimized for diving deeply into a topic. That is, chronic multi-tasking may help us get better at seeing what’s in front of us, but can diminish our ability to understand and carefully consider what we’re seeing. In some cases, stress resulting from digital overload is leading to changes in behavior. About six in ten current Facebook users say they have voluntarily taken a break from using Facebook for a period of several weeks or more, citing a variety of privacy, burnout, and time-related reasons. There is a particular concern about how much time children and teenagers are spending with digital devices, and many websites offer advice to parents about how to help children reduce screen time.

Privacy and surveillance concerns: Prior to the internet, big data, and the advent of digital mobile devices the points at which a person’s privacy could be compromised by data collection were more limited (e.g., phone calls, credit card or medical records, etc.). New technologies offer many more opportunities to track everyday behaviors, and new privacy issues are emerging. Companies are motivated to track users’ online behavior to, among other things, provide targeted advertising. Taking things a step further, companies are finding ways to track and advertise to users across devices, for example showing a consumer ads on their mobile phone based on Web sites they visit on a computer. Geospatial tracking is also possible: allowing companies to show a user content on their device based on their physical location.

Among the issues raised are: the possibility that a third party could gain access to personal data (e.g., the government, a hacker) or that it could be used for purposes that put the user in danger (e.g., stalking apps). Even seemingly harmless data collection on consumer behavior can lead to privacy infringements, as illustrated by the case of Target knowing that a Minneapolis teen was pregnant before her father did, based on her purchasing habits. While research indicates that many Americans, including teens, are concerned about digital privacy and take measures to protect themselves online, they continue to adopt devices and behaviors that make this increased level of tracking possible. Concerns about digital privacy are stirring up calls for new legislation and consumer protections – not just from lawmakers, but also major tech companies. This topic has seen a flurry of attention following Edward Snowden’s revelations about U.S. government surveillance capabilities and practices, including mass collection of the phone records of millions of Americans, the cracking of internet encryption for intelligence purposes that put web users’ security at risk, and a program code-named Prism that allowed U.S. and U.K. security agencies to gain back-door entry into the data of nine prominent internet companies. While the extensive – and secretive – data
collection programs that formed after September 11, 2001, were intended to bolster national security, many believe that they infringe on civil liberties, and do little to prevent terrorist attacks. The public’s trust of the privacy of their digital communications has taken a blow.

**Implications for libraries**

- How can libraries, as physical spaces, creatively bridge the physical and digital worlds? What do they have to offer that solely online platforms do not?
- With 15% of Americans offline in the midst of the increasing connectivity overall, might public libraries become even more important “safety nets” for meeting the information and communication needs of less digitally connected populations?
- Should libraries cater to “adopters” of or “adapters” to new technologies, or both?
- Will libraries remain relevant in terms of bridging future digital divides as we increasingly move from computers to mobile devices?
- Can libraries help people deal with digital overload: providing spaces for contemplation and training in information literacy skills that can help reduce that overload?
- Given that library patrons increasingly access information at the library and even library books (e.g., ebooks) via digital devices and third-party commercial vendors, to what extent can libraries guard privacy in a digital age? Will libraries themselves increasingly make use of the digital data they have access to (perhaps on an “opt-in” basis), and will their customers demand this use as customized recommendations and services become evermore the norm? Michael Zimmer, an assistant professor in the School of Information Studies at the University of Wisconsin at Milwaukee suggests that as librarians expand digital services, they face “a Faustian bargain.” He comments that librarians may decide that, “the benefits of these advanced data-based services outweigh the traditional protection of patron privacy.”

**Part II: Influential and policy-relevant trends**

Information technology trends, trends impacting traditional information institutions and trends in information use and consumption – described above – have a direct impact on the operating contexts of libraries. Trends in other sectors, while perhaps less obviously connected, are also significant for the future of libraries. The following seven trend areas are explored below:
These topics areas were chosen because they connect with the services that libraries offer to communities, including those related to education (supporting K-12 students, as well as lifelong learning, literacy and training), work (career readiness, employment-related assistance and launching a business product or idea), and equity (free access to technology and other tools and services), and reflect the fact that libraries serve diverse communities. Other trends – public sector, environment, and global context – were chosen because of their potential to powerfully impact libraries, as well as society as a whole. Each of these trends has one or more policy angles, meaning that there is potential for library advocacy on the topic.

Within some trends a particular topic area was focused on more than others. For example, demographic trends in information use, population growth, diversity, age and location were deemed to be of more importance to libraries than trends such as gender balance in the workforce, marriage, and household structure, so more attention was given to the former. Likewise, one demographic trend – economic inequality – seemed significant enough to warrant its own treatment. There are, of course, additional future trends that are important but aren’t considered in detail here. This includes topics such as: values and worldviews; business; non-profits; health and health care; energy, and so on. When possible, though, they are briefly addressed in the context of other trends, such as the fact that the environment, energy and geopolitical stability interconnect.

Global context: An interconnected world

Overview

In recent years, the transport, communication, financial, ecological and other systems of the globe have become ever more interconnected. Increased international flows of trade, finance, people and data appear set to continue, fueled by a rise in consumption in emerging markets and a growing pervasiveness of digital technologies and internet connectivity. In essence, this means that events happening in far off places are no longer so distant when it comes to their potential to impact the United States and the operating context of community focused institutions such as libraries. Interconnected systems can support weak spots in times of crisis, bolstering global stability, but they can also amplify cascading shocks – as in the case of the 2007/2008 financial crisis. And, according to the World Economic Forum, “multiple trends are contributing to linking
global systems ever more closely and in more complex ways. For example, the increased carbon emissions and reduced ecological diversity resulting from unsustainable economic growth now fundamentally threaten to undermine not only the stability of the global ecosystem but also the economies that depend on it.\textsuperscript{153}

While it is challenging to summarize trends on a global level, there are a number of clear areas of emerging opportunity and risk likely to impact the United States, and libraries, in both direct and less direct ways. A number of these trends fit into the larger category of “security”, with global issues as diverse as rising inequality, unemployment, burgeoning middle classes, terrorism, and epidemics, creating potential areas of conflict – and interacting in complex ways with one another. At the same time, trends related to technology and the economy, such as the increasing number of people in emerging economies set to get online and the resulting economic implications, add another dimension to the shifting global context.

\textit{Key Trends and Challenges}

\textbf{Global political, social and economic trends may lead to new opportunities for some, as well as contribute to unrest.} According to the World Economic Forum, key global risks for 2014 – and likely beyond – include fiscal crisis in key economies, structurally high unemployment and underemployment (youth unemployment levels in Europe, for instance, are near or above 50% in some countries\textsuperscript{154}), severe income disparity, greater incidence of extreme weather events (e.g., floods, storms, fires), global governance failure, food crises, failure of a major financial mechanism/institution, and political and social instability.\textsuperscript{155} Other risks and trends of note include: diminishing trust in economic policies and governments, the growing importance of megacities, the expanding middle class in Asia, and rising tensions in the Middle East and Africa.\textsuperscript{156} In some countries and regions, such as Eastern Europe, demographic trends are also significant. Here, and elsewhere, the dependency ratio – the proportion of elderly to working age – is increasing, creating a potential economic burden.\textsuperscript{157} These trends have a variety of implications for the U.S., including possible security threats and immigration trends, as well as an increased impact on the environment as global consumerism and resource use rise as Asia’s middle class grows. According to The Economist, “by 2030 we will demand twice as many resources as the planet can supply – risking social unrest and conflicts as people and nations compete for ever scarcer resources.”\textsuperscript{158}

The BRIC nations (Brazil, Russia, India, China) remain development powerhouses, but each country faces economic challenges. Jim O’Neill, the former Goldman Sachs executive and inventor of the BRIC meme, believes that bloc “no longer enjoys pole position for global growth.” He sees the economic prospects of Mexico, Indonesia, Nigeria and Turkey as interesting. Meanwhile, the former Eastern Bloc countries, as illustrated by current events in the Ukraine, have a complex relationship with the European Union (EU) – with divisions in terms of whether joining the EU is the path they want to take.\textsuperscript{159} In the U.S., as the country is moving out of a period of more than 12
years of conflict, the Department of Defense budget is set to contract significantly as well as the number of active personnel. The military will be challenged to strategically pare down operations and help veterans transition to new roles, while responding to ongoing and emerging issues such as terrorism, the proliferation of weapons of mass destruction, climate change, new technologies, and new centers of power.\textsuperscript{160}

**Cyber security, online privacy and access to information are central issues.** Privacy is not only a consumer issue, but has implications for citizen’s rights, international relations, and global security. Since Edward Snowden released information about U.S. National Security Agency (NSA) activities in 2013, concerns about privacy have reached a new height.\textsuperscript{161} Cyber security issues are also increasingly important and visible. As the U.S. Department of Defense notes, as we have come to depend on cyberspace to deliver essential services, perform national security functions, and make and store wealth, cyberspace has become an attractive target for attacks.\textsuperscript{162} Finally, some countries censor and monitor internet access. China, for instance, blocks sites belonging to pro-democracy activists, related to Taiwanese government or media, connected with the Dalai Lama or the Tibetan Independence Movement, as well as other information.\textsuperscript{163} This is no small endeavor: up to 50,000 Chinese government workers engage in the censorship of search terms and websites. While risky, others provide ways around “the great firewall”, which they say is important in part because many Chinese residents may not be aware that it is shaping their internet experience.\textsuperscript{164}

**Climate change may lead to an era characterized by shortage, conflict and migration.** Groups ranging from the World Economic Forum to the U.S. Department of Defense to Business Insider are concerned with the consequences of inaction on climate change. There is a general consensus that global actors are not moving fast enough. Climate change is a global issue: even regions or countries acting in more sustainable ways can face consequences of unsustainable behavior elsewhere. Coupled with population growth and/or increased resource use, the consequences are serious. In China, for example, water is being used at an unsustainable rate. The number of large rivers has been halved in the past 60 years and many of those left are being polluted to the point that the water is unusable. Water and food shortages as well as other resource shortages can amplify tensions and lead to conflicts, having implications for U.S. national security and global stability.\textsuperscript{165} For instance, “drought in Russia in 2010 led to restrictions on agricultural exports, causing the price of staple grains to rise across North Africa and the Middle East. The resulting food shortages and price rises aggravated the tensions that led to the Arab Spring.”\textsuperscript{166}

Some argue that these conditions will lead to an increase in climate change-related migration, with an estimated 200 million to 1 billion climate migrants by 2050. Especially vulnerable regions include sub-Saharan Africa, the Middle East, South and Southeast Asia.\textsuperscript{167} On the other hand, research suggests that climate-related migration tends to be short distance and within national borders, rather than international, and that environmental drivers are typically one of a number of factors leading to migration.\textsuperscript{168}
Shifting climate conditions have also been linked with increases in epidemics and infectious diseases among human populations, as well as among other animals, plants and insects.\textsuperscript{169} Finally, while urbanization has a number of advantages, such as job and education opportunities, it also poses environmental and health challenges. For example, if planners do not address air pollution in growing megacities, air quality stands to become an increasing health threat for many, especially in the developing world where megacity growth is the strongest.\textsuperscript{170} Additionally, much urbanization is occurring along coastal areas, and the United Nations predicts that the number of people in large cities exposed to climate change-related events will more than double in the first half of this century.\textsuperscript{171}

**As the next 1-3 billion citizens move online there are implications for commerce, education, and politics.** The largest part of this growth is projected to occur in emerging economies, and mobile computing devices, especially smart phones, will be the means by which many of these users connect. Both India and China, for instance, have more than 1 billion mobile handsets while smart phone penetration is only 10% in India and 43% in China, leaving a sizeable margin for increase. The balance of who’s online is already shifting. According to Cisco’s forecasts, by the end of 2012 there were more internet users in China than in Western Europe and the U.S. combined, and the number of users in Africa and the Middle East surpassed those in North America. Additionally, the company projects that by 2015 internet users in the BRIC countries will generate almost as much consumer traffic as those in the United States, and nearly half of all internet users will be in Asia.\textsuperscript{172} This first wave of internet users was comprised of highly educated people in the developed world, but this new wave of internet users has different skills and needs. Related to this development, one commentator believes that literacy may ultimately become less important: “The most intensive users of teleconferencing in the future may well be illiterate ... over the next 200 or 250 years, reading and writing, which have been at the core of Western civilization, [may] disappear (or perhaps become archaic, like speaking Latin).”\textsuperscript{173}

This increased global connectivity could help facilitate local entrepreneurship, financial inclusion via mobile payment services for those without banking services, as well as spur the design of “glocal” services for new populations that tailor global offerings to local needs.\textsuperscript{174} These developments, while not centered in the United States, may have implications for Americans. Companies including Google and Microsoft are experimenting with ways to affordably extend internet access in hard-to-reach regions abroad via balloon and TV white space technologies in the face of infrastructural challenges, such as a lack of electricity.\textsuperscript{175} Resulting innovations may be relevant to U.S. regions where internet access is currently patchy or expensive. Also, as resources become scarcer and climate change accelerates, it is possible that “infrastructural conditions in current high-consumption countries [may] begin to look more like those currently prevalent in ‘developing’ countries.”\textsuperscript{176} In that scenario, products and services developed for developing world conditions, such as information and communication
technologies driven by solar power or low-tech options, may be increasingly applicable in the United States.

Expanded access to the internet around the world may bring new education and political opportunities, as well. According to the International Federation of Library Associations and Institutions (IFLA) trends report, global expansion in online education—facilitated by increased connectivity—is set to “make learning opportunities more abundant, cheaper and more accessible” and “online courses will be serving more people in the near future than all the students currently attending universities around the world.” Already, almost one-third of Coursera visitors, are from BRICs, taking advantage of free online classes from universities and other organizations. On a political level, hyper-connected societies promise to encourage the growth of single-issue movements, moving debates away from traditional party politics and empowering the rise of new voices. Assuming that the future internet is relatively free from censorship, the same resources could help empower diaspora or migrant communities in the U.S. and elsewhere by enabling people from around the world to support or criticize policies and politicians in other countries. Finally, open government initiatives and public sector data access will become increasingly prominent, adding additional transparency to this arena. Even so, people who lack basic digital literacy skills, or access to technologies, may become increasingly excluded.

Global business, finance, work and security are being reshaped by new technologies. The technologies and innovations that promise to transform the U.S. economy—ranging from robots and smart machines to big data—will re-shape the global economy as well: disrupting manufacturing and finance practices, enabling increased communication through translation technologies, trading via e-currencies like bitcoin, conducting small-scale export business via platforms like eBay, and so on. Better connectivity will reduce some (but not all) of the advantages linked with physical location, and people will increasingly be able to participate in the global information economy from anywhere on earth with the help of digital platforms like Skype, GoogleDocs and oDesk. Additionally, microscale activities including microwork, micropayments and microshipments will challenge traditional business models. Overall, these trends have the potential to increase competition from emerging economies, which may spur protectionist policies from the developed world. It is notable that a shift in global trade activity has already begun from developed to emerging economies, which is indicative of the shifting landscape likely to characterize the future. In 1990, 54% of all goods trade was between developed economies, but in 2012 these flows accounted for only for 28% of trade. Meanwhile, emerging economy participation has increased with these countries now accounting for 40% of the global flow of goods, and with 60% of that flow being between emerging economies.

Unfortunately new technologies and advances in science can also have sinister applications: biotechnology breakthroughs could make dangerous agents more widely available; the ramifications of cyber attacks may become increasingly serious as more
and more of the physical world, including critical infrastructure, is connected to the Internet of Things; low-cost 3D printers could revolutionize warfare manufacturing logistics; and highly-advanced weapons systems such as stealth technology – previously only available to some – could proliferate.\(^{181}\)

**Implications for libraries**

- In what ways may U.S. libraries be impacted by global economic, environmental, geopolitical, societal and technological risks? How can libraries prepare themselves to be resilient institutions in the face of these risks?
- How can libraries be responsive to the needs of refugee populations that have come to the United States as a result of global instability?
- What role do libraries have to play in privacy, cyber security and freedom of access to information?
- Could libraries help U.S. communities adopt and employ technologies created for developing country contexts abroad, but that make sense at home, as well?
- How can libraries play an effective role in sharing critical information about epidemics and infectious diseases?
- Is there a role for libraries to play in terms of facilitating open government and the availability and/or use of public sector data?

**Environmental trends: The rise of resilience**

**Overview**

While often overlooked in technologically focused trends reports, the implications of environmental trends are highly significant for all other future trends. Our economic, technological, political and social systems, at their root, rely upon natural resources and (relatively) stable ecosystems. The implications of environmental trends are deeply challenging to the continued viability of our present day economic system based on growth, debt, fossil fuels and continual expansion.\(^{182}\) In a strongly worded report from the German Advisory Council on Global Change, an independent scientific advisory body to the German Federal Government, the council states: “the carbon-based economic model is ... an unsustainable situation, as it endangers the climate system’s stability, and therefore the natural life support system for future generations. The transformation towards a low-carbon society is therefore as much an ethical imperative as the abolition of slavery and the condemnation of child labour.”\(^{183}\)

A wide range of data shows that humans are using increasingly more resources and creating increasingly more pollution and damage to the environment. Still, addressing environmental challenges can be politically contentious. Some argue that economic development ultimately has a positive impact on environmental quality (hypothesized as the environmental Kuznets curve). There is some evidence to show that things like water and air quality do tend to improve as a country’s gross domestic product and
incomes rise above a certain level, after passing through a phase of negative environmental impacts to get there. Yet, there is little evidence that this is true for other pollutants and impacts. Land, energy and resource use (our “environmental footprints”), for example, do not tend to fall with rising income.\textsuperscript{184}

Information – and therefore libraries and librarians – has a role to play in terms of understanding environmental issues, wrestling with the cultural and practical implications, and taking proactive steps to transform unsustainable behavior and infrastructures, including responding to instability and crisis situations resulting from environmental degradation and change. While environmental issues are global in scope, their impacts are felt locally, meaning that the presence of libraries in communities and institutions across the U.S. could provide an important, responsive infrastructure.

Key Trends and Challenges

Different groups have different views on how serious environmental issues are, and how we should react. That is, even among those who agree that it is important to consider environmental concerns, people advocate for a wide variety of approaches. Some have a hopeful view of the future (“we can achieve a balanced way of living if we change”), others are more fearful (“things have gone too far, and we’re unlikely to change our behaviors enough to avoid significant environmental challenges”), and others perceive that environmental concerns are overstated. As a result, some promote relatively shallow levels of change (“we can do our part by shifting to more efficient light bulbs”), while others assert that only deep and systemic change is enough (“true sustainability isn’t just about adding another player to the team; it’s about changing the rules of the game”). Or as John Ehrenfeld writes in the \textit{MIT Sloan Business Review}, “The real business case for sustainability requires more radical, fundamental and difficult change than most are ready to consider, but anything less ignores the real problem and may, in fact, contribute to it.”\textsuperscript{185}

Addressing environmental challenges is a politically contentious issue. Interestingly, the climate change views of the Republican and Democratic parties did not significantly differ from one another until the Kyoto Protocol negotiations in 1997: “This was in the midst of the polarizing Clinton administration, and for some, the association made global warming belief seem unsavory.”\textsuperscript{186} While the majority of Americans today (67%) believe that global warming is a reality, there are clear partisan divides: 88% of Democrats believe there is solid evidence for global warming, while 62% of Independents and 50% of Republicans do. Among Republicans there is a further divide: just 25% of Tea Party-leaning voters believe evidence for global warming is clear, while 61% of non-Tea Party Republicans do.\textsuperscript{187} For obvious reasons, this can make it difficult to gain support for environmentally related initiatives in some contexts.

While the implications of environmental trends are highly significant for all other future trends, the environment is often a “blind spot.” When people think about the
future of technology, the economy, work, equality, demographics, and so on, the complex inter-relationship of these trends with the environment is often not explicitly considered. For example, among technology reports, there is a notable lack of examination of how technology trends intersect with the environment. There’s often an assumption that technology use will increase and be increasingly interwoven into our lives. But, it is also important to consider that technology requires raw and natural materials, as well as energy, in its manufacture and use. Many of these resources are limited and non-renewable, at least on human time scales. Additionally, technology enables us to do more, faster. This often means that we also have a greater impact on the environment, faster. While environmental applications of information and communication technologies hold promise in terms of helping us be more sustainable (e.g., the use of increasingly sophisticated energy sensors in buildings) it should be recognized that technology has the possibility to both mitigate and to contribute to environmental problems.

**Sustainability is becoming increasingly mainstream.** Despite blind spots, there is an increasing recognition across sectors, organizations and in daily life that sustainability is important. There has been a rise in “green” publications and conferences in nearly every sector. Many standards and certifications have been developed to help organizations in industries as diverse as building, fishing, forestry and higher education to become more sustainable. And, young job seekers are increasingly attracted to organizations with sustainable or other social good-related practices. The book *Greening Libraries* (2012) details a wide variety of ways that libraries are engaged in sustainability including greening library buildings and supporting green programming and sustainability outreach. Some libraries are going a step further to support community transition initiatives of community groups and local governments working to develop local sustainable economies and infrastructures.

**What if sustainability doesn’t work out?** Even as sustainability efforts have increased, there is evidence that we are neither changing our behavior enough nor fast enough to avert (as least some level of) environmental crisis. While “green tech” and sustainability solutions are being enacted, demand for energy continues to increase, driving growth in the exploitation of energy sources that are non-renewable and likely driving climate change further. Shell Energy, well known for its futures scenarios, writes: “even if it were possible for fossil fuels to maintain their current share of the energy mix and respond to increased demand, CO2 emissions would then be on a pathway that could severely threaten human wellbeing.” Shell offers two basic future energy scenarios, which it calls “Scramble” and “Blueprints.” In Scramble, countries scramble to gain access to energy sources and push dealing with climate change into the future. Because of this lack of action, much time, effort and money must be spent in the future to deal with the negative impacts of climate change. In Blueprints, cities, regions and other entities begin to take the lead in sustainable energy practices. Eventually this puts pressure on national governments to create policies that sew together this “patchwork” of local practices, moving us towards a more balanced energy scenario. Shell gives
examples of present-day developments – such as the U.S. energy policy direction (Scramble) and the development of green cities (Blueprints) – that are indicative of each scenario.  

**Resilience thinking is on the rise.** Resilience differs from sustainability in that it refers to the ability of a system to bounce back after a shock. Some systems are both resilient and sustainable, but others only fulfill one criterion. For example, Hurricane Sandy hit New York City the hardest in Lower Manhattan, where it was most recently redeveloped. Although this area contains the largest collection of LEED certified green buildings in the world, it didn’t fare well: “The buildings were designed to generate lower environmental impacts, but not to respond to the impacts of the environment” — for example, by having redundant power systems.

In keeping with resilience thinking some libraries, especially those in areas hard hit by severe weather, are learning to “plan for the worst; hope for the best” and strengthening their ability to become community hubs during disasters. There are efforts to update library disaster planning and education to enable librarians to take a more active role in disaster management, moving beyond preserving buildings and collections to supporting communities and relief efforts. The importance of libraries in this role is beginning to be recognized, but there is still much work to be done: “The first formal recognition of public libraries as essential community organizations came in January 2011 when the Federal Emergency Management Agency (FEMA) decided to make libraries eligible for temporary relocation during major disasters and emergencies under the FEMA Public Assistance Program.”

Similarly, in a recent paper a group of prominent information and communication technology researchers argue that it is essential to consider how the “CHI [Computer-Human Interaction] community can help civilization react to, and perhaps plan for, global collapse” brought on by things like the declining availability of easily accessible energy sources upon which much of civilization (transportation, safety, agriculture, health care, etc.) is based, as well as serious environmental challenges. They add: “It is worth noting that ICT may also play a prominent role in bringing about collapse. ICT is a force multiplier and has hastened the development of the various environmental issues that surround us.”

**Implications for libraries**

- Given today’s environmental challenges, how can libraries proactively prepare for the worst while hoping for the best?
- How can libraries step up their sustainability and resilience initiatives, at local, state and national levels? Many public libraries, for instance, circulate energy meters in their communities to support increased energy efficiency and energy cost savings. Are there other resources libraries might circulate, as well as
providing information and/or serving as a convener for community problem-solving?

- What could library roles be in a collapse scenario? How might energy and resource shortages impact the availability and value of digital and physical information?
- How can library efforts, resources and infrastructures be best integrated into local, state and national government sustainability and disaster planning?

**Demographic Trends: Bigger, older and more diverse**

**Overview**

A number of overarching shifts are occurring in terms of U.S. demographics that are relevant to libraries. In essence, the U.S. population is growing, getting older, and more diverse. Additionally, over the past 100 years population growth has been concentrated in the South and West, though the east coast remains the most population dense area of the country. During this time there has also been a movement toward metropolitan centers, especially the suburbs, though rural areas are critical to the country’s future, as well. While many demographic trends have implications for the future, some trends are more directly relevant to libraries than others, and particular trends will impact certain types of libraries more strongly. Demographic trends have consequences for other sectors as well such as work, education and the environment, which in turn influence the context of libraries. The growing global population, for instance, puts more stress on the environment, leading to increased sustainability challenges, which libraries may play a role in addressing.

**Key trends and challenges**

**The U.S. population is getting bigger.** It has more than doubled since 1950 and it is estimated that it will continue to increase, reaching 440 million by 2050 (some estimates are lower but still over 400). This future population growth will come from increased births, decreased deaths and net immigration (immigration in minus migration out).

**The U.S. population is getting older.** In 2050 about one in five people will be over the age of 65. In contrast, only 8.1% of the population was older than 65 in 1950, and 12.8% in 2009. Challenges associated with this trend include addressing whether this older population will have adequate retirement income and health care. It also poses intergenerational equity issues, for example: should the government continue supporting pensions at the expense of funding programs that benefit Americans of all ages and/or younger Americans?^{197}

**The U.S. population is getting more diverse.** This increased diversity is resulting from continued immigration plus differing birth rates among different races and ethnicities,
as well as intermarriage. Immigration flows have been steadily increasing since the 1950s. In 2009 Mexico (164,067 persons or 14.6%), China (6.0%) and the Philippines (5.3%) were the three biggest sources of immigrants, followed by India (5.1%), Dominican Republic (4.4%), Cuba (3.4%), and Vietnam (2.6%). Immigration policy in the United States is guided by four principles: reuniting families; the admission of immigrants with special skills; the protection of refugees; and diversity in countries of origin. Partly as a result of these policies, immigrants to the U.S. are a mix of both high- and low-skill workers, and it is estimated that about two-thirds of immigrants are legal, while one third are unauthorized.²⁹⁸

In terms of the racial and ethnic make-up of the country, Hispanics are now the largest minority in the U.S., and it is estimated that they will make up about 30% of the population in 2050, up from about 12.6% in 2000. As of 2009 approximately 74% of the population identified as White (including Hispanics) down from 81% in 2000, 12% identified as Black or African American, 4% as Asian, about 1% as American Indian, Alaska Native, Native Hawaiian or other Pacific Islander, and 5% as “some other race.” In the future “increases [in population] will be most dramatic for Asians and for persons in the “other races” category. Between 2000 and 2050, the number of Asians is expected to increase by 23.7 million persons, an increase of 220%, while the number in the “all other races” (which includes persons who identify with two or more races) category will increase by almost 15.8 million, or 223%.”²⁹⁹ One in five same-sex couples (21%) are interethnic or interracial, compared to 10% of married opposite-sex couples. Additionally, a recent survey of 6,400 transgender Americans found that 24% identified as people of color.³⁰⁰

**Millennials differ from older generations in a number of ways.** Compared to older Americans, the Millennial generation (generally considered those born between 1982 and 1993, about 80 million people) tend to have more liberal views, including valuing the environment. They tend to be more upbeat and open to change, to believe that the government should do more to solve problems, to believe that business should have a societal purpose beyond making profit, and to support internet freedom – they protested the Stop Online Piracy Act (SOPA) and the PROTECT IP Act (PIPA). They’re also more racially and ethnically diverse, less likely to have served in the military, less religious, less likely to be married than young adults of past generations at the same age, and are highly price- and value-conscious as a result of having grown up during recessions. As history’s first “always connected” generation, they grew up alongside the internet, mobile phones, and social media. Still, this doesn’t mean that they have 100% positive views of technology. An Intel Labs study found that 61% of young adults find technology dehumanizing, the highest percentage of any age group. Notably, this group has higher levels of student loan debt, poverty and unemployment and lower incomes than previous generations at the same age. Nevertheless, this generational cohort is likely to be increasingly influential, due to both its large size and higher levels of education.³⁰¹
Family structure is shifting. In short, age at first marriage, divorce rates, non-marital childbearing, and cohabitation among young adults have increased. Related to these trends, more Americans are getting higher educations, especially women, though educational attainment varies starkly by race, and women now hold half (49.8%) of all jobs, and the percentage of older men in the workforce has declined sharply. Meanwhile, households tend to be smaller than they were in the past: the average household size declined from 4.6 people per household in 1900 to 2.6 in 2000. And, in 2000 one quarter of households in the U.S. were one-person households.\textsuperscript{202} Still, counter trends to this are emerging. For example, from 2000-2010 grandparent-headed households were on the rise, with one or both parents of the child often also living in the household, indicating that multi-generational households may increase as we move into the future.\textsuperscript{203}

LGBT issues are front and center. Across the country, as well as nationally, laws and policies are increasingly supportive of LGBT equality, though challenges continue to exist. Around 3.5% of the adult U.S. population identifies as lesbian, gay or bisexual, and 0.3% identifies as transgender, meaning that this encompasses a population of nearly 9 million people. Approximately 2 million children live with LGBT parents, and about 1 million lesbians and gay men are veterans. The LGBT community faces challenges such as workplace discrimination, unequal benefits, being able to take time from work to care for a sick child or partner, respectful treatment by healthcare providers, safety from harassment, and the ability to serve in public service.\textsuperscript{204} Access to information and communications technologies and privacy protections while using them, are important in terms of enabling LGBT people to securely meet and empower each other, regardless of geographic distance.\textsuperscript{205}

One of most contentious issues has been marriage equality, which is linked with other social benefits. Currently 30 states have same-sex marriage bans, while 20 states, as well as Washington, D.C., support marriage equality, and this number seems likely to increase.\textsuperscript{206} In 2013 a Gallup Poll found that 52% of Americans would support legalizing gay marriage in all 50 states (43% were opposed).\textsuperscript{207} Comparatively, in 1996 only 25% of Americans supported the legalisation of same-sex marriage.\textsuperscript{208} Also in 2013, Section 3 of the Defense of Marriage Act was ruled unconstitutional, meaning that the federal government now recognizes same-sex marriages for federal purposes such as insurance benefits for government employees, immigration, the filing of joint tax returns, bankruptcy, and so on.\textsuperscript{209} Because public libraries support many in accessing e-government services, this ruling has particular implications for libraries.

Population growth has been strongest in the South, West, and in the suburbs. Between 1900 and 2000 the South and West have seen two thirds of U.S. population growth. Just four states: California, Texas, Florida and New York accounted for 38% of the population increase. Nevertheless, throughout the century population density was greatest in the Northeast. Notably, in 1950 the population in the U.S. became predominately metropolitan (e.g., not rural). The percent of people living in city centers has remained relatively steady over time, while the bulk of growth has come with the
development of the suburbs. About 25% of suburban residents are minorities. Related to suburban living, 76% of the workforce drives to work alone daily. Thirty years ago, 64% of the workforce did that. Carpooling and walking have declined. Only 5% of the U.S. population uses mass transit daily. This increase in driving to work is partly because of the trend towards employment and population growth in the suburbs, where one often needs a car to get around.\textsuperscript{210}

\textbf{Immigration has a geographic component as well.} Since 1971 six “destination states” have dominated: California, New York, Texas, Florida, Illinois, and New Jersey. In 2009 about 62% of immigrants landed in one of those states. More specifically, there are 10 metropolitan areas that receive a high percentage of all legal immigrants. In 2009 the following areas were the intended residence of 57% of all legal immigrants: New York-Northern New Jersey-Long Island, NY-NJ-PA; Los Angeles-Long Beach-Santa Ana, CA; Miami-Fort Lauderdale-Pompano Beach, FL; Washington-Arlington-Alexandria, DC-VA-MD-WV; Chicago-Naperville-Joliet, IL-IN-WI; and the San Francisco-Oakland-Fremont, CA metro area.\textsuperscript{211}

\textbf{The shape of the rural United States has been and continues to be strongly influenced by agriculture.} In 2012 approximately 17% of the U.S. population lived in rural areas, compared to 19% in 2004.\textsuperscript{212} The decline in rural populations post-World War II has been linked with the industrialization and consolidation of agriculture. This trend, and the resulting decline in rural small businesses over time, has had further ramifications including fewer opportunities for young adults, as well as decreases in public services and stresses on social services resulting from population loss.\textsuperscript{213}

Agricultural consolidation has continued in more recent decades. In 1980, for instance, there were 65,000 hog farmers in Iowa. By 2002 this number had dropped to 10,000 farmers, while the number of hogs per farm jumped from 200 to 1,400.\textsuperscript{214} While the majority of farms in the United States continue to be small farms, the percentage of cropland held by large farms increased from 24% in 2001 to 34% in 2011. According to a U.S. Department of Agriculture (USDA) report, as communications, measurement and monitoring equipment is increasingly applied to farming this “may allow large complex firms to acquire the detailed and localized field-level information that was previously available only through persistent personal experience in fields,” leading to at least some shift away from the strong culture of family-farming in the U.S. (family farms aren’t necessarily small).\textsuperscript{215} While U.S. food production is at an all-time high, and food prices are relatively low, we will need to increase food and feed production by 70% over next 40 years to keep pace with projected population increases. This is important to our national security.\textsuperscript{216} Unfortunately, intensified crop planting and the use of chemical agriculture, often associated with agricultural industrialization, can have worrisome environmental impacts, such as the role that it has played in the recent decimation of the monarch butterfly population.\textsuperscript{217}
Interestingly, despite, or perhaps because of, the increase in metropolitan living, there has been an increased interest in farming and food sources within cities. And, while farmers are aging on the whole, the farming profession appears to be becoming more attractive to young people, including college graduates, many of whom are drawn towards organic production and other environmentally aligned farming practices.\(^{218}\)

**Rural areas face challenges, but are key to future resilience.** Rural Americans tend to be older, less educated, more likely to be service workers (vs. in a profession), and earn less than other Americans. Rural child poverty and persistent poverty are issues, and rural communities face large health care challenges, such as a relative lack of doctors and transportation difficulties.\(^{219}\) Despite these challenges, some argue that the rural United States is a critical asset to the future of the country. As Charles Fluharty outlined during a Federal Communications Commission rural broadband workshop, rural America – and a dispersed yet digitally connected settlement pattern more generally – is important to the nation’s security in terms of resilience in the face of threats such as terrorism and pandemics, as well as man-made and natural disasters. Along these lines, rural areas offer assets that are likely to become increasingly important in the future including: clean air; clean water; safe, abundant and affordable food and energy; natural amenities, arts, and tourism.\(^{220}\) Many libraries are important community hubs and sources of connectivity for rural communities.

Notably, the most recent population geography figures (2010-2013) show, for the first time since World War II, a decline in suburban and exurban population growth. According to the USDA, “This period may simply be an interruption in suburbanization or it could turn out to be the end of a major demographic regime that has transformed small towns and rural areas throughout the country for decades.”\(^{221}\)

**Implications for libraries**

- As the U.S. population ages, will this group have specific information seeking and technology needs that libraries can and should support? Pew studies show that people over 65 today are the least likely of any age group to have visited a public library in the past year.\(^{222}\) Will folks who are younger now continue to use libraries, as they grow older, or not?
- Will public pension costs for older Americans drain the public sector of funding for services like libraries?
- Today Blacks (86%) and Hispanics (80%) are more likely than Whites (73%) to say that public libraries are important to them personally, though all three groups consider libraries to be nearly equally important to the wider community. As the United States becomes more diverse, will strong support for libraries continue among Hispanics and Blacks?\(^{223}\)
- How can libraries better support the LGBT populations they serve?
- How has population growth in particular areas of the country (South, West, suburbs) impacted libraries in those locations?
• How are libraries in states and metropolitan areas that receive a particularly high percentage of immigrants responding? Could other libraries play a supportive role for New Americans in the way the Queens public libraries do in New York City? Could a more formal collaboration between the U.S. government (or other organizations) and libraries help immigrants take advantage of programs and services for New Americans?

• How can rural libraries help support a revitalization of rural communities that takes into account the important roles rural areas and agriculture play in national resilience and security?

Rising economic inequality

Overview

Wealth inequality in the United States is at historic highs, with some estimates indicating that 1% of Americans hold nearly 50% of the wealth. This tops levels seen just before the Great Depression in the 1920s. A variety of factors have led to increased wealth and income inequality over the past few decades including monetary and tax policy, the decline in unionization, and changing social mores, as well as globalization and free trade policies that have put American workers in competition with often much lower-paid workers around the world, leading to an erosion of traditional middle class jobs. While the majority of Americans today aren’t classified as living in poverty, many are struggling to make ends meet. In 2010, for instance, nearly two thirds (61%) of Americans "always or usually" lived paycheck-to-paycheck, up from 49 percent in 2008 and 43 percent in 2007. And, only the top 5% of U.S. households have earned enough additional income to match the rise in housing costs since 1975.

In 2013 an online video visualizing the results of research conducted by Michael Norton (Harvard University) and Dan Ariely (Duke University) on wealth inequality in the United States went viral, creating new buzz on an old topic. Norton and Ariely’s study found that Americans, across the board, believe that wealth distribution should be more equal in the United States than it currently is, and that study participants vastly underestimated the extent of today’s disparity in wealth distribution. They suggest that reasons behind this could be related to the availability of credit, e.g., you don’t know if your neighbor bought a car outright or with a loan, and the fact that people tend to interact within similar social strata.

Inequality is relevant to libraries in many ways. Libraries offer a wide variety of resources to the public for no fee. While people of all incomes make use of libraries, free programs and services may be especially critical for those with fewer financial resources. With higher levels of inequality, some people aren’t able to access tools they may need to participate in economic, civic and social life. People with the lowest incomes, for instance, are less likely to have home internet access than higher income
brackets, meaning that they may be more in need of public internet access. Some 24% of adults with incomes under $30,000/year are offline versus only 4% of adults with income over $75,000/year, and about one-fifth (19%) of adults who aren’t online cite cost as a main barrier. By offering public access to information and communications technologies as well as one-on-one assistance and classes on how to make use of them, libraries help to mitigate that divide.

**Key trends and challenges**

**Wealth and income gaps in the U.S. have significantly risen and continue to rise.** More than 80% of wealth in the U.S. belongs to 20% of the population. And, wealth is particularly concentrated among the ultra-rich: the wealthiest 400 Americans have the same combined wealth of the nation’s poorest – more than 150 million people, which is nearly half the country’s population. Looking historically, some shifts are surprisingly big: In 1950, for example, the ratio of the average executive’s paycheck to the average worker’s paycheck was approximately 30 to 1. Since the year 2000 however, that ratio has increased to between 300 to 500 to one. These trends have intensified more recently: “According to the latest study by the highly regarded economic-concentration specialist Emmanuel Saez, the richest 1% of Americans have been receiving 95% of the income-gains during the Obama "economic recovery." Everyone else has seen income-gains of 0.4%. Other studies have shown that the bottom 95% of Americans have actually experienced overall reductions in their incomes under President Obama. So for most Americans, the "recession" has merely continued." While related, these two metrics (wealth, income) are not exactly the same: in the U.S. the top 1% has about two times as large a share of national wealth as it does income: e.g., wealth inequality is even greater than income inequality. Some suggest that there is a fundamental and growing disconnect between policymakers and citizens in terms of the wealth/income gap, as for the first time more than half of the members of Congress are millionaires. The congressional salary alone ($174,000 a year) puts members in the top 6% of earners.

**The demographics of poverty look somewhat different than in decades past, but poverty persists.** After 50-plus years, there is a debate about how much the difference the “War on Poverty” has made. One issue is the complexity of measuring poverty, with different measures painting different pictures. What is clear, though, is that the demographics of poverty have shifted from the 1960s to today. Overall, poverty seems to have fallen somewhat. There was a 14-16% poverty rate in 2012, compared to 19% in 1964. Childhood poverty continues to exist in the United States. With 21.8% of children living below the poverty line in 2012, this was the highest rate in 20 years, though down from 27.3% in 1959.

Today, the majority (57%) of people living in poverty are in their prime working years, i.e., between 18 and 64, versus 41.7% in 1959. What is significantly different than before is that far fewer elderly are poor today than 50 years ago despite the fact that the
elderly population has doubled: 28.5% were in poverty in 1966; 9.1% were in 2012. This shift is largely credited to changes in social security benefits in the 1970s. Some argue, however, that the poverty rate among the elderly hasn’t shrunk as much as it might seem, as the elderly face higher out-of-pocket health related expenses than younger people.\textsuperscript{236} Another shift is that poverty among Blacks has fallen sharply, though the poverty rate for Blacks (at about 27.2% in 2012, down from 41.8% in 1966) is still more than twice as high as for Whites (at 12.7%). Since the 1960s poverty has risen slightly among Hispanics to about 25.6%, and the Hispanic population is five times bigger. Finally, the South remains the region of the U.S. with the highest poverty rate: it is home to 41.1% of people living below the poverty line.\textsuperscript{237}

Rates of poverty among Native American communities are also higher than the national average. According to the Center for Native American Youth: “Numerous tribal communities have unemployment rates near 70% and more than 23% of all Native Americans live in poverty, of which 32% are under the age of 18. Some of the poorest counties within the United States are located on Indian reservations.” Underfunding of education and housing has led to dilapidated conditions in schools and homes, and the high school graduation rate for Native students in a number of states is under 50 percent. While circumstances vary, Native communities face high rates of alcohol and substance abuse, violent crime, youth suicide, and health care disparities compared to the rest of the United States.\textsuperscript{238}

\textbf{About 36 million U.S. adults have low literacy, numeracy or digital skills.} While this is a different dimension of inequality, skill disparities are correlated with wealth and income inequality. According to an international comparative study by the Organisation for Economic Co-operation and Development (OECD), while nearly two-thirds (63\%) of low-skilled adults in the U.S. are employed – more than in other countries – low skills are linked to worrisome trends in personal and social wellbeing. The chances of having low levels of health, for example, are four times higher for low-skilled adults in the U.S. than for adults with the highest skills. There are significant linkages between demographics and skill level: more than half of low-skilled adults are Black or Hispanic and one-third were born outside the U.S. The numbers differ somewhat among different skills, but in terms of literacy 43\% of Hispanic and 35\% of Black adults have low literacy skills, compared with just 10\% of Whites. Furthermore, racial differences in skills remain even among adults with similar levels of education. Overall, U.S. adults rank in a tie for fifteenth out of twenty-three countries in literacy, twenty-first in numeracy, and tied for seventeenth in problem solving in technology-rich environments compared to other developed nations. OECD suggests several possible explanations for the skills gap: “failings in initial schooling, lack of improvement in educational attainment over time, and poor skills in some subpopulations including migrants.”\textsuperscript{239}

In the context of the OECD report the U.S. Department of Education led a series of five “Time for the U.S. to Reskill” engagement sessions across the country, one of which was held in Silicon Valley. According to Brenda Dann-Messier, a Department of Education
representative, the Silicon Valley session was especially significant because: “If you’ve got 36 million folks – and federally we’re only serving 2 million – traditional means aren’t going to work,” she said. “We have to really make sure that we utilize technology-enabled solutions.” While technology-based solutions may indeed help build skills, the equation is likely not as simple as it may seem. In the OECD study, adults with lower literacy and numeracy skills, not surprisingly, tended to score lower in terms of problem solving skills in technology-rich environments. In other words, if adults with low literacy and numeracy skills are expected to learn in technology-rich environments there may be challenges, as their digital skills may be low as well. Notably, the U.S. had one of the lowest shares of young adults (ages 16 to 24) performing at higher levels of problem solving in technology rich environments (38%), while on average across OECD countries about half (51%) of young adults do so, and in Sweden, Finland and Korea the figure is more than 60%.

**People as well as politicians are concerned about inequality.** In a poll in which Americans were asked what they would do if they had $100,000 to give to charity, for instance, people’s number one pick was to offer the money towards food and shelter for the needy. On a political level, President Obama has spoken out against inequality (though some argue that his financial policies have actually increased it). And, in his inauguration speech newly elected New York City mayor Bill De Blasio: “vowed to take on what he has dubbed "the Tale of Two Cities" – the vast income gap that sets a sparkling and buoyant Manhattan apart from the grinding poverty found in the outer boroughs.” Both men face significant barriers to taking action on this issue. De Blasio wants to tax New York City’s millionaires more highly, for example, but observers believe that tax plan is unlikely to be accepted at the state level. Inequality has been strongly criticized from other angles as well in recent years, ranging from participants in Occupy Wall Street to Pope Francis’s stark critique of modern capitalism in late 2013. Additionally, while it is contentious topic, there has been a recent movement nationally, as well as in select states, to raise the minimum wage. gap is a “very big” problem.

**Implications for libraries**

- How do libraries play a role in mitigating inequality in the United States? Has this role changed over time? How could libraries be supported to play an even more proactive role?
- How can libraries continue to support low-skilled adults to gain literacy, numeracy and digital literacy skills?
- In addition to providing no-fee access to resources and services, are there other ways in which libraries may partner with other public and private partners to increase economic opportunity at the community level?
- Some libraries have begun to employ case managers or collaborate with other city or county departments to better coordinate health and social services, particularly with library patrons who may be homeless. Are there other staffing
changes or partnership opportunities that could be created to support vulnerable populations?

**Public sector trends: Beware budget shortfalls**

**Overview**

The public sector, the part of the economy that provides basic government services, is comprised of many different components including: federal, state, local government; roads, public transit, public infrastructure; police, military, fire, disaster services; schools, libraries; public health care, social services; and so on. The public sector is influenced by many of the meta-trends that impact other sectors such as changing demographics; rapidly evolving technology; inequality; environmental issues; and the economy. In turn, the public sector has the power to impact many of these trends through programs that address topics such as inequality (e.g., health care for the poor), the environment (e.g., carbon emission caps or recycling programs), demographics (e.g., immigration policies) and technology (e.g., digital privacy education). In other words, there is a complex inter-relationship between the public sector and the direction that other major trends take.

The availability of (or cuts to) government funding has impact on the availability and quality of public services, including libraries. Thus, public sector services are influenced by who holds power at various levels of government and prevailing ideologies on spending, taxes, benefits, and so on. Additionally, decisions, issues, and available finances at higher levels of government impact state and local governments, as state budgets include federal funds, and local budgets include both state and federal funds. Since libraries are primarily funded at the local government level, this means they’re impacted by decisions at many levels of government and by issues that may stretch well beyond their domain.

Today one of the main challenges for the public sector in the United States is addressing the issue of budget shortfalls, which are likely to become worse with looming local and state government pension fund obligations and the rising cost of health care. This funding gap has worrisome implications in terms of the future of public services, and critical infrastructure upgrades. This squeeze threatens public library budgets, as well as school and academic libraries via cuts to public education. In short, libraries have the opportunity to help the public sector address the huge challenges it faces in terms of demographic shifts, new technologies, environmental issues, etc. At the same time, libraries are threatened by many of these same challenges (e.g., new technologies) as well as public sector trends (e.g., increasing budget shortfalls and related cuts).

Additional trends relevant to the public sector, which are not discussed in detail here – though some are touched on elsewhere in the report, include: accelerating globalization
and shifting centers of economic activity and consumerism, evolving societal relationships (e.g., expectation of government services to be available 24-7), growing threats to social stability and order, the expanding impact of technology, and the rise of “un-lobbying” in the U.S. (an increase of under-the-radar or indirect lobbying in recent years).

Key trends and challenges

Red and Blue states are moving in opposite directions in a new era of single-party control. As of 2013 three-quarters of states – more than at any time in more than the last half-century – were controlled by either Republicans or Democrats and “elected officials in these states are moving unencumbered to enact their party’s agenda.” Specifically, Republicans hold the governorship as well as majorities in both legislative chambers in 23 states, while Democrats have full control in 14 states. This control has implications for public services, like libraries. Republican states have tended to enact strategies based on less regulation, lower taxes, and deeper spending cuts. While Democrat-controlled states have also cut spending, they have been more likely to raise taxes to pay for education or infrastructure. Additionally, while the National Governors Association was once a place where leaders of both parties came together to find common ground, the governors’ partisan organizations — the Republican Governors Association and the Democratic Governors Association — now dominate, reflecting a more polarized climate where state politicians are less inclined to cooperate with legislators of the other party than in the past.

A recent survey from the National Association of Counties showed an increase in the number of elected county officials who identify with the Republican Party. In 2012, 52% of county officials identified as Republicans and 31% as Democrats. In 2004 and 2008 those percentages were more balanced, when county officials self-identified at approximately 40% each for Democrats and Republicans. This has impacts on local governance, as Republicans and Democrats tend to take different approaches to addressing economic and social issues, for instance: “76 percent of Republicans favor privatization of county services, compared to only 53 percent of Democrats and 64 percent of Independents.”

The economic recession and “small-government” policy approach have led to record cuts in government jobs. Since 2008 approximately 600,000 federal, state, and local government employees have lost their jobs. While the recession made cuts a necessity in some cases, it seems clear that there is an ideological component at play as well. A study by The Roosevelt Institute found that “public sector losses have hit hardest and most often in states where Republicans took control of state legislatures during the 2010 mid-term elections” and that “in 2011, newly-Republican states accounted for 40% of the public sector layoffs while cutting government jobs at rates that far outpace the national average.” Similarly, a National Association of Counties survey found that Republicans at the county level were more likely than Democrats or Independents to
think government cutbacks relating to the economic downturn were permanent, and “most strikingly, 55 percent of Republicans (versus 39 percent of Independents and 22 percent of Democrats) think the cutbacks "should be permanent." 

State and local governments face budget shortfalls due to pension and health care obligations. According to the U.S. Government Accountability Office (GAO) state and local governments face “persistent and long-term fiscal pressures.” If significant policy changes are not made, the GAO warns, state and local government will face an alarmingly widening gap between receipts and expenditures in future years. Since most state and local governments are required to balance their operating budgets this means that if additional funds are not raised, cuts will need to be made. The increasing budget shortfall is largely related to healthcare and pension obligations: “the decline in the sector’s operating balance is primarily driven by the rising health-related costs of state and local expenditures on Medicaid and the cost of health care compensation for state and local government employees and retirees.” Pension funds are challenged in the long term because “in the past, some plan sponsors have not made adequate plan contributions or have granted unfunded benefit increases, and many suffered from investment losses during the economic downturn.” Since more than 27 million people are covered by state and local government pension plans, this is no small issue. The GAO estimates that closing the projected revenue gap would require either a 14.2% reduction in state and local government spending each year beginning now, an increase in revenue of that magnitude, or a combination of those two strategies.

Economic challenges raise demand for public services and exacerbate budget shortfalls. During the latest economic recession many local and state budgets suffered from falling revenues and greater costs, making deficits worse. As the GAO comments: “The economic downturn and slow recovery led to budget shortfalls in the state and local sectors because of declining tax revenues and increased spending on economic safety net programs such as health care and social services.” If the economy encounters further periods of recession – as it likely will – this would put additional pressure on already stretched budgets, potentially leading to more cuts in public service funding, including for libraries. Somewhat similarly, in recent years as part of cost saving and efficiency efforts, many public sector services have been moved online. While accessing government services online rather than via paper and in-person offices is convenient for many, it creates issues for some. For people who need or desire assistance, libraries and other community organizations have taken up the slack (e.g., helping people to apply for benefits such as unemployment). Sometimes, there is coordination between government entities and libraries, but more often, the cost is shifted to community organizations, including libraries, without additional support. In other words, by moving services online the need for in-person support doesn’t automatically disappear, it simply becomes someone else’s “job” to provide it, sometimes at the expense of fulfilling official duties. Based on the potential for future budget shortfalls, it is plausible that this pattern of cuts and cost shifting will continue.
The country’s infrastructure is aging, and significant investments are required to fix it. In their most recent annual report, the American Society of Civil Engineers (ASCE) gave U.S. infrastructure a grade of D+. It is not only the country’s roads and bridges that face issues, but aviation, drinking-water supply, roads, schools, public housing, transit, inland waterways, gas mains, sewage treatment infrastructures, etc. are also growing older.

Much of New York City’s basic infrastructure, for example, was built in the late 19th and early 20th centuries.261 Every day, approximately 2.7 million cars pass over 47 New York City bridges that are considered to be “fracture critical;” i.e., they suffer from distress, and if one beam, span, or joint of the bridge fails, the whole thing could come crashing down.262 Lack of investment in infrastructure can leave people more vulnerable to the impacts of natural disasters, as well as have less visible, but pervasive consequences. Aged leaking pipes can lead to consistent waste (e.g., water) or even dangerous situations (e.g., in the case of gas). Similarly, outdated roads and other transit infrastructures can lead to delays and traffic jams.

Fixing these issues is no small matter. The ASCE estimates that getting U.S. infrastructure in good working order would require a $3.6 trillion investment by 2020. If the current level of spending continues, it will fall short of that amount by $1.6 trillion.264 The fact that the needed level of spending seems unlikely to materialize has led to creative financing suggestions, including civic crowdfunding, where individual citizens and investors (“the crowd”) would pool together money specifically for infrastructure projects.265 This model may be increasingly relevant to libraries as well. On a small scale, the Delta County Library District in rural Colorado raised approximately $4,150 from 63 donors via a Kickstarter campaign to buy equipment to support a public wi-fi network.266 Similar to pension and health care obligations, these infrastructure demands could more urgently overwhelm other public funding budget requests.

Library users are not necessarily library supporters at the ballot box. More than 80% of funding for public libraries in the U.S. comes from local sources. Therefore, local decision-making plays an important role in whether and how these libraries are funded – both in terms of how money is managed (are there funds available for libraries?) and community priorities (with the funds that are available, are libraries considered important to support?). Still, public library funding makes up a relatively small percentage of local operating budgets overall. According to U.S. Census Bureau numbers, in 2004 local government expenditures where broken up in the following way: Education (62%), Utilities (17%), Police (7%), Public Welfare (5%), Health (4%), Fire (4%), Libraries (1%). Interestingly, a study commissioned by the Online Computer Library Center (OCLC) found that voters who say they will definitely vote yes in support of a library referendum typically say that they are willing to support an increase in taxes to fund other local public services, as well. In other words: “voters do not necessarily trade off funding support to one public service for another, and those who vote for increased funding do so across all services.” Surprisingly, the study also found that there only a weak connection between library use and library support at the ballot box.267 A 2013 Pew Internet Project report also found that even though 54% of American adults
visited their library in the 12 months, 90% said that the closing of their local public library would impact their community as a whole, with 63% saying it would have a major impact.

**Privatization and outsourcing is a trend that is being considered across the public sector—including libraries.** While privatized public libraries is an anathema to some, it is a future possibility. Library System and Services, Inc. (LSSI) — the only library privatization company in the U.S., runs at least 15 library systems in California, Oregon, Tennessee and Texas. As such it is, effectively, the fifth biggest public library system in the country. In Santa Clarita, California, the city believed it could run its library system for $5.1 million per year, but LSSI does it for $3.8 million. Notably, “the bulk of the lower costs, both for the city and LSSI, comes from cutting the benefits previously afforded to librarians. Santa Clarita's library staff has been removed from the state's pension plan, and must instead contribute to a 401K.” Privatization of library services may become a stronger trend if local officials see it as a way to reduce costs where they’re hurting the most (pensions) with the promise of being able to continue offering library services to the public.

In short, the overarching trends for the public sector don’t particularly bode particularly well for publically funded libraries.

**Implications for libraries**

- How can libraries respond to state and local budget shortfalls in creative, proactive ways? Can they demonstrate, for example, that library services offer a strong return on investment?
- What is the strongest advocacy case for libraries in terms of a “small government” policy context?
- How does aging public infrastructure impact libraries, and can libraries play a role in ensuring it is updated?
- If library privatization increases, what could this mean for libraries and public access to information?

**Education trends: Self-directed, collaborative and lifelong**

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.” -- futurist Alvin Toffler

**Overview**

Like other sectors, education and related institutions are undergoing huge shifts and challenges. As some comment: education as-we-know-it grew up in the industrial age, and we now need models of education that make sense for the information economy.
Overall, education is projected to become more self/student-directed, collaborative and lifelong. Traditional educational players, including K-12 schools and especially higher education institutions, are facing disruptive threats from new technologies and education models. Key trends identified in the New Media Coalition’s comprehensive Horizon reports for K-12 and Higher Education include information technology-related topics such as: social media, open content, mobile learning, cloud computing, 3D printing, applications of big data/analytics to the education sector including data-driven learning and assessment, gaming & gamification, and virtual assistants (e.g., an advanced Siri). The impact of these things on education isn’t to be underestimated. Questions on the table include: Will traditional school and university models continue to be relevant models for learning? Or, does new technology enable other configurations that will ultimately be more nimble and more appealing to (at least some) students? Will those new models help to cut tuition costs for higher education? Will where you have a degree from become less relevant, versus the skills that you can demonstrate? Will informal, lifelong learning trump formal learning? What is the value of educators in an information-rich world? Who will win and who will lose in the new education landscape?

Beyond information technologies, education trends are interconnected with many other trend areas, including the future of work (what skills are needed in future jobs?), inequality (access to quality education; demographic differences in skill level and the consequences of that in terms of income, health, and participation in society), and the public sector (funding for education and ideologies about that). A number of specific budgetary and policy-related issues face the education sector. These include increased testing, assessment and accountability structures, the rise in charter schools and school vouchers for K-12 students, state and local budget cuts, and, at the university level, increasing student debt. Education trends are of course particularly important to school and academic libraries, which are embedded in the very education institutions that are poised for change. Education trends are also relevant to public libraries, which have a long tradition of supporting informal and lifelong learning – two trends which are on the rise.

**Key trends and challenges**

**Education is projected to become more self-directed, collaborative and lifelong.** Mobile technologies, cloud computing, and advances in online education will support new forms of learning. In this context, traditional educational institutions will see competition from new educational models and will be challenged to keep education relevant as formal and informal learning increasingly blur.
This vision for the future of education is embodied in a short video created by the
Institute for the Future where a young man foregoes a university education (the
lectures, anonymity, and “pointless exams” simply aren’t working for him) to pursue an
architecture education more independently. The young man participates in an online
learning platform that tracks his progress and his contributions to the architecture
community awarding him “level-ups” when he reaches certain goals — one example of
the gamification of education. The platform also connects him with a mentor, a retired
architect, who encourages him to explore architecture hands-on by observing the city
around, participating in architecture meet-ups, and helping out on local projects — all
facilitated by information and communications technologies.273

Similarly, Udacity’s Sebastian Thrun, for one, dreams that his young son will have the
opportunity to take a less conventional path to learning: "I hope he can hit the
workforce relatively early and engage in lifelong education … I wish to do away with the
idea of spending one big chunk of time learning." Thrun, a former Stanford University
professor turned-entrepreneur, is a central figure in the development of MOOCs (online
courses open to all via the web). While the initial hype around MOOCs has died down,275
Thrun continues to see opportunities for big shifts in education. According to the
Institute for the Future, MOOCs are just the beginning of things: “MOOCs today are our
equivalents of early TV, when TV personalities looked and sounded like radio
announcers (or often were radio announcers). People are thinking the same way about
MOOCs, as replacements of traditional lectures or tutorials, but in online rather than
physical settings.”276

Educators will move from assigning to enticing with content, and from acting as
content conveyors to becoming content curators. Schools are already experimenting
with “flipped classroom” models in which: “valuable class time is devoted to more
active, project-based learning where students work together to solve local or global
challenges — or other real-world applications — to gain a deeper understanding of the
subject. Rather than the teacher using class time to dispense information, that work is
done by each student after class, and could take the form of watching video lectures,
listening to podcasts, perusing enhanced e-book content, and collaborating with peers
in online communities.” Open content and data are also changing the way learning
happens as students and educators share and make use of these resources, both during
and outside of class time. The growing ubiquity of social media plays a role too:
“changing the way people interact, present ideas and information, and judge the quality
of content and contributions.” School and university libraries may play a role here by
identifying content for use in flipped classrooms (which make use of things like already-
existing online lectures from MOOCs or talks from experts); and identifying and
managing open data, content and other resources.

Advances in online education are challenging teachers and institutions to
simultaneously scale up and expand access and to make learning more personalized.
As the Institute for the Future describes: “Many institutions are built to work at one
particular scale. Large lecture halls can accommodate hundreds of students; small discussion groups serve few students in intimate settings. Large universities are geared to serve tens of thousands of students; small liberal arts colleges cater to much smaller numbers. The new generation of connective technologies, however, will provide opportunities for us to rethink scale. From a relatively small university and a classroom geared to a small number of students, Sebastian Thrun and his colleagues at Stanford University offered a course in AI to 150,000 online students. This is the age in which many organizations will need to learn to work at such extreme scales — making it possible to offer highly personalized courses, yet having the capability to reach hundreds of thousands and more when needed. Learning analytics – deciphering patterns and trends from educational big data – promises to help with the personalization of learning, such as detecting at-risk learners in order to improve student retention. Though, tracking and analyzing data generated by students (on online platforms, etc.) can pose privacy and ethical issues. Libraries and librarians might work with educators to develop privacy guidelines for learning analytics and other educational applications of big data, as well as help to facilitate internet and technology access for lower-income students.

For more details on related trends and challenges see the sections in the NMC Horizon reports on: evolution of online learning; quantified self; scaling teaching innovations; expanding access, and demand for personalized learning.

A shift is underway from degrees to reputation metrics and from grades to continuous feedback mechanisms. In the future will a university degree mean as much as it does today? That question is open for debate, but in some settings other factors are more likely to get you a job. In a recent survey asking people who hire contractors through the freelance platform oDesk to rank the criteria for making their hiring decisions, for example, the lowest listed requirement was possession of a college degree. The number one criterion for hiring a person was the assessment of a person’s previous performance on a similar task. Similarly, innovative online education platforms like Khan Academy (whose mission is to provide “a free world-class education for anyone anywhere”) are providing feedback on performance and measuring a learner’s level of mastery rather than assigning grades.

Education is moving out of lecture halls and into collaborative spaces. In many disciplines and classrooms learning is becoming more hands-on and collaborative, and students are encouraged to create and problem solve rather than simply consume content. This includes the development of “maker spaces” and 3D printing labs – sometimes housed in libraries – where students share a communal space and equipment. At the K-12 level, virtual and remote laboratories are on the horizon, which will allow learners to explore topics (such as the physical sciences, or even language learning) in ways that otherwise might not be possible given a school’s budget or location. Virtual labs offer access 24/7 from the internet as well as allowing students to practice in a “safe” environment before using real, physical components. Remote
laboratories, meanwhile, offer a virtual interface to real physical laboratory, reducing costs for schools that cannot afford high-caliber lab equipment.\textsuperscript{283}

**Education institutions must get better at adopting new technologies and develop agile approaches to change.** Both K-12 and higher education have a need for ongoing professional development of educators to keep pace with new tools and technologies. Further, it is important to recognize that education’s own practices can at times limit the uptake of new technology: “resistance to change simply reflects comfort with the status quo. In many cases, experimentation with or piloting of innovative applications of technologies are often seen as outside the role of teacher or school leader, and thus discouraged.”\textsuperscript{284} Integrating agile approaches to change – such as those used by technology startups, which are designed to quickly shift processes and workflows, could help educators to experiment with new technologies, practices and pedagogies and integrate them more effectively into the learning environment. This mindset can also help foster innovation and entrepreneurial activity among both faculty and students in higher education settings.\textsuperscript{285} School and academic libraries may play a role in supporting ongoing digital literacy training for teachers. They may also offer spaces for experimentation with new tools, and assist educators in integrating information and digital literacy into curricula.

On a different note, a number of policy-related and budgetary trends have implications for the future of education as well:

**The past decade has seen an increase in K-12 educational testing and assessment.** While standardized tests and assessments existed in the past as well, the passage of the No Child Left Behind Act of 2001 ushered in an era of increased accountability. The Act requires all public schools receiving federal funding to test students using standardized state tests, and all schools must make Adequate Yearly Progress (e.g., this year’s scores for sixth graders should be better than the previous year’s scores). If results do not improve, schools face a series of penalties, which can eventually lead to a major restructuring of the school, takeover, or closure.\textsuperscript{286} Critics argue that too much school time is going towards preparing for and taking tests, and that schools and teachers are being unjustly blamed for deeply rooted socioeconomic problems when their performance is judged by student test scores.

Recently, there has been a push to increase adoption of the newly formed Common Core State Standards Initiative, for which related tests are being developed. The standards, sponsored by the National Governors Association and the Council of Chief State School Officers and supported by the Bill & Melinda Gates Foundation, lay out what K-12 students should know by the end of each grade in math and English language arts. Common Core was developed in part to address concerns that the No Child Left Behind Act had effectively lowered the bar on what students should learn, since by requiring that test scores improve, but leaving it up to states to write their own tests it gave states an incentive to lower standards to make sure students passed.\textsuperscript{287} With
Common Core states can choose to use these standards as a common, national benchmark. States are not required to use the standards, but can gain additional points towards federal education grants if they do.

Although the Common Core initiative initially shared widespread support, it has been increasingly questioned from both the right and the left, causing some politicians and organizations to draw back their support and some states to delay implementation. Concerns include worries over an increase in national level influence on education (though Common Core isn’t a federal government program), as well as worries about additional increases in the amount of time students are likely to spend taking tests, among a number of other critiques. Some argue, for example, that testing and assessment is increasingly funneling public education funds towards the private sector in terms of the money schools pay to the companies that provide tests and related materials, through forced closures of “failing schools” that are reopened as for-profit charters, and the use of public education funds to subside private school education via vouchers. In early 2014 teachers at a Seattle school boycotted a district test, helping to kick off a wider “opt-out” wave among teachers, students and parents across the country. Despite discontents, educational testing and accountability measures aren’t likely to go away anytime soon. Nevertheless, as critiques grow, they may lead to reforms.

School vouchers are on the rise, and controversial. The concept of school vouchers is more than 100 years old, but they have achieved prominence in recent decades starting with economist Milton Friedman’s promotion of vouchers, picking up steam in the 1980s with the Reagan administration, and encouraged by the George W. Bush administration in the early 2000s. In essence, school vouchers allow public education funds to “follow the child” to the K-12 school of his or her choice, whether that is a better performing public school, a charter school, a private school, or even home or online schooling. Initially, school vouchers were often framed as protecting the right of parents to send their children to schools that reinforced their values (often Christian schools) – though whether public education funds should go to religious schools continues to be controversial due to laws regarding the separation of church and state. More recently, the discourse has shifted to emphasize how vouchers may be able to improve opportunities for disadvantaged students, such as children of low-income and minority families. Yet, the actual impacts of vouchers are complex, and controversial.

Critics argue that vouchers ultimately weaken the public school system, while offering a large profit opportunity for the private sector (the federal government spends some $600 billion on education each year and with vouchers a portion of that public money is diverted to private entities). Critics also point out that vouchers don’t appear to have a significant impact on student achievement. Additionally, there have been a host of contentious issues associated with vouchers, including voucher funds going to sub-standard private or charter schools, to support religious education including teaching
creationism, as well as subsidizing the private school tuition of students whose parents previously paid the bill themselves.  

Currently, it is up to individual states to decide whether to implement voucher programs, and while some states and courts have ruled against them, about one third of states offer some sort of school voucher. These programs served an estimated 220,000 students in 2012, just a fraction of a total of nearly 55 million K-12 students. To date, most voucher programs have been aimed at particular groups (e.g., low-income families, low-performing schools, special education programs), but recently a handful of states have moved to vastly widen eligibility. Republicans tend to be more supportive of school vouchers than Democrats. At a national level, Republicans are currently leading a legislative push to further promote this model. One proposed bill would give states the option to divert a total of $24 billion, about 41% of current federal K-12 education spending, to vouchers. The rise in/expansion of voucher programs over the past few years is attributed in part to Republican success at the state level in the 2010 elections. In sum, despite their controversial nature, and the fact that a relatively small percentage of U.S. school children currently make use of them, school vouchers appear to be on the increase.

As public schools face budgetary pressure, they are making cuts where they can. This involves making hard choices about what to prioritize. As a result of budget cuts at local and state levels about 300,000 education jobs were lost between 2009 and mid-2012. In some cases where K-12 school districts have needed to make lay-offs they are sharing staff, such as librarians, nurses and even teachers, among schools as a means to continue offering services to students, albeit in a reduced manner. In other cases, schools have replaced more highly skilled staff with lower paid employees, or have trained remaining staff to take on basic duties outside their area of expertise. This trend is likely to continue as the public school system grapples with tighter state and local budgets. Traditional public schools are also feeling funding-related impacts from the rise in vouchers and charter schools. In Boston, for example, state funding only covers 13% of public school budget today, down from 31% fifteen years ago. While state aid has actually slightly increased for Boston over that time period, much of the state money that previously went to the public education system is being used to support the city’s expanding number of charter schools. This expansion is true elsewhere as well: since the first charter school was created in Minnesota in 1991, charter schools have seen a large increase in number to over 5,300 by 2011. School voucher advocates argue that public schools actually benefit financially from vouchers that send students to charter schools. This is because while state educational funding “follows” the student elsewhere, the local money stays in the school district, where the same amount of local funds can be spread among a lesser number of students. While this sounds promising, the reality of who gains and who loses financially with school voucher programs is complex.
The cost of higher education, as well as student debt, is high and rising. While more people are taking advantage of higher education than in decades past, its cost can be a serious stretch for students and families, resulting in rising levels of educational debt. Some argue that students from wealthier families are subsidizing education for students from lower-income families, as they’re less likely to receive financial aid and more likely to have to pay full price. Overall, the trend of rising tuition and fee rates for higher education is a complex and ideologically divisive issue. There are multiple possible drivers of this trend, including: increasing levels of administrative and technical staff in universities, rising levels of luxuries and extras higher education institutions offer to “compete” with other universities and colleges, the unofficial practice of upping university spending as soon as more money is available (whether that’s really needed or not), falling state funding for higher education (related to state budget crunches, driven in a large part by health care and pension costs), availability of government and other student loans (schools know they can charge more because students have access to loans), and supply and demand issues – many believe it’s essential to go to college and there are many more willing “buyers” than open slots at the highest rated institutions.

Partly as a consequence of rising education costs, student debt has skyrocketed. Between 1982 and 2007 tuition and fees rose 400%. To put that in perspective, in the past decade college tuition has risen three times as fast as the Consumer Price Index (CPI) and twice as fast as medical care. Student debt levels have risen accordingly. In 2003 25% of 25-year-old Americans had student debt; in 2012 43% had student debt. Additionally, the average loan balance rose 91% from 2003-2012, with 39 million people owing an average of $24,803 in 2012 up from $10,649 in 2003. Will there be a point where students and their families are fed up with the costs of higher education and begin to move towards other models of gaining skills? (Other types of debt are an issue for Americans as well. For example, people in their late 20s and early 30s have more credit card debt than their parents or grandparents did at their age, and the American debt-to-income ratio is above 100%. Additionally, people – often the country’s poorest – are serving jail time because of unpaid debt related to court fines and fees, which are increasingly used to fund the criminal justice system.)

Implications for libraries

- How can school and academic libraries help their institutions keep pace with upcoming education trends and address associated challenges?
- How can libraries help educational institutions and communities harness the power of open content and big data, while mitigating privacy risks?
- Do any of these trends pose a threat to libraries? (e.g., Could virtual assistants mentioned in the NMC Horizon Higher Education report eventually make librarians less relevant, as envisioned in Apple’s Knowledge Navigator concept films?)
If educational institutions as we know them become less relevant, or significantly transform, what will happen to libraries embedded within them?

- How might public libraries help to facilitate collaborative as well as hands-on learning in the future, both online and offline? How can libraries encourage learning and related innovation that will benefit the community at large?

- How can school libraries help schools meet standards and reduce testing burdens?

- If more public education funds are funneled to private and charter schools via vouchers, what may that mean for school libraries? Do charter and private schools tend to have school libraries?

Future of work: New skills, new structures

Overview

We’re in a time of great transition and creative destruction in terms of work-as-we-know-it. Developments in information and communication technologies are a key driver in this, as well as changes in global demographics. More specifically, disruptive shifts that will reshape the workforce landscape include:

- **Extreme longevity**: Increasing global life spans change the nature of careers and learning. Organizations like Civic Ventures, a think tank dedicated to helping people find “purpose, passion and a paycheck” in the second half of life, for example, are tapping into the energy and ambitions of older workers in an age of “un-retirement.”

- **Computational world**: Massive increases in sensors and processing power make the world a programmable system.

- **Superstructured organizations**: Social technologies drive new forms of production and value creation.

- **Rise of smart machines and systems**: Workplace robotics nudge human workers out of rote, repetitive tasks.

- **New media ecology**: New communications tools require new media literacies beyond text.

- **Globally connected world**: Increased global interconnectivity puts diversity and adaptability at the center of organizational operations.

New business models are also emerging within these parameters. Technology entrepreneur Lisa Gansky, for example, talks about “the mesh” a business model that is enabled by technologies like radio frequency identification (RFID) and global positioning systems (GPS), as well as the internet. Involving an intersection of social and mobile technologies and physical goods it is resulting in innovative companies and platforms like Zipcar (car sharing), Kickstarter (connecting artists with funders) or music gyms (cooperatives where musicians or related artists share the cost of space and
equipment). In this world “access trumps ownership” and sharing is key. Related to this, on the future of libraries, Seth Godin comments: “The next library is a place, still. A place where people come together to do co-working and coordinate and invent projects worth working on together. Aided by a librarian who understands the Mesh, a librarian who can bring domain knowledge and people knowledge and access to information to bear.”

**Key trends and challenges**

**Everything that can be routinized, coded, dissected will eventually be done by machines.** Even managerial work such as coordinating tasks, determining the best workflow processes and matching people to tasks is beginning to be replaced by new technology and related platforms. Using the online platform Taskrabbit, for instance, you can hire people in your neighborhood to complete odd jobs such as picking up groceries. The platform now also helps businesses to find people to complete administrative, sales, data entry and customer service jobs. While automation is significantly impacting jobs today, it isn’t new. Between 1970 and 2010, for example, the number of workers across some major job types (bookkeepers, typists, telephone operators, secretaries, etc.) declined more than 50 percent as they were replaced by technology.

In the future, jobs that are less easily automated may still be transformed. For example, the tasks that a doctor performs today now may be broken down into more discrete tasks, some of which would be performed by machines, and others taken care of by less skilled (and less-highly-paid) people. In some cases, where cheap labor is available, it will still be more cost effective to use humans to complete a task, even though it could be completed with machines. Notably, researchers estimate that jobs are at high risk of being automated in 47% of the occupational categories into which work is typically sorted. This list includes legal work, technical writing, accountancy, and quite a few other white-collar occupations. The jobs of “Library Assistants, Clerical” and “Library Technicians” both have over a 90% chance of being automated according to the study.

**Workers with skills highly complementary to machine intelligence will succeed.** Since the 1980s jobs that require non-routine interactive and non-routine analytic tasks have gained ground over routine and manual jobs. Additionally, technology complementary jobs like computer systems analysts, engineers and surveyors show three times higher wages as well as higher wage growth than the average occupation. Additional skills that are likely to be needed for the jobs of the future include:

- **Sensemaking**: Ability to determine the deeper meaning or significance of what is being expressed.
- **Novel and Adaptive Thinking**: Proficiency at thinking and coming up with solutions and responses beyond that which is rote or rule-based.
• **Transdisciplinarity**: Literacy in and ability to understand concepts across multiple disciplines.

• **Social Intelligence**: Ability to connect to others in a deep and direct way, to sense and stimulate reactions and desired interactions.

• **Computational Thinking**: Ability to translate vast amounts of data into abstract concepts and to understand data-based reasoning.

• **New Media Literacy**: ability to critically assess and develop content that uses new media forms, and to leverage these media for persuasive communication.

• **Design Mindset**: ability to represent and develop tasks and work processes for desired outcomes.

• **Cross Cultural Competency**: Ability to operate in different cultural settings.

• **Cognitive Load Management**: ability to discriminate and filter information for importance, and to understand how to maximize cognitive functioning using a variety of tools and techniques

• **Virtual Collaboration**: ability to work productively, drive engagement, and demonstrate presence as a member of a virtual team.

This has implications for the sort of education that will be needed to prepare people to succeed in the workplace.

**There will be an increase in temporary, part-time, freelance, and contract work and self-employed workers.** Currently about 30% of U.S. workers engage in this type of work, and that percentage is projected to grow to about 40% by 2020, or more than 60 million people. It is projected that the future of business will be made up of a combination of small businesses who serve niche markets and global giants who will have bought up many mid-sized companies. This trend towards part-time, self-employed work is likely to impact different workers differently. For some, the freedom and flexibility of part-time or freelance work is a desirable trade-off for its relative instability. For others who are unable to find full-time work, and for whom part-time work doesn’t pay the bills, this can be a stressful situation. According to the Bureau of Labor statistics, during October of the 2008 recession there were 8.1 million involuntary part-time workers. A growing trend in some industries, such as retail, which has received criticism from labor advocates, is to staff workers on an on-call basis. This just-in-time labor can save a company money, but means that workers may have no or few fixed hours per week, and must be ready to work if the employer calls them in.

The trend towards less stable work has policy repercussions as well. Most directly, it is at odds with the benefits and tax structure of the United States, which is presently geared towards people working in conventional ways (e.g., one employer, full time employment). On a more positive note, by making health insurance more affordable for many, especially for people with pre-existing conditions, the Affordable Care Act is prompting some to leave jobs they have held for health insurance purposes to start businesses or pursue other passions. If the Act succeeds, it could push this trend further, leading some to pursue part-time or self-employed work, for whom this otherwise
would not have been an option. The trend towards the increased automation of work due to advances in AI and robotics discussed elsewhere in this report may contribute to the rise in part-time, and/or less stable jobs as people are displaced from work by machines. For those who can financially manage a cut in hours and pay this scenario may be acceptable – freeing up time for other pursuits, yet it is likely to become a hardship for others.

Another important trend is telework, which is becoming more established. Already in 2012 about 23% of U.S. workers did some or all work at home. Those with a bachelor’s degree or higher were more likely to do so than those with less education. One commentator suggests that with increased freelancing and teleworking we’ll see (and companies should actively foster) new “approved workplace ecosystems” – a variety of spaces where people will work, including co-working spaces and coffee shops – outside of traditional offices. This is, of course, already occurring and public libraries are one potential work spot.

There’s a decline in “the long job.” We’re living in a world of increased insecurity, volatility and risk as industries undergo creative destruction. This is reflected work-wise in the increasing movement towards freelancing, contract and part-time work as well as emergent trends in the traditional job market. The median number of years an American worker has been at his or her current job is 4.4 years, a much shorter time than in the 1970s. According to Fast Company: “tacking swiftly from job to job and field to field, learning new skills all the while—resembles the pattern that increasingly defines our careers.” While in the past companies may have been reluctant to hire an employee who showed a history of job-hopping, companies like Google are beginning to see job-hopping for career and personal growth as an attractive asset – as these are the “people who can lead companies toward new markets and ideas.” At IBM, for instance, “career vitality” is a watchword, and the company encourages employees to job-hop within the company. For some, this volatility and flexibility in the job market is a plus – allowing workers to continually expand their horizons. But again, those who are unwillingly pushed into part-time or freelance work or out of a job may experience these dynamics as less ideal.

Inequalities in pay and geographic disparities in jobs are apparent. Over the last decades wages for most workers have stagnated. While, over the same period, the price of “widgets” has gone down, the price of things like education and health care have risen. As touched on above, there’s an increasing divide among “top earners” and the rest of workers. These “superstars” – very highly paid CEOs, artists and sports stars – receive disproportionate rewards for the work they do.

Somewhat differently, in “The New Geography of Jobs”, Enrico Moretti writes about geographic aspects of jobs and affluence. He argues that over the last thirty to forty years the rise of hubs of “idea creators” in centers of innovation like San Francisco, Boston, Seattle, and Austin has led to large disparities in income, education, family
stability, life expectancy and political engagement – with some places increasingly benefitting and others falling farther behind. These innovation centers are doing well, in part, because for each new innovation job, Moretti posits, five additional non-innovation jobs are created. In other words: “in Silicon Valley, high-tech jobs are the cause of local prosperity, and the doctors, lawyers, roofers, and yoga teachers are the effect.”\(^3\)

On the flip side of things, in “Digital Dead End”, Virginia Eubanks, illustrates how today’s “technology poor” (the approximately one quarter of Americans without reliable information and communications technology access) do in fact heavily participate in the information economy – often as low-wage data entry workers or service workers, and also in terms of navigating and being monitored by the social service system. Her research is contextualized in Troy, NY: a city that has been working to boost itself into the information age by offering major incentives and tax breaks for high tech companies to locate there, with the hope of becoming an innovation hub. The result has been that a limited number of high tech jobs have been created, while rising housing and real estate prices have pushed many poor and working class people out of the city.\(^3\)

**Americans are concerned about jobs, the economy and inequality.** Given the increasing volatility of the job market, recent economic shake-ups, and rising inequality, it is not surprising that a 2013 Gallup poll found that “creating more jobs” and “helping the economy grow” were the top two priorities for Americans in terms of what they feel the government should focus on. “Reducing poverty and inequality” also made the list, albeit lower down and with bigger differences by political affiliation.\(^3\)

**Implications for libraries**

- Which of the key drivers impacting the future of jobs (e.g., extreme longevity, computational world, new media ecologies, etc.) also impact libraries?
- What aspects of library work are likely to be done by machines or outsourced in the future?
- How can libraries help communities attain key skills needed for the future of work, including skills that are highly complementary to machine intelligence?
- How can libraries support independent workers and very small, niche businesses?
- How can libraries support workers who have lost jobs due to automation?
- How can libraries help to facilitate “the mesh”?
- What can libraries do to help people start businesses that put social good purposes before profit?
- Are different jobs strategies relevant for libraries located in “innovation hubs” versus those in other locations?
Conclusion

To be developed.

About this report

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