Impact of Disruptive Technologies on Grey Literature Management

Analysis of disruptive information technologies (IT) is based on five 2017 reports, issued by several leading international consulting companies with a special interest in researching the impact of IT on business and work environments. Four technologies were identified with a potentially high impact on information and grey literature management. The major disruptors identified are artificial intelligence and machine learning, virtual and augmented reality, internet of things and big data.

Information technology has become a driving force for change and innovation of our work processes and the services we offer. It is particularly evident in the way we create, distribute and use information products and services. Management of grey literature is a good example of this. The emerging new digital information environment has the potential to disrupt all aspects of our work and the world around us. In order to meet expectations and benefit from this challenging opportunity, information managers need to be aware of new IT trends, the disruptors they bring and the disruptions they might cause. At the same time, these changes also offer opportunities to improve our work.

Grey Literature Defined

At the 12th International Conference on Grey Literature (GL12), held in Prague in 2010, the most widely currently used definition of grey literature (GL) was drafted. It states that ***"Grey literature stands for manifold document types produced on all levels of government, academics, business and industry in print and electronic formats that are protected by intellectual property rights, of sufficient quality to be collected and preserved by library holdings or institutional repositories, but not controlled by commercial publishers, i. e., where publishing is not the primary activity of the producing body"*** (Farace, D. and Schöpfel, J., 2010).

An attempt to add an additional twist to the definition of grey literature was a suggestion to look at it from the perspective of traditional publishing, which usually goes through a peer-review process. This revised definition is regarded as: ***"the diverse and heterogeneous body of material that is made public outside, and not subject to, traditional academic peer-review processes"*** (Adams at al., 2016).

The current concept of GL, as stated in the Prague definition, faces some challenges. The main challenge relates to multiple types of originators; humans and machines, volume and type, and the speed of GL creation. In order to overcome a possibility of the definition becoming obsolete due to its inability to differentiate GL from other types of literature, I have proposed a new definition, which might help meet some of the above-mentioned challenges. Accordingly, ***grey literature is any recorded, referable and sustainable data or information resource of current or future value, made publically available without a traditional peer-review process.***

Disruptive Information Technologies

The term ***'disruptive technology'*** was coined by Harvard Business School professor Clayton M. Christensen in his 1997 best-selling book – "The Innovator's Dilemma" (Christensen, 1997). There, he separated new technology into two categories: sustaining and disruptive. Sustaining technology relies on incremental improvements to an already established technology, while disruptive technology lacks refinement, often has performance problems because it is new, appeals to a limited audience and may not yet have a proven practical application.

In another words, a disruptive technology displaces an established technology and shakes up the industry, or introduces a ground-breaking product that creates a completely new industry. During the last few decades, information technology played that role by introducing new solutions that shook up the world, especially the world of business. IT continues doing so by introducing newer and newer products and solutions which impact our lives and the way we organize our work and conduct business.

Many leading international consulting companies have a special interest in researching the impact of IT on business and work environments. For this review, five reports created by leading IT consulting companies were selected (Table 1). Although somewhat different in their approach and the way they look at the future, the IT trends identified offer a good starting point to determine major IT influences and potential disruptors that will define the near future.

After looking at the reports, four major potential disruptors of grey literature management were identified. They are:

- Artificial intelligence and machine learning
- Virtual and augmented reality
- Internet of things
- Big data

Disruptors!

Gartner	Forbes	Forrester	Deloitte	Accenture
1.AI and advanced machine learning 2.Intelligent apps 3.Intelligent things 4.Virtual and augmented reality 5.Digital twin 6.Blockchain and Distributed Ledgers 7.Conversational System 8.Mesh App and Service Architecture 9.Digital Technology Platforms 10.Adaptive Security Architecture ***Gartner's Top 10 Strategic Technology Trends for 2017***	1.IoT and smart home tech 2.AR and VR 3.Machine learning 4.Automation 5.Humanized Big Data. (visual, empathetic, qualitative) 6.Physical-Digital Integrations 7.Everything On-Demand ***7 Technology Trends That Will Dominate 2017***	***Engagement technologies*** *1.IoT software and solutions* *2.Intelligent agents* *3.Personal identity and data management* *4.Real-time interaction management* *5.Augmented and virtual reality* ***Insight technologies*** *1.AI/cognitive* *2.Customer journey analytics* *3.Insight platforms* *4.IoT analytics* *5.Spatial analytics* ***Supporting technologies*** *1.Security automation and orchestration* *2.Containers and container management* *3.Edge computing* *4.Cloud native application platforms* *5.Hybrid wireless* ***The Top Technology Trends To Watch: 2017 To 2021***	1.IT unbounded 2.Dark analytics 3.Machine intelligence 4.Mixed reality 5.Inevitable architecture 6.Everything as a service 7.Blockchain: Trust economy 8.Exponentials watch list ***Tech Trends 2017: The kinetic enterprise***	1.AI is the new UI 2.Ecosystems power play 3.Workforce marketplace 4.Design for humans 5.The uncharted ***Technology Vision 2017 – Technology for People: The Era of the Intelligent Enterprise***

Table 1 2017 Information technology trends

Artificial Intelligence and Machine Learning

Artificial intelligence (AI) and machine learning applications are systems that can think and act rationally, almost like humans. They are usually very costly and complex to develop maintain and deploy. Their power comes from a combination of many technologies and techniques, such as deep learning, neural networks, and natural-language processing (NLP). Initially they appeared as rule-based or expert systems, but today's algorithms can understand, learn, predict, adapt and potentially operate autonomously. They are often built into physical devices (e. g., robots, cars, consumer electronics, and security systems); into apps and services (e. g., virtual personal assistants, smart advisors, voice recognition, computer vision, translation, and finance). Applied in the area of information and knowledge management they become a powerful help in processing, organizing and disseminating data and information.

Virtual and Augmented Reality

Virtual reality (VR) systems take us out of our reality and bring us to some other place, while augmented reality (AR) takes our current reality and adds something to it. A simple way to understand the difference between VR and AR is to compare scuba diving to the aquarium. For example, VR can bring us to a construction site where we can walk in any direction and see every detail, while AR could be helpful for a client who can't visualize something. The idea is that a designer, an architect and a homeowner could sit around a table and look at the same 3D model on the table instead of a 2D plan. The power and the danger of this type of technology lies in the fact that the human mind is not able to tell the difference between computer-generated images and the real world. This technology offers many possibilities for developing applications for the military, medicine, science, manufacturing, real estate, fashion, navigation, sightseeing, advertising and promotion, and games like Pokémon Go.

AR's ability to enhance what already exists is what makes it an excellent fit for document repositories, libraries, museums and similar institutions.
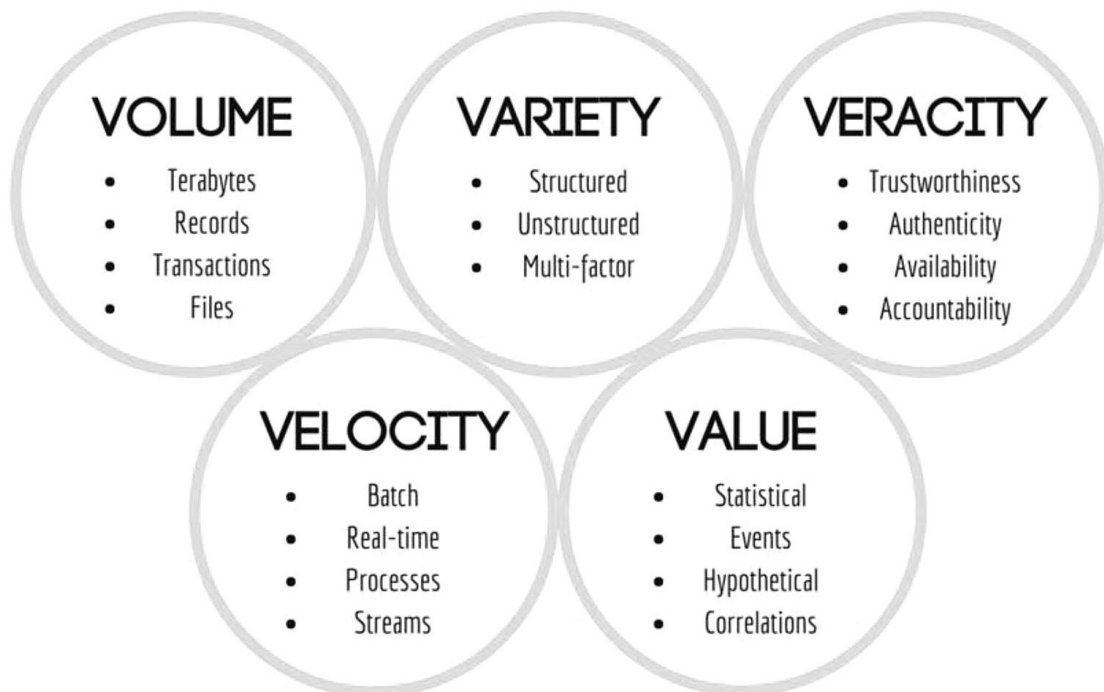
Internet of Things

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT systems require an object, often referred to as a 'thing', a unique identifier (IP), Wi-Fi, sensors, and electronic circuits for control. A 'thing' can be goods, objects, machines, appliances, buildings, vehicles, animals, people, plants, or even soil. Some examples include a person with a heart monitor implant, a farm animal with a biochip transponder, cars with built-in sensors to alert the driver when tire pressure is low, supply monitors, search and location, city management, controllers for electricity use, game immersion, etc. Something to keep in mind is that data creation and capture is moved from people to computers. Some of the challenges with IoT include its huge complexity and non-existent privacy.

Big data

There is wide spread and growing interest in 'Big Data.' This popular term is often used to describe the huge growth and availability of both structured and unstructured data. Generally, five V's are highlighted when talking about big data – Volume, Variety, Veracity, Velocity and Value.

The 5 Vs of Big Data

VOLUME
- Terabytes
- Records
- Transactions
- Files

VARIETY
- Structured
- Unstructured
- Multi-factor

VERACITY
- Trustworthiness
- Authenticity
- Availability
- Accountability

VELOCITY
- Batch
- Real-time
- Processes
- Streams

VALUE
- Statistical
- Events
- Hypothetical
- Correlations

Digital Economy Forum

Currently, we are facing an exponential growth in the volume of data. Virtually all devices are now generating data in some way, shape, or form. A modern car has over 100 sensors built in. This translates into approximately 11 billion sensors used just in cars around the world. Think of the volume of data being generated by your TV cable subscription today versus just 20 years ago.

With big data, there are problems with collection, privacy, security, long-term preservation, technical and financial sustainability, standardization and future usability.

Impact on Grey Literature Management

The impact of the four disruptors mentioned above is already being felt across the wider information management sector, and it will continue to be of major concern, bringing many challenges and requiring well-planned, well-established, and well-financed actions. As a part of general information management, grey literature will be impacted by these technologies.

Based on the above brief summary of disruptors, four different groups of trends and impacts dealing with various aspects of grey literature management are identified. They are:

Technology	Customers
-More difficult access to GL due to security constraints -Higher level of IT expertise required to access and process GL -More dynamic documents, less GL -New tech-driven/based forms -Tremendous increase of big data and related documents	-High expectations (e.g. comprehensiveness, relevance, aggregation, added value) -Interconnectivity -Top of the line finding tools -Web 2.0 features (e.g. social networking, collaboration, user generated content) -Tools to analyse and exploit big data -Mobile expectations of the new generation -Lack of understanding of GL value and importance
Products/Services	**Employees**
-Self generated data/information/docs. -Competition with 'big players' -Lack of interest to collect, preserve and make GL widely available -Difficulty with going beyond local repositories -Intellectual property protection -Disappearance of e-archives and older web-based materials	-Availability of HR and financial resources -Lack of proper training and education -Limited career development -Frequent change of jobs and interests (i.e. lack of continuity and long-term planning) -Changing technical requirements -Business focus -Culture of preservation missing -Multitasking and rapid delivery expectations

The above table indicates that key areas of grey literature management, namely technology, customers, products/services, and employees will be impacted in the future by those disruptive technologies that have been identified. Sustainability of grey literature management requires many planned efforts to overcome all the anticipated challenges in order to continue making it valuable, viable and usable as future information resource.

Conclusions

In the last few decades, developments in information technology have had an immense impact on the way we manage information in general, and on the way we create, disseminate and use grey literature. Based on this review of the main disruptive information technologies, it can be concluded that grey literature will face considerable challenges in the future. Due to the impact of big data and the Internet of Things, grey literature volume will experience exponential growth, while due to the use of artificial intelligence and virtual and augmented reality, the management of grey literature will become more complex and more difficult.

In order to meet the challenges of disruptive technologies on the future of information and grey literature, it is necessary to increase knowledge of information specialists and improve cooperation among data and information specialists, librarians and archivists. Promotion and increased efforts to demonstrate the value of properly managed grey literature collections could bring about the necessary recognition of this important field of information management.

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Dr. Dobrica Savić
d.savic@iaea.org ■
Nuclear Information Section (NIS) International Atomic Energy Agency (IAEA)