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## **Libraries with Minds and Souls (Complexity vs Artificial Intelligence vs Library Science?)**

**Viorel Guliciuc**

«Ștefan cel Mare» University of Suceava, Romania  
[viorel.guliciuc.1958@gmail.com](mailto:viorel.guliciuc.1958@gmail.com)

**Carlos E. Montano**

Universidad Autonoma de Ciudad Juarez, Mexico

**Roxana-Ema Dreve**

«Babeș-Bolyai» University of Cluj-Napoca, Romania

**Valeria-Alina Miron**

«Babeș-Bolyai» University of Cluj-Napoca, Romania



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### **Abstract:**

*Almost all the librarians observed (or should have) something essential, for the very identity of the libraries, librarianship and LIS, tis happening in the Digital Age under the Social Networking: the arrival of the Artificial Intelligence.*

*This event is more than observing that LIS is a complex, trans-disciplinary (not just multi- or inter-disciplinary) field of study and practice. It is more than claiming that “libraries are at a turning point”, because “the way we access and consume information has changed dramatically”, under the advent of new technologies. It is even more than making a prophecy: to survive in the digital age and firmly stay relevant, “libraries need to be brave and innovative” and “must embrace both the physical and virtual” (British Council).*

*It is about answering the question: “Why do we need libraries in the Networked Digital Age?” We are dealing with the increasing infusion of / merging with, the Artificial Minds in our very way of living and being as Humans. Those non-human artifacted minds are learning from, with and for us how we are accessing, using and sharing the information, in our profound need of sense and order under the Information and Programming Turn we have to deal with.*

*Libraries are the perfect playground for such an existential game. When an Artificial Mind / Artificial Intelligence is interacting and learning from, with and for the Human Minds, it is about a network of*

*Minds / Intelligences working, under the Collective Wisdom, with and for the Human Souls for a better world.*

*This is a new confirmation of the truth that “Libraries are forever” means “Humankind is forever in the librarianship”.*

**Keywords:** LIS, complexity, Artificial Intelligence, Networked Digital Age, Information Turn

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## **The complex world we are living in**

It is almost a truism to say we are living in a complex world. “Almost”, because the sense and the use of the words “complex” and “complexity” has increasingly gained new meanings after we have discovered we are surprisingly often confusing “complex” with “complicated”.

Even if the online dictionaries do not promote it, let us accept, *grosso modo*, the following etymology: “the stem of the word complexity i.e. Complex is composed of the Latin words *com* (meaning: “together”) and *plex* (meaning: woven). This is best contrasted with Complicated where *plic* (meaning: folded) refers to many layers”. So, “a complex system is thereby characterised by its inter-dependencies, where as a complicated system is characterised by its layers”. This is why “complexity is generally used to characterize something with many parts where those parts interact with each other in multiple ways, culminating in a higher order of emergence greater than the sum of its parts”. [1]

Yet, even to the date, there is no large agreement about a definition of complexity; it is possible to characterize a system or a process that is complex. Among those complex systems and processes, one will find: peace building, capacity building initiatives, natural resource management, innovation systems, sustainability, healthy communities, raising families, women's empowerment a.s.o.

Moreover, a complexity science exists: “complexity science is the scientific study of complex systems, systems with many parts that interact to produce global behaviour that cannot easily be explained in terms of interactions between the individual constituent elements. Complex systems include IT networks, ecosystems, brains, markets, cities and businesses”. [2]

As Arnold Kling is quoting Ben Ramalingam, even if “we treat complex things as if they were merely complicated...”, we have to distinguish between “complicated systems, which can be modelled mathematically, and complex systems, for which there is no mathematical model which can say, if X is the situation then do Y”. Under these circumstances, “complexity science pulls back the curtain on these processes and it can force you to think about the world you live in in a different way”. [3]

So, we are living in a complex and not in a complicated world, as it is a world characterized by its interdependencies and not by its layers, a world where the order emerged from its parts is higher than their sum.

## **The complexity of LIS**

Among those complex systems of our world there are libraries, too.

When it is about the complexity of LIS, as field of study and practice, let us, first of all, observe the complexity of the information itself.

As practice, “the role of information technology in the LIS profession has put”, in the last decades, a “special focus on the ability to adapt to change, and especially rapid change that technological innovation has brought to the library environment”. Under these challenges, “over the years it has been shown that e.g. technological development in libraries have contributed to the emergence of different professional strategies to adapt to change”.[4]

In the traditional library, the core skills were, essentially, “connected to collecting and organizing information”.[5] Even, before the end of the 20th century, the LIS literature underlined the need of maintaining those traditional skills with an updated ability to operate in the new digital context (Internet, social media).

But, there is more in the changes LIS is facing during recent years - observe Gunilla Widén and Maria Kronqvist-Berg: “there has been a strong Library 2.0 discourse, focusing the possibilities of social media in libraries”. In this context, “library professional skills ... doesn’t seem to be located so much in certain qualities, but rather in their convergence and complexity”. Yet, “the Library 2.0 discourse has been explicit about capacities to act in the context of digital and social media”.

So, as practice, the LIS is strongly related to complexity.

As study, LIS is strong related to the complexity (of the meaning) of information:

Indeed, “a detailed analysis of the linguistic roots of the term, and of the usage of the concept since classical times, shows a change in its meaning, and in particular of a continuing duality between an objective and subjective implication of the term”.

Moreover, “this complexity in meaning has led to what has been termed “Capurro’s Trilemma,” with three options for understanding the idea of information”.

Those three options are:

- univocity: the concept of information has the same meaning in all contexts
- analogy: the concept of information has an original meaning in a specific context, and is applied as an analogy in other domains
- equivocity: the concept of information has different, but equally valid, meanings in different contexts”.

Let us observe the impossibility to unify the understanding of the idea of information.

If we will accept this natural observation, then, it immediately follows that “the implication of this is that a truly unified theory of information is impossible, since, whichever of these options is adopted, no satisfactory theory can result”.[6]

Under these observations, let us conclude there are everywhere complex interdependencies (and not layers) in LIS as field of practice and study.

## **The trans-disciplinarity of LIS**

The complexity of LIS, as practice and field of study, is engaging us (because it is related to) in a short discussion about the type of the LIS disciplinarity.

Under this condition, we have, first of all, to consider a clear distinction between multi- (pluri-), inter- and trans-disciplinarity.

There is a clear incomprehension between scientists and the literary and cultural theorists, when discussing about disciplinarity. This is why, as Merja Polvinen observes, “whenever a theory of physics and theories of literature are brought together, it is important to make clear the project’s interdisciplinary position”. With a special focus on this issue, “the research field of

literature and science has featured two major discussions in the last century: the Snow versus Leavis or 'Two Cultures' debate in the 1950s and 60s, and the 'Science Wars' or 'Sokal affair' in the 1990s". Those discussions raised the question: "What ... can be done to avoid the problems caused by such interdisciplinary incomprehension?"

One of the best answers is "Julie Thompson Klein's *Interdisciplinarity: History, Theory and Practice* (1990)", where "the definitions of multidisciplinary, interdisciplinarity and transdisciplinarity depend on the levels of the interaction taking place between disciplines".

Under this philosophy, "multidisciplinary approaches consist in the coming together of scholars from various fields to provide multiple points of view to a particular object or problem. Multidisciplinary approaches leave the methodologies of the individual disciplines more or less intact, whereas truly interdisciplinary work, as Klein proposes, would involve some kind of methodological synthesis between the participating fields of research. Beyond these two cooperative modes Klein sets transdisciplinarity, with its aim for an overarching synthesis, or a larger vision covering several disciplines".[7]

Or, this is the case with LIS, too, where the aim for a synthesis is everywhere.

Even in the sceptical positioning against the trans-disciplinarity of LIS, the tendencies toward a synthesis are strongly present.

Under these circumstances, for some researchers, the question about the disciplinarity of LIS, for example, is another one: "A multidisciplinary, interdisciplinary or monodisciplinary field?"

LIS is viewed as "a field that started as a multidisciplinary field based on literature, psychology, sociology, management, computer science etc., which is developing towards an academic discipline in its own right". From such a perspective, "as a field with its own body of interrelated concepts, techniques, journals, and professional associations, LIS is clearly a discipline", but, in the same time, one will disagree with the idea: "by the nature of its subject matter and methods LIS is just as clearly an interdiscipline, drawing on many adjacent fields".[8]

However, the levels of interaction between the disciplines, seems to be a more appropriate answer, when considering the disciplinarity of LIS, against those claiming that cross-disciplinary research is a process, and not a state or structure – as Emin Tengström is, 3 years after Klein's analysis.

Let us also observe that, under the Digital Era, the information core of LIS has transformed it, both as field of study and as practice, toward a synthesis of the information related issues from all its components.

Indeed, the nature of the information itself is the force securing the trans-disciplinarity of LIS, over any multi- and inter- disciplinarity.

This is why, when considering LIS, we claim, against the "Capurro's advocacy of a conjoined discipline of library" (Bawden & Robinson, 2016), that LIS is not a simple conjoined discipline, but has a strong trans-disciplinary dimension and this is precisely the fact Capuro did not understand when analyzing Floridi's claim of "a close relation between the philosophy of information and LIS" [9].

The trans-disciplinarity of LIS is based on its very complexity, based on information's complexity, as, in LIS, as field of study and practice, we are dealing with interdependencies and not with layers.

## LIS in the Networked Digital Era

As Alex Solk Riba writes, “the role of the library has changed dramatically over the years, with libraries becoming less about books and more about accessing information”. Under these circumstances, a first question could be: “Can the traditional library retain its significance within a community building of the 21st century?”[10]

Indeed, “the advent of new technologies has changed some of our reading habits”. In the same time, “our need for shared, community-centred spaces to find information and connect with others is unlikely to change any time soon”.

It is obvious true that the 315,000 public libraries in the world (from which 3 quarts are in the developing and transitioning countries) “have always been at the heart of the communities they serve”, because they are “accessible and safe spaces, providing access to huge resources of information and knowledge” and “the public library transcends national and cultural boundaries” because “no matter where you are in the world, they are an essential part of creating and maintaining an educated and literate population”.

Moreover, it is also true that “today, public libraries are at a turning point”.

The cause is rooted in the disruptive changes in the “way we access and consume information” in the 21st century, made possible by the asymptotic increase of the use of the new digital technologies in every aspect of our lives. It “presents major challenges and opportunities for public library systems across the world”.

“To survive in the digital age and stay relevant, public libraries need to be brave and innovative. They must embrace both the physical and virtual”. [11]

For LIS professionals, those technologies have challenging and surprising effects.

Challenging, “because people so often identify libraries with physical books, new digital information and communication technologies have spawned speculation whether libraries, as such, are obsolete”. However, libraries “predate books, and, in their modern form, libraries of all kinds – public libraries, research libraries, school libraries, professional libraries – still typically stand at the informational heart of the communities they serve”. Ourdays, “digitization creates new challenges and opportunities, however, forcing libraries to both take on new roles and perform traditional roles in new ways”. [12]

Surprisingly, accepting the evolution of those new technologies (including their applications in LIS as field of study and practice) is almost unpredictable. As Reuven Cohen observed, all those amazing recent technological advancements have been described as the “Age of Surprise” - “a concept originally described by the U.S. Air Force Center for Strategy and Technology at The Air University, as part of a project known as Blue Horizons“.[13]

Considering the increasing importance of the knowledge/information management for ourdays human society, there are more issues to discuss than new digital technologies in librarianship

It is the arrival of the Artificial Intelligence (AI) in the LIS practice and field.

This is why, for other professionals, especially those from the field of the new communication and information technologies, that arrival has merely a positive effect.

“The technology behind virtual assistants like Cortana is about to transform our lives and change the world as we know it. This change will be simultaneously wonderful and horrible. But mostly wonderful”.[14]

Now, the question is: What is happening, in LIS, with the arrival of AI?

## **Intermezzo (a very short one): What is an Artificial Intelligence?**

Grosso modo, the simplest and shortest definition of AI is a Wikipedia type one: “Artificial intelligence (AI) is intelligence exhibited by machines”.

In computer science, there are the "intelligent agents": devices that “mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving””.

Nowadays capabilities classified as AI include “successfully understanding human speech, competing at a high level in strategic game systems” “self-driving cars, intelligent routing in content delivery networks, military simulations, and interpreting complex data”.

Among the central problems of AI research, one will find: “reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects” as well as “general intelligence”. [15]

AGI it is about the creation of non human intelligent and full minds.

“Artificial general intelligence (AGI) is the intelligence of a machine that could successfully perform any intellectual task that a human being can”. It is also referred to as "strong AI", "full AI" or as the ability of a machine to perform "general intelligent action".

Such an artefact, “is required to do the following: reason, use strategy, solve puzzles, and make judgments under uncertainty; represent knowledge, including common sense knowledge; plan; learn; communicate in natural language; and integrate all these skills towards common goals” and also it should have “the ability to sense (e.g. see) and the ability to act (e.g. move and manipulate objects) in the world where intelligent behaviour is to be observed”. Moreover, “this would include an ability to detect and respond to hazard”. [16]

Our days problem is that we have over crossed a limit once considered as unbreakable – the jump from specialized AI to general AI.

We have already created several such AGIs.

The last one is called Nigel, and it is the creation (and the claim) of a Portland-based AI company: “...Kimera Systems insists that is precisely what it has done. It says 'Nigel' is a "breakthrough achievement in artificial intelligence coming decades before most experts predict such AI technology could be ready for commercial deployment””. [17]

Under these circumstances, our question is: What is happening, in LIS, with the arrival of AGI?

## **The arrival of the Artificial General Intelligence in LIS**

Nowadays society is increasingly “centered on information handling, processing, storage and dissemination”, when is developing “hardware and software that can initiate intelligent human behaviour”.

As a field of study, Artificial Intelligence (AI) is “a combination of computer science, psychology, and philosophy.”

Moreover, “experts are convinced that it is now only a matter of time; the present generation will experience the impact and utility of new applications based on artificial intelligence in offices, factories, libraries and homes. This general area of research is known as ‘Artificial Intelligence.’”

In LIS, the most extended AI presence has the appearance of the expert systems.

The application of Expert Systems, facilitating the dialogue “between staff and users, users and database appears quite promising”, as “an Expert System will help the librarian in realizing the need for an improvement in the productivity”. Moreover, a “well programmed Expert System will also improve the quality”.

Among the applications of the Expert Systems in LIS as practice and field of study, one will find such artefacts in Reference Service, Cataloguing, Classification, Indexing, Acquisition.[18]

Another presence of the AI in LIS has the appearance of virtual assistants.

A good example is Cybersphinx, which is A Virtual Assistant Librarian for Libraries.

“Cybersphinx for Libraries is a fully customizable chatbot that works to automate routine and low-level inquiries currently handled by librarians. The virtual assistant librarian is capable of answering questions about library hours, location, special events, etc. It is incapable of performing the functions of a research librarian.

The virtual assistant librarian answers most of your frequently encountered questions. And answers them well.” Yet, “the virtual assistant librarian has a customizable personality”[19].

Very soon, a third, new presence of the AI in LIS will have the appearance of a AGI.

For now, it seems that Nigel, from Kimera, will be among the very first AGI, ready for human users interacting in a natural language.

“As an artificial general intelligence technology, Nigel represents a new approach that fuses together a broad range of hard and soft sensor data, achieving moment-to-moment contextual awareness that allows Nigel to learn and apply what it understands to real-world situations. Rather than a centralized “brain” or knowledge bank, Nigel learns through an ever-growing neural network with nodes that can extend to any type of connected device. As more people use Nigel-enabled apps and devices, its understanding of concepts accelerates, allowing the technology to recognize user needs based on location, calendar and contact entries, time of day, environments, and more”.[20]

From all those perspectives, considering the trans-disciplinary nature of LIS, as field of study and practice, under the collision with the Artificial Intelligence, the real challenge for the librarians is, nowadays: “Why do we still need libraries in this Networked Digital Age?”

### **Why do we need libraries in the Networked Digital Age of AGI?**

We are dealing with the increasing infusion of and merging with, the Artificial Intelligences in our very way of living and being as Humans.

“Now AI is increasingly slipping into everyday life for the general public, not just movie and novel plots. Siri is perhaps the most famous AI application, but there are many more (...) For example, Siri learns from the users’ individual speech pattern.”

Those non-human artifacted intelligences are learning from, with and for us how we are accessing, using and sharing the information, in our profound need of sense and order under the Information and Programming Turn we have to deal with.

Libraries are the perfect playground for such an existential game.

“With many AI applications focused on delivering information to the user, on face, it can appear that AI is a challenge to libraries. In some ways it is. If Siri can tell me the tallest building in the world, I don’t need to visit my local library. Google Maps can quickly re-route me when

I'm in an unfamiliar city and encounter construction. In this circumstance I don't need to consult a print map or atlas.”

“What AI gives libraries is the opportunity to shift focus. The way we navigate the information architecture is changing. AI gives us useful shortcuts to apply this knowledge and produce better outcomes. Libraries focus on access to content and application of knowledge. We already see evidence of this shift toward application with many libraries developing MakerSpace capabilities. These organizations are positioning themselves to take advantage of technological tools by fostering their use.”

“Additionally, what is lacking is the human connection. Inherent in AI's name is that the intelligence is artificial, not human.”

“Libraries can connect people to information and, more importantly, to other people”.[21]

When an Artificial Mind / Artificial Intelligence is interacting and learning from, with and for the Human Minds, it is about a network of Intelligences working, under the Collective Wisdom, with and for the Human Souls for a better world.

This is a new confirmation of the truth that “Libraries are forever” means “Humankind is forever in the librarianship”.

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