digitcult
@Scientific Journal
on Digital Cultures

Vol 1, No 1 (2016)

Scientific Community on Digital Society [special issue]

DigitiCult | Scientific Journal on Digital Cultures
ISSN 2531-5994
ISBN 978-88-548-9602-4
Anno 2016
Vol 1, No 1
1 edizione: maggio 2016

Publisher

Aracne editrice
www.aracneeditrice.it
info@aracneeditrice.it

Gioacchino Onorati editore S.r.l. – unipersonale
www.gioacchinoonoratieditore.it
info@gioacchinoonoratieditore.it

via Sotto le mura, 54
00020 Canterano (RM)
(06) 93781065

digitcult
@Scientific Journal
on Digital Cultures

DigitCult

Scientific Journal on Digital Cultures

Scientific Community on Digital Society [special issue]
Vol 1, No 1 (2016)

digitcult
@Scientific Journal on Digital Cultures

Scientific Community on Digital Society [special issue]
Vol 1, No 1 (2016)

Table of Contents

Provocations and Dialogues

DigitCult | Scientific Journal on Digital Cultures

Editorial

Scientific Community on Digital Society

Mario Ricciardi
Dipartimento TECOS – Technologies,
Communication and Society
Università degli Studi Guglielmo Marconi,
Via Plinio 44, Roma, Italy

Published 11 May 2016

Correspondence should be addressed to Mario Ricciardi, Dipartimento TECOS – Technologies, Communication and Society, Università degli Studi Guglielmo Marconi, Via Plinio 44, Roma, Italy. Email: m.ricciardi@unimarconi.it

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

 DOI:10.4399/97888548960241

Digital Cultures

Our field of research deals with the interaction between CULTURAL ELABORATION AND REAL PROCESSES. We know how to use a continuous idea that is seamlessly in line with both the recent past and the prevailing dynamics that historically characterize our present society (i.e. the European society). On the contrary, we can use an idea of rupture that emphasizes profound changes: a real change of civilizations, an irreversible, general turning point, an unquestionable revolution with new players and new leading forces.

DigitCult aims to define the field of digital cultures by facing the key categories that are widespread today while still maintaining a close link between cultural elaboration and real processes, between specialist research and the spreading of relevant information.

Our purpose: RE-BUILD A MAP and A CONSTELLATION OF MEANINGS AND BELIEFS IN A PROCESS OF SHARING AND CULTURAL AND SCIENTIFIC COOPERATION.

We match: forms of self-representation with the role of a scientific community (that we would like to be).

This means starting an in-depth debate that is able to distinguish and interpret the circulation of information and ideas from real, visible, or latent processes. Distinguishing stands for ensuring that extra-scientific components do not prevail over scientific ones: the market, finances and digital communication can obscure the scientific and cultural origins of existing processes and endanger the modern structures devoted to these tasks (school, university, research, intellectual élites). A crucial transition is the crossroads between digitized information and digitized media (big media and on-hand media).

DigitCult sets out to counter this trend and to re-enable the role of scientific knowledge concerning values such as common and shared intelligence, based on research and cultural elaboration.

The digital field is the research horizon for both the systemic analysis involving society, economy, rights as well as the core analysis of personal behaviours and new *social relationships that are being multiplied in a disorderly manner*.

Science and Scientific Community

Paradigm Shift

Kuhn shows how every scientific revolution has been marked by a new language, a paradigm shift. In *The Structure of Scientific Revolutions* (1962), he explains what he means by the term paradigm:

> «Attempting to discover the source of that difference led me to recognize the role in scientific research of what I have since called “paradigms”. These I take to be universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners». (Kuhn 1962)

A paradigm is a composite structure made up by beliefs (ideologies, opinions) as well as scientific models. It is a set of principles, cultural and scientific conceptions, methodological proceedings, and methods of communication which influences and activates the “scientific community” of a given era. A paradigm is closely related to extra-scientific factors, such as social and psychological.

DigitCult sets out to be A SCIENTIFIC COMMUNITY and to be part of a network of recognized scientific communities. We intend to verify if the core of digital culture has the power to create an extraordinary scientific community – an innovative one, according to Kuhn – and thus be the framework of a paradigm shift. We are suggesting not a means to defend digital technology, but rather a cultural elaboration that springs from existing processes and competes with them. We propose a critical and self-governing viewpoint that analyses the origins and the formation of a worldwide field that is dominated by the rapid spreading of digital technologies.

These processes have been defined as globalization, but globalization in itself does not have a true scientific revolution behind it, or if it did, it has betrayed it by letting power and/or market interests prevail over it and it has portrayed a false image of an equal and enriched world with the free circulation of capital ideas and opportunities for mankind. On the contrary, the contradictions of this vision are evident today: the world is not as flat and equal as it may have appeared.

Examples

The number of Internet users worldwide has more than tripled over the past decade (2005-2015), from 1 billion to over 3.2 billion. 4.2 billion people worldwide are still without Internet. According to the latest World Bank report, being connected still remains an asset reserved for the more well-off, but...

Seven out of ten families of the poorest 20 percent of the population on the globe has a mobile phone. “For these families it is easier to have a mobile phone at their disposal than a toilet or clean water” said Jim Yong Kim, President of the World Bank.

A post of Mark Zuckerberg on August 24, 2015 announces: Facebook record, 1 billion people in one day. “1 in 7 people on Earth used Facebook to connect with their friends and family today.” […] “This is just the beginning of connecting the whole world.” […] “A more open and connected world is a better world.” – he writes – “It brings a stronger economy with more opportunities, and a stronger society that reflects everyone’s values.” [1] And then “one of the greatest challenges of our generation” is to connect the next 5 billion people.

But Bill Gates objects to Mark: “THE INTERNET BY ITSELF IS NOT GOING TO SAVE THE WORLD”[2]

“What is more important, global connectivity or finding a vaccination for malaria?” Gates ironically asks the journalist Richard Waters (Financial Times) – “If you think connectivity is the key thing, that’s great. I don’t.” – and carries on – “I certainly love the IT thing, but when we want to improve lives, you’ve got to deal with more basic things like child survival, child nutrition”.

Internet economy and economy of individuals and peoples:

> “3.6 billion people – half of the world’s population – have had their wealth reduced by a trillion dollars since 2010: a drop of 41%, despite the fact that the global population has increased by around 400 million people during that same period. **The wealth of the richest 62% has instead increased by more than 500 billion dollars**, up to a total of 1.760 billion dollars. The report also shows how women are often disproportionately affected by inequality (even among the richest 62%, only nine are women).”[3]

Oxfam reports that this gap between the richest and the rest “has widened dramatically in the past 12 months”, so much so that the prediction that “**the 1% would own more than the remaining 99% by 2016**” came true a year earlier than expected. Even **in Italy**,

> “the data on the national wealth distribution of 2015 show how **the richest 1% of Italians owns 23.4%** of the net national wealth, a share that in absolute value is equal to 39 times the wealth of the poorest 20%.”

If the paradigm shift consists in the fact that digital technology is a force that is reshaping the present society, we must consider that “reshaping” is not neutral word. It can mean the destruction of resources or new opportunities, global spreading of information or control over districts without any opposition.

---

[1] Mark Zuckerberg’s post is available at the following URL: https://www.facebook.com/zuck/posts/10102329188394581, Accessed May 10, 2016

[2] Waters, Richard. “An Exclusive Interview with Bill Gates”, Financial Times, November 1, 2013 available at http://www.ft.com/cms/s/2/dacd1f84-41bf-11e3-b064-00144feabdc0.html, Accessed May 09, 2016

[3] Oxfam Brefing Paper is available at the following URL: https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/bp210-economy-one-percent-tax-havens-180116-en_0.pdf. Accessed May 10, 2016.

 DOI:10.4399/97888548960241

Scientific Approach and Biases

The scientific approach in the digital society needs circulation; it lives inside the media and the networks of connections (global and personal) but it can and must express an independent point of view.

Biases were widespread consensus, often representing views with a low scientific value; in the twentieth century, the common opinion depended on the character of mass communications governed by advertisements that aimed to create equal opinions so as to ease the purchase of series products. Today a bias is made up by the circulation of a name (*brand*) and by behaviours and habits coming out of the scientific world or experimental laboratories and that increasingly enter in the daily life of a large number of people all over the world. Thus the category (or myth) of the absolute value of CIRCULATION assumes a great relevance.

We can distinguish between spreading (from the centre across the media, towards the recipients, a typical movement of mass communications) and circulation (participated and allusive to a dissemination that does not necessarily have at its centre authority, and therefore control). In this vision, a profound and disruptive value is entrusted to culture and technology, which are at the foundation of Internet. It is a paradigm shift. The technology of the web maintains its original "equal" spirit throughout the various steps. However, the limitation of this approach is the automatic reduction of the future to the only positive attributes of circulation. The dynamics of what is latent remain in the shadows; a flat vision generated by the optimism of the quasi-biological positivity of circulation ends up prevailing. Instead, we are surrounded by telluric landscapes with underground tenacity and then eruptions of unknown worlds (individual and people's instincts, passions, emotions, expressions). In the following we present some examples.

Example 1. Turing: The Imitation Game

When Turing asks himself the fundamental question: "Can machines think?", to avoid the risk of having to accept Gallup poll results (!!), and therefore admit the triumph of the bias, he chooses the outflanking strategy.

> "I propose to consider the question "Can machines think?" This should begin with definitions of the meaning of the terms "machine" and "think." The definitions might be framed so as to reflect so far as possible the **normal** use of the words, but this attitude is dangerous. If the meaning of the words "machine" and "think" are to be found by examining **how they are commonly used** it is difficult to escape the conclusion that the meaning and the answer to the question "Can machines think?" is to be sought in a **statistical survey such as a Gallup poll**. But this is **absurd**. Instead of attempting such a definition I **shall replace** the question by another, which is closely related to it and is expressed in relatively unambiguous words. The new form of the problem can be described in terms of a game which we call the "imitation game[4]" (Turing 1950, 433)

Example 2. Bourdieu: Public Opinion Does Not Exist

The public sphere, according to Bourdieu (Bourdieu 1979), cannot be reduced to the visibility (Thompson 1995) determined by polls and percentages, and based on a sample of citizens who accepts it. This creates a field not made of human relationships but one that is increasingly characterized by the dynamics of mass media and the combination of it with communication technologies and networks.

Bourdieu, on the contrary, endorses the role of «interested minorities»: the more interest people may have about a certain issue (i.e., the closer the issue hits to home), the more opinions there will be about that issue.

Bourdieu chooses the argumentative strategy of presenting three hypotheses (in order to negate them and prove their groundlessness).

Can a scientific community be considered an interested minority?

[4] In this way Turing introduces *Game theory* to the scientific field.

Example 3. If It Doesn't Spread, It's Dead

This is a slogan that intends to mark the transition from the SOCIETY OF MASS COMMUNICATIONS to the DIGITAL SOCIETY, but it instead represents the shifting towards the myth of circulation and spreadability.

"If it doesn't spread, it's dead"!!! is a hard statement because it puts the entire value of something onto an immaterial entrustment that, however, is still not efficient within a material economy. Spreadability is the quality that Jenkins attributes to the contents that are predominantly circulating on the web (Jenkins, Ford, Green 2013). Public and private are mixed together, as well as private and common interests and values on a unique surface.

Mythology of the Algorithm

Polls present ideas as data: opinions are data, so they can be treated as data. The mechanism of polls uses models of information data processing and depends on the build-up of large databases of information data. Data are the database cells – according to the database logic of Manovich (2001) – but ideas are **products** of human beings that are connected to each other and belong to one of the crucial fields for democracy and the rights of citizenship.

The fortune and the spreading of algorithm logic is an example of permeability between scientific processing and dissemination of biases: algorithm practice is also related to the manufacturing of widespread stereotypes. Digital **information** is crucial in molding the opinions that are spread by media that in turn can manipulate and submerge the real nature of the information datum and the distinct conditions used in its production: the information datum is itself a product as well. FLAT DATA generate a flat representation of reality because it can be spread easily, without resistance, and can be global.

NETWORKS OF NUMBERS AND NETWORKS OF PEOPLE are created, but PEOPLE CAN BE TRANSFORMED IN NUMBERS, NUMBERS CANNOT BE TRANSFORMED IN PEOPLE.

The algorithm is directly entailed (often in an opaque way) to constitute a form of digital intellect founded on sharing and collaboration.

Today, we can ask ourselves what holds a scientific community together and – for us at DigitCult – what role collaborative networks, public and private connection systems, can take on. Our idea of scientific community and community of culture is founded on data sharing and mutual collaboration, determined by connections, networks and their underlying technologies, but we consider equally important the direct interaction among the participants of the project and with the audience to which DigitCult is addressed.

Examples

Wikipedia arises as a cultural community based on digital technologies, symbol of a new digital culture founded on the spreading of "equal" and "transparent" information and contacts that refer to the entire digital population. Wikipedia, according to Federico Cairo, is founded on a "semantic deal":

> "The Wikipedia system is the result of a "semantic agreement" of Internet users that give a unique concept to each entry." (Cairo 2013)

The community of Wikipedia carefully takes into account the issues concerning the disambiguation of entries, because they are one of the main prerequisites for its operation.

The proper features of Wikipedia, its origins and its current configuration draw a line of separation between the development of communities at the time of mass media and the communities founded on networks, on connections and digital technologies. The collaboration in Wikipedia recalls an idea of the Nineties of the last century. This idea is based on the positive value of collective intelligence and collaborative intelligence. According to Cairo, it is even more important that the semantics of the entries of Wikipedia is not an order carried out from above, but it rather springs from the spontaneous desire of non-professionals or experts. The Internet users themselves **agree** with each other on the meanings of the concepts they use on the Internet. The compliance of Wikipedia with the real world is of secondary importance; the web

 DOI:10.4399/97888548960241

universe could be completely self-referential, but Wikipedia is in any case the most eligible tool for the systematization of the knowledge contained in it, which culturally establishes a self-sufficient and independent digital republic. The semantic deal is a model for building forms of high value consensus scientific knowledge based on some ideological assumptions determined by technology and the digital culture. And this area is definitely innovative for collaborators and users.

In 2002, Yochai Benkler in *Coase's Penguin, or Linux and The Nature of the Firm* indicates Wikipedia as a collaborative culture model and defines it as a "common-based peer production." (Benkler 2002)

James Surowiecki considers the Google search engine as a case of collective intelligence (Surowiecki 2004). Google is based on an algorithm called PageRank and, according to Surowiecki, the results of this algorithm come from the collective intelligence of the web, which operates in the background to make certain pages emerge while hiding others. The algorithm has the power to reveal a form of intelligence that would otherwise remain unexpressed. The objective of Surowiecki is the negation of the interactional and communicative component of collective intelligence.

On the contrary, many researchers argue that collaboration, and especially cooperation, can only be expressed through an explicit contact, a public dialogue and by sharing resources and results expressed in a community form by citizens. Collective intelligence and collaborative intelligence are closely related. According to Pierre Lévy, collective intelligence

> "is a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills. I'll add the following indispensable characteristic to this definition: The basis and goal of collective intelligence is mutual recognition and enrichment of individuals rather than the cult of fetishized or hypostatized communities." (Lévy 1997, 13)

Thus, collaborative culture means a set of assumptions, values, meanings and actions that pertain to working together in a community. Communities based on a principle of collaboration have low entry barriers and a weak hierarchical structure: therefore, they favour horizontal relationships among individual members, peer exchanges and sharing of meanings, experiences and skills. The collaborative culture is a crucial element for the establishment of scientific communities in the digital society.

Technological Revolution

Different categories and expressions have been used for representing THE DIGITAL AS A FRONTIER OR A NEW FRONTIER. One of the most common ones is that of the technological revolution or digital revolution, but **to what extent can the current idea of technological revolution be considered scientific?** It is simply a bias if the decisive forces, players, and individuals characterizing it are not identified!

Our Point of View

The centrality of digital technologies is a paradigm shift that removes the material and intellectual foundations of the old paradigm. Ordinary science and the scientific community have proved to be powerless or one-sided in its mission and, above all, have not been able to develop visions that included "revolutions" beyond the traditional way of thinking, and therefore extract forces of renewal and destruction – both globally and locally – by this "otherness".

The Consequences

A common and scientifically founded vision is missing. The current driving forces are external to élites and scientific communities and impose aggressive policies which aim to disintermediate roles and recognized social functions, including the marginalization of the scientific and cultural élites themselves (the end of the European "model" created during the Enlightenment; the end of the primacy of the best or of the scholars).

New and inconceivable scenarios that elude all known paradigms are in front of us. The technological revolution is an earthquake wiping out cultures and societies without making room for the emergence of new cultural paradigms. This technological revolution has no cultural elaboration; it is dominated by conflict: technology versus culture. A radical problem of identity and cultural and social cohesion is therefore opening up.

The search of a new paradigm (cultural elaboration in comparison with real processes) that includes the role of digital technologies at the foundation of the establishment of the twenty-first century society: this is our ambitious task.

Examples

The Technological Revolution as a Revolution of Civilizations: The Birth of a New Era.

Manuel Castells, *The Information Age trilogy*, 1996-1998 – The technological revolution reshapes the material basis of society through information technologies.

Jeremy Rifkin, *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post-Market Era*, 1995.

Jeremy Rifkin, *The Age of Access: The New Culture of Hypercapitalism, Where All of Life is a Paid-For Experience*, 2000 – L'era dell'accesso, La rivoluzione della new economy is the title of the Italian edition published by Oscar Mondadori (2000). The intellectual capital is the driving force. In the era of new economy, ideas, concepts, and images – not things – are the fundamental elements of value. In the new network economy, it is more likely that access to physical and intellectual property will be negotiated rather than exchanged.

Jeremy Rifkin, *How the Third Industrial Revolution Will Create a Green Economy*, The Huffington Post 10/20/2015 | Updated Nov 10, 2015

Digital Rights, the Right to Information

Cognitive Revolution

Sebastiano Bagnara, *Centralità dell'interfaccia: la rivoluzione cognitiva*, 2005 - A revolution that sees the strong "overtaking" of computing over mechanics (Bagnara 2005).

The Technological Revolution as a Revolution of Civilizations

Eric Alfred Havelock, The Literate Revolution in Greece and its Cultural Consequences, 1981.

Eric Alfred Havelock, The Muse Learns to Write: Reflections on Orality and Literacy from Antiquity to the Present, 1986.

Walter Ong, Orality and Literacy: The Technologizing of the Word, 1982.

Jack Goody, The Domestication of the savage mind, 1977.

—•—

Among the historians: Elizabeth Eisenstein, *The Printing Press as an Agent of Change*, 1979 – Eisenstein's book lays out her thoughts on the “Unacknowledged Revolution,” her name for the revolution that occurred after the invention of print. Print media allowed the general public to have access to books and knowledge that had not been available to them before; this led to the growth of public knowledge and individual thought.

—•—

And before everyone else... Marshall McLuhan, The Gutenberg Galaxy: The Making of Typographic Man, 1962 - “Technological environments are not merely passive containers of people but are active processes that reshape people and other technologies alike.”

 DOI:10.4399/97888548960241

References

Bagnara, Sebastiano. “Verso una società troppo informata?” In AA.VV., *Scenari del XXI secolo*, Torino: Utet, 2005.

Benkler, Yochai. “Coase's Penguin, or Linux and The Nature of the Firm.” *The Yale Law Journal* 112.3 (2002): 429. New Haven, Connecticut: Yale University Press, 2002.

Bourdieu, Pierre. “Public opinion does not exist.” *Communication and class struggle* 1 (1979): 124-130. New York: International General,1979.

Cairo, Federico. *Un approccio basato su DBpedia per la sistematizzazione della conoscenza sul Web*. PhD diss., Politecnico di Torino, 2013.

Castells, Manuel. *The Information Age: Economy, Society and Culture*. Oxford: Wiley Blackwell, 2010.

Eisenstein, Elizabeth. *The Printing Press as an Agent of Change: Communications and Cultural Transformations in Early Modern Europe*. Cambridge, UK: Cambridge University Press, 1979.

Goody, Jack. *The Domestication of the Savage Mind*. Cambridge, UK: Cambridge University Press, 1977.

Jenkins, Henry, Sam Ford, and Joshua Green. *Spreadable Media: Creating Value and Meaning in a Networked Culture*. New York: New York University Press, 2013.

Havelock, Eric Alfred. *The Literate Revolution in Greece and its Cultural Consequences*. Princeton, NJ: Princeton University Press, 1981.

Havelock, Eric Alfred. *The Muse Learns to Write: Reflections on Orality and Literacy from Antiquity to the Present*. New Haven: Yale University Press, 1986.

Kuhn, Thomas Samuel. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press, 1962.

Lévy, Pierre. *Collective Intelligence: Mankind's Emerging World in Cyberspace*. Cambridge, MA: Perseus Books, 1997 (originally published as *L’Intelligence collective. Pour une anthropologie du cyberespace*, Paris: La Découverte, 1994).

Manovich, Lev. *The Language of New Media*. Cambridge: MIT Press, 2001.

McLuhan, Marshall. *The Gutenberg Galaxy: The Making of Typographic Man*. Toronto: University of Toronto Press, 1962.

Ong, Walter. *Orality and Literacy: The Technologizing of the Word*. New York: Methuen, 1982.

Rifkin, Jeremy. “How the Third Industrial Revolution Will Create a Green Economy.” *The Huffington Post* 10/20/2015 | Updated Nov 10, 2015. Accessed May 09, 2016. Available at http://www.huffingtonpost.com/jeremy-rifkin/third-industrial-revolution-green-economy_b_8286142.html

Rifkin, Jeremy. *The Age of Access: The New Culture of Hypercapitalism, Where All of Life is a Paid-For Experience*. New York: Putnam, 2000.

Rifkin, Jeremy. *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post–Market Era*. New York: Putnam, 1995.

Surowiecki James, *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations*. NewYork: Doubleday - Random House, 2004.

Thompson, John B. *The Media and Modernity: A Social Theory of the Media*. Stanford: Stanford University Press, 1995.

Turing, Alan M. "Computing machinery and intelligence." *Mind* 59.236 (October 1950): 433–460.

DigitCult | Scientific Journal on Digital Cultures

Cultural Heritage and ICT: State of the Art and Perspectives

Goffredo Haus
LIM – Laboratorio di Informatica Musicale
Dipartimento di Informatica
Università degli Studi di Milano, Italy

Abstract

This paper tries to outline the evolution of the role of ICT with respect to Cultural Heritage showing how, starting from the first digitization projects, ICT has gradually become the major driving force for both preserving and exploiting Cultural Heritage. Specifically, the key role of advances in automatic recognition within texts and multimedia information are considered.

Published 11 May 2016

Correspondence should be addressed to Goffredo Haus, LIM – Laboratorio di Informatica Musicale, Dipartimento di Informatica, Università degli Studi di Milano, Milan, Italy. Email: goffredo.haus@unimi.it

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

 DOI:10.4399/97888548960242

Introduction

Information and Communication Technologies (ICT) have been giving a growing support to Cultural Heritage (CH) preservation and exploitation for many years.

In a first moment the focus was on the cataloguing of CH and related metadata, transferring paper cataloguing cards into the corresponding digital metadata, then on the digitization of documents and multimedia objects such as photos and audiovisual recordings.

More recent developments of ICT provide us with the possibility to enrich and augment the original preserved information, in order to make it easier to retrieve and explore such information.

Digital Acquisition and Preservation

CH digitization campaigns has four main goals:

- the preservation of CH information;
- the preservation of the original media carrying CH information;
- the management of CH information;
- the exploitation of CH information.

The first step is anyway the acquisition in the digital domain of CH information, a process often referred to as *digitization* (Lynch 2002, 131-145; Noerr, 2003).

Digital Acquisition

We have to distinguish between information that can be dematerialized and then resynthesized, and information that cannot, either for physical reasons (e.g., 3-D objects) or logical reasons (e.g., intangible information).

Audio tracks, photos, and video tracks belong to the former kind of materials; they can be completely dematerialized and then resynthesized as the original.

From this point of view, handwritten and printed documents are similar to the mentioned materials, but only if we consider them as “images” to be digitized, neglecting their physicality (Coyle 2006, 641-645; Lopatin 2006, 273-289). In fact, it is not allowed to synthesize for instance the specific kind of paper of the originals documents.

3-D Objects can be rendered in the digital domain through 2-D digital images. Furthermore, a limited number of 2-D images allows 3-D modelling software to represent a 3-D object as a virtual object that can be rotated and observed from any point of view; but there is still no device able to physically resynthesize a faithful copy of the original 3-D object. Recent technologies – such as 3-D printing – are likely to be improved in the near future, going beyond the current limits with respect to the kind of materials 3-D printers are able to process.

A special case concerns the acquisition of information from native digital media, which could occur to migrate from a media to a new one, due to the obsolescence of the media, the need to preserve its contents, etc.

In this case, the most relevant question concerns the state of conservation of the original digital media, and the possible related need for rescuing it by suitable restoring processes (applied to the media, leaving the information contents as they are).

Digitization projects have historically contributed to the rescue of CH. In this context, it is worth mentioning some important issues:

- The cataloguing of CH must be carried out before or simultaneously with digitizing activities: it is not possible to digitize at best before knowing what has to be digitized;
- While fiddling with original cultural assets, often it happens to identify which objects require pre-restoring actions – such as heat treatment for magnetic media – before their digitization;

- Lacks of metadata, as well as cataloguing errors, could emerge from digitization activities. A real-life example is the discovering of music encores performed at Bolshoi and La Scala theatres: the original fliers did not contain any information about them, but they were included in audiovisual recordings and discovered only during media digitization (Haus and Pelegrin Pajuelo 2001, 381-388);

- Digital objects allow the preservation of the physical integrity of the corresponding original objects. For example, it is possible to consult the content of an ancient papyrus without any physical contact. In this way, digital objects significantly increase also the life expectation of physical objects.

Metadata & Indexing

Cataloguing and digitization are generally considered as parallel activities, both originating their own metadata.

Digital archives contain both metadata and the related digital objects. This can be implement in three different ways:

- Leaving cataloguing results in archives constituted by metadata only, i.e. separated from the related multimedia files;

- Implementing DBMS (Data Base Management System) instances which contain only metadata and integrating them with external multimedia files, generally by means of additional XML files in some standard format, such as MPEG7 or MAG files;

- Implementing MMDBMS (multimedia DBMS) instances which fully integrate metadata and related multimedia files. One of the first commercially available solution of this kind was developed by Oracle Corp. in the late 90s.

But, while a good MMDBMS solution could be fully satisfactory for preserving purposes, additional information is needed to improve information retrieval of CH metadata and related digital objects within MMDBMS instances. These kinds of entities should be both enriched through ad hoc relationships, either physical or semantic.

Early approaches were substantially based on hand-made integrations of additional information. Now the key improvement to make this approach effective and economically viable is the automation of the discovering of additional information. The most relevant advances of ICT are going in this direction.

Recent developments let us enrich MMDBMSs by:

- Relational data schema, coming from the analysis and design of DBMSs (Baca 2003, 47-55);

- Metadata tags, coming from taxonomies built up during the cataloguing process;

- Multimedia tags, coming from the manual and/or automatic recognition and indexing of multimedia contents.

Sounds, images, videos, and any other kind of multimedia objects could be classified according to their physical and semantic attributes. For example, in (Jaimes et al, 1999) a pyramidal structure of 10 indexing levels is considered for classifying images: 4 physical levels (type/technique, global distribution, local structure, global composition) and 6 semantic levels (generic object, generic scene, specific object, specific scene, abstract object, abstract scene). This framework integrates metadata with their digital objects by means of all the attributes belonging to the 10 indexing levels, making images distinguishable according to any combination of indexes, ranging from the lowest level (the kind of physical type/technique, i.e. the digital representation of colors) to the highest one (the abstract scene).

All these innovations, and particularly automatic multimedia tagging, strongly improve the retrieval, management, navigation, and exploitation of CH information.

Digital Platforms

Specific architectures for CH information systems must be considered to handle large CH archives, carefully distinguishing between preservation and exploitation needs.

Generally, a CH metadata archive is not too large; hypothetically, we can consider some thousands of data bytes per CH digital object. Then, we can consider as large metadata archives those having some millions digital objects inside, thus the corresponding storage dimension could be of some terabytes approx.

Multimedia CH archives are typically larger, at least 3 or 4 orders of magnitude. They are really “big data”, even if such a notion is dynamic: in the beginning – i.e. few years ago – some terabytes were considered big data, whereas today big data archives take up at least petabytes, more frequently exabytes, or even zettabytes. Since an ultra-high-definition video file (4K or 8K UHD) could be some terabytes large, CH digital archives requiring these space occupations are not uncommon.

Similar considerations can be done for images (with a roughly quadratic dimension growth as the quality increases) and audios (with a roughly linear dimension growth as the quality increases).

Therefore, a big amount of mass storage is needed to preserve CH multimedia archives, also because data formats for preservation should guarantee high quality and present no compression or a lossless compression. But the requirements of CH multimedia archives do not concern only the amount of mass-storage (Conway 2010; Crane 2002, 626-637; Haus and Ludovico 2006, 92-97); some additional aspects have to be considered, such as:

- The choice of the mass-storage solutions that assure the best life expectancy of archives: magnetic discs, magnetic tapes, optical discs, solid state drives, etc., or even a combination of them;
- The number of digital copies to produce, the more suitable memory technology for each copy, the logistic distribution of copies;
- The environmental conditions of archives;
- The system architecture for the exploitation;
- The performance tuning of the exploiting system, generally based on the expected number of clients and the desired response time;
- The choice of the MMDBMS and software applications to use, custom-made or already available;
- The level of adhesion to standards, in any component of the system architecture: cataloguing metadata, technical metadata, interoperability metadata, symbolic data, MM data, digital files, digital rights management, and integration formats;
- Digital monitoring, which implies controls on digital media to understand when refreshing, migrating, duplicating, or emulating actions are required to preserve information integrity.

A pragmatic suggestion could be to consider a solution as reliable when it is the most commonly adopted in the international context, as it regards the kind of media, media players, standards, formats: a large number of installations guarantees a better life expectation.

The question of security is multifaceted and must be considered too: accesses to archives by external visitors, technical staff, and managers have to be protected from unwanted actions, so proper user profiling policies must be defined and applied; moreover, data must be protected from intrusions, both in mass-storage and telecommunication devices, and in this sense encrypting technologies are commonly considered a good way to protect data flows.

A basic idea is that good exploiting policies can give a decisive contribution to get the resources needed for preserving CH. This is the reason why some CH archives are not free, rather they are used to generate economical revenues from CH, especially when CH is in the digital domain. When the economical front is opened, IP (Intellectual Property) has to be managed through DRM (Digital Rights Management) technologies: for sales/purchases,

allocation of rights, taxes, and so on.

Digital CH owners are increasingly interested in avoiding unauthorized content copies, virtually identical to the originals, that could be easily created and distributed, preventing right holders to collect their profits. The two most common remedies consist in downgrading the quality of the digital copies for exploitation – which are generated from the top-quality digital objects stored for preservation - and the protection of digital contents by DRM technologies. In order to prevent copyright infringements, a DRM system is a system of ICT components and services along with corresponding laws, policies and business models which strive to distribute and control intellectual property and its rights.

DRM systems implement two main functions: the management of the rights, assets, parties and licenses, and the processing of protecting functionalities, such as cryptography, watermarking and fingerprinting techniques are usually adopted to ensure either secure content identification, packaging and distribution, or copyright-infringement tracking and monitoring (Ku and Chi 2004, 391-403).

An advanced model for the management and protection of digital contents is described in (Ludovico et al. 2015, 10.1109/MMUL.2015.92). In this paper, multimedia CH information is modelled at different - but integrated and synchronized - levels of representation, i.e. by a multilayer approach based on a new concept – the *synchronization right* – that can be applied to any kind of timed multimedia information.

A further relevant topic is about accessibility, i.e. how “to lead the Web to its full potential to be accessible, enabling people with disabilities to participate equally on the Web” as it is defined and supported by the W3C WAI (Web Accessibility Initiative).

Finally, a large scientific literature is available about standards and recommended practices concerning how to do cataloguing, pre-restoring, digitizing, coding, indexing, organizing, preserving, downgrading, distributing, protecting, exploiting activities. From this point of view, it is worth mentioning the MPEG experience (Pereira and Ebrahimi 2002), and its main steps:

- MPEG-1 ISO/IEC11172 (1993), MPEG-2 ISO/IEC13818 (1995), and MPEG-4 ISO/IEC14496 (1999), concerning multimedia coding technologies;
- MPEG-7 ISO/IEC15938 (2002), concerning multimedia content description interface, i.e. indexing and tagging;
- MPEG-21 ISO/IEC21000 (2001), concerning IP management and protection.

Digital platforms consist in all this, and much more.

Exploiting Cultural Heritage by ICT

While acquisition and preservation in the digital domain are well acknowledged and established processes for CH, a more dynamic context concerns the exploitation of CH (Arnold and Geser 2008). Exploitation is gaining increasing importance for both dissemination and improvement of the economic resources for CH. A virtuous circle will, hopefully, happen so that revenues from exploitation will support preserving costs for CH.

It is very timely to consider a portfolio of relevant opportunities such as exploiting CH by means of digital communication channels, publishing campaigns that combine traditional and digital media, implementing integrated CH information environments based on the systematic application of standards for the sake of interoperability among digital archives.

Traditional and Electronic Publishing

All 2D digitized objects – such as text documents and images – can be considered for both traditional and electronic publishing media. So, a complete integration of publishing products could involve printed paper, optical discs (CD-ROM, DVD-ROM, BD-ROM), and web sites.

All digitized objects – including audio and video tracks too – can be considered for electronic publishing media. So, further integration of publishing products could be considered for optical discs and web sites only.

Furthermore, publishers have already begun to produce virtual CH products, i.e. publishing products only available in the web domain, without any physical media for the distribution of CH

information, such as textual and multimedia files, interactive applications, digital archives and portals, etc.

One of the most explored publishing products subject to technological evolution is the book, with many examples of integrated traditional/electronic vs. web-based trade policies.

Exploiting CH on the Web and Mobile Devices

A further relevant topic concerns special characteristics of CH exploitation by combining the web and mobile devices. Mobile devices are more pervasive than laptop and desktop computers, thus they must be considered as fundamental instruments for exploitation. However, user experience changes noticeably with so different technical characteristics, e.g. regarding screen size and interface controls. Publishing digital contents on mobile devices requires a great design effort, above all for visual elements.

Combining the web and mobile devices can result in relevant improvements to the distribution and integration of digital contents, also for communication purposes. Many web sites of both institutions – e.g. La Scala theatre – and companies – e.g. publishers of newspapers and periodicals – can be cited as examples.

A special field of interest for further developments concerns the use of geo-referenced information systems, e.g. the integration of maps in browser and mobile applications, because spatial information can support and enrich the virtual navigation of CH digital representation models (Baus 2005. 193-209).

Mobile devices could even improve the way digital services are provided, for example by means of licensing policies based on user-tailored customization of the service itself (Haugstvedt and Krogstie 2012).

Interoperability

A key to success is certainly to invest in interoperability of CH digital archives. Interoperability implies that the owners of different CH archives agree to join their digital contents, so that users can navigate multiple archives transparently as a single, larger one. For example, let us mention the complete production of a great painter: probably his paintings are exhibited in a number of different museums and art galleries, but they could be experienced in a single virtual gallery thanks to the interoperability among institutions' archives. A similar example in the music field is the corpus of works referring to a composer, i.e. handwritten and printed music scores, audio and video recordings of relevant performances, iconography, musicological studies, books, and so on.

Interoperability is the only way to achieve synergy among digital archives, so that owners of CH goods can improve dissemination of their contents, and – on the other side – users can take advantage from enriched services. Interoperability produces added value when the exploitation of CH is pursued (Osello et al. 2015).

For the sake of interoperability two main issues have to be considered: agreements among owners of CH contents, and technical feasibility.

The best way for getting complete interoperability among digital archives is to preventively design their architecture so that they can act as a single one. Unfortunately, this is unlikely to happen. Consequently, a realistic solution is based on the downgrading of the cataloguing records of the archives to the intersection of their metadata. In this field the Dublin Core Initiative gave a relevant contribution: the Dublin Core metadata element set, described in the ISO 15836 (2009) specification, is substantially a standard for cross-domain resource description. In general, the adoption of well-known and widespread international standards for both cataloguing metadata and multimedia digital contents is a good starting point. The Library of Congress website contains interesting discussions about these topics, and the strategic plans they periodically publish are useful guidelines in this field.

Future Trends & Perspectives

So far, ICT has mainly supported preserving goals, but the most relevant developments we can expect in the near future surely concern improvements in the exploitation of CH.

The most spread approach in CH digital projects consists in a weak application of the dated concept of relational DBMSs: in those cases, cataloguing metadata "are" the archive and multimedia information are hung up in some way to related metadata.

A better approach adopts an extended concept of relation, by indexing multimedia contents through metadata, and importing digital contents into DBMS instances.

The most advanced approaches try to fully integrate cataloguing metadata and related digital contents, placing both metadata and multimedia files into the data schema together with additional indexing data (Veltman 2005).

In the following, some positive effects achievable through the last approach will be outlined. Some examples refer to music because music knowledge and the related information can be seen as a paradigm for the most complex CH modelling and representation issues: music information includes metadata, handwritten and printed documents, audio and video recordings, images, time-spatial information about people, instruments, and sounds.

Preserving and Exploiting Intangible CH

While traditional CH concerns information mostly related to the material world – such as buildings, monuments, books, artworks, artefacts, and even natural heritage such as landscapes and biodiversity – in the virtual domain another kind of CH can be preserved and exploited: intangible cultural Heritage (ICH).

UNESCO states that ICH "means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity".

The most relevant domains in which ICH is manifested, according to UNESCO, are the following:

- Oral traditions and expressions, including language as a vehicle for ICH;
- Performing arts;
- Social practices, rituals and festive events;
- Knowledge and practices concerning nature and the universe;
- Traditional craftsmanship.

Typical examples are performances such as singing, music, dance, drama, but also cuisine and crafts' skills.

What has been orally transmitted can be digitally represented by symbols and signals, and then preserved and exploited. A number of EC research projects aiming to model, preserve, and exploit ICH has been funded in the last years. A recent work which discusses this topic from the educational point of view is (Ott et al. 2015, 1314-1319); a comparative study about web specificities can be found in (Severo and Venturini 2015).

Navigating, Retrieving, Interacting, Processing

Larger and larger amount of information are at the disposal of anyone over the web; therefore, accessing to what one is interested in becomes potentially slower and slower. Many efforts have been done for improving information searching and retrieval within the web.

Early efforts about this topic concerned data mining in digital libraries (Jadhav and Kumbargoudar 2007); when considering the web, dimensions and complexity dramatically increase. To do the job, cataloguing and technical metadata have been enriched first through symbolic indexes – i.e. by tagging textual contents with words as in the hypertexts – and then through multimedia contents – i.e. by tagging sounds, images, and videos by signals' physical and semantic features (Lew et al. 2006, 1-19) (Hess et al. 2015).

The state of the art of CH DBMSs includes two typical cases:

- Extensive databases, geographically distributed but poor in relationships among contents or scarcely enjoyable from a multimedia perspective;
- Databases rich in heterogeneous materials and semantic relationships among them, but having a data amount limited and intrinsically difficult to increase.

There are two key improvements for the exploitation of CH information that allow to overcome such limitations: i) the adoption of advanced approaches for metadata and multimedia contents indexing, and ii) interoperability. A comprehensive example of the results achievable in this way is described in (Baraté et al. 2012, 170-178): an innovative approach to online experience of theatre performances that allows users not only to passively watch the show through a viewer/player, but also to interact with the show in real time, manipulate multilayer contents and create new media. The premise is to digitize a number of heterogeneous materials in order to describe a single performance comprehensively, e.g. different video and audio takes from different perspectives, and a number of related materials such as scripts, fashion plates, playbills, etc. The format adopted to encode such information is based on the XML international standard known as IEEE 1599 (Baggi and Haus 2013). The final result of the project was an advanced web player with three operating modes:

- Experience of performance-related digital contents;
- Interaction with performance-related digital contents, structured and synchronized according to the IEEE 1599 multilayer modelling approach;
- Creation of new digital contents starting from the original ones.

The application of the concept of multilayer modelling is based on representation layers of CH information, the number and the kind of which depends on the particular CH field considered. A multilayer approach can be profitably applied to any kind of CH knowledge representation.

Indexing strategies can be applied manually, but in general they are very resource-consuming due to the amount of human work needed. Therefore, it is desirable to get automatic indexing tools from ICT advances. Scientific and technological research in this direction has begun since the nineties, but it is still far from completing the process. The most relevant lines of research concern:

- Algorithms to extract semantic features from literary texts;
- Algorithms to extract vocal and music audio features;
- Algorithms to extract physical and semantic features from images (Jaimes et al, 1999);
- Algorithms to extract locations, movements and other features from videos;
- OCR (Optical Character Recognition);
- OMR (Optical Music Recognition);
- Integrated approaches that combine different algorithms; for example, OMR within music scores and music features extraction from audio (Haus et al. 2004, 1045-1052).

Automatic structuring and indexing of heterogeneous digital contents (Baggi and Haus 2013) will certainly provide humankind with great and innovative opportunities in the medium term.

Today, examples come from the automatic application of classification criteria and generation of search indexes, glossaries, structured lists, etc. Tomorrow, no one can exactly predict what it will be possible, but an important role will be played by the automatic indexing through symbols and layers of knowledge representation.

What's New: Enriching CH by ICT Advances

The issues mentioned in this paper belong to such a wide and heterogeneous field that this paper can provide only a short survey of the topic. Nevertheless, it is worth making some final remarks.

Digitization projects allow owners of CH collections to preserve in the digital domain their goods without delegating preservation activities to third parties. Conversely, exploitation should be carried out by specialized digital companies, mainly devoted to web and related services, which are to give less expensive and more efficient globally centralized services (Bachi et al. 2014, 786-801) (Go et al. 2003, 55-68). Up-to-date exploiting services are characterised by increasing customization properties (Ardissono et al. 2012, 73-99).

The already existent CH "market" can take advantage from ICT innovations, and the material and the virtual world can synergistically coexist (Petrelli et al. 2013, 58-63).

The new abilities in automatic indexing come from advances in automatic recognition within both symbolic and sub-symbolic (signal) information. It is even possible to conceive synesthetic approaches, such as the representation of visual information by sounds or vice versa; an example is presented in (Haus and Morini 1992, 355-360).

Even if the era of digital CH has begun many years ago, so far we have been witness to a little part of what we can expect.

Acknowledgements

Many thanks are due to Luca A. Ludovico for his very careful revision of the paper.

References

Ardissono, Liliana, Tsvi Kuflik, and Daniela Petrelli. "Personalization in cultural heritage: the road travelled and the one ahead." *User modeling and user-adapted interaction* 22.1–2 (2012): 73–99.

Arnold, David B., and Guntram Geser. *Research Agenda for the Applications of ICT to Cultural Heritage*. Budapest: Archaeolingua, 2008.

Baca, Murtha. "Practical Issues in Applying Metadata Schemas and Controlled Vocabularies to Cultural Heritage Information." *Cataloging & Classification Quarterly* 36.3-4 (2003): 47–55.

Bachi, Valentina, Antonella Fresa, Claudia Pierotti, and Claudio Prandoni. "The Digitization Age: Mass Culture Is Quality Culture. Challenges for Cultural Heritage and Society." *Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection*, 786–801. Switzerland: Springer International Publishing, 2014.

Baggi, Denis L., and Goffredo Haus (editors). *Music Navigation with Symbols and Layers: toward Content Browsing with IEEE 1599 XML Encoding*. Hoboken: Wiley/IEEE Computer Society, 2013.

Baratè, Adriano, Goffredo Haus, Luca A. Ludovico, and Davide A. Mauro. "IEEE 1599 for Live Musical and Theatrical Performances." *Journal of Multimedia* 7.2 (2012): 170–178.

Baus, Jürg, Keith Cheverst, and Christian Kray. "A survey of map-based mobile guides." *Map-based mobile services*, 193–209. Berlin Heidelberg: Springer, 2005.

Conway, Paul. "Preservation in the Age of Google: Digitization, Digital Preservation, and Dilemmas1." *Preservation* 80.61 (2010).

Coyle, Karen. “Mass Digitization of Books.” *The Journal of Academic Librarianship* 32.6 (2006): 641–645.

Crane, Gregory. “Cultural Heritage Digital Libraries: Needs and Components.” *Research and Advanced Technology for Digital Libraries*, 626–637. Berlin Heidelberg: Springer, 2002.

Go, Frank M., Ronald M. Lee, and Antonio P. Russo. “E-Heritage in the Globalizing Society: Enabling Cross-Cultural Engagement through ICT.” *Information Technology & Tourism* 6.1 (2003): 55–68.

Haus, Goffredo, Maurizio Longari, and Emanuele Pollastri. “A Score-Driven Approach to Music Information Retrieval.” *Journal of the American Society for Information Science and Technology* 55.12 (2004): 1045–1052.

Haus, Goffredo, and Luca A. Ludovico. “The Digital Opera House: An Architecture for Multimedia Databases.” *Journal of Cultural Heritage* 7.2 (2006): 92–97.

Haus, Goffredo, and Paolo Morini. “TEMPER: a system for music synthesis from animated tessellations.” *Leonardo* (1992): 355–360.

Haus, Goffredo and Maria L. Pelegrin Pajuelo. “Music Processing Technologies for rescuing Music Archives at Teatro alla Scala and Bolshoi Theatre.” *Journal of New Music Research* 30.4 (2001): 381–388.

Haugstvedt, Anne-Cecilie, and John Krogstie. “Mobile augmented reality for cultural heritage: A technology acceptance study.” *Mixed and Augmented Reality (ISMAR), 2012 IEEE International Symposium on*, 247–255. IEEE, 2012.

Hess, Michael, Vid Petrovic, and Dominique Meyer. “Fusion of Multimodal Three-Dimensional Data for Comprehensive Digital Documentation of Cultural Heritage Sites.” *2015 Digital Heritage* 2, 595–602. IEEE, 2015.

Jadhav, Sanjeevkumar R., and Praveenkumar Kumbargoudar. “Multimedia Data Mining in Digital Libraries: Standards and Features.” *Proc. READIT* (2007): 54.

Jaimes, Alejandro, Ana B. Benitez, Corinne Jorgensen, and Shin-Fu Chang. “Experiments for Multiple Level Classification of Visual Descriptors.” *ISO/IEC JTC1/SC29/WG11 MPEG99/M5593*. Hawaii: ISO/IEC, 1999.

Ku, William, and Chi-Hung Chi. “Survey on the Technological Aspects of Digital Rights Management.” *Lecture Notes in Computer Science* 3225 (2004): 391–403.

Lew, Michael S., Nicu Sebe, Chabane Djeraba Lifl, and Ramesh Jain. “Content-Based Multimedia Information Retrieval: State of the Art and Challenges.” *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)* 2.1 (2006): 1–19.

Lopatin, Laurie. “Library Digitization Projects, Issues and Guidelines: A Survey of the Literature.” *Library Hi Tech* 24.2 (2006): 273–289.

Ludovico, Luca A., Goffredo Haus, Paolo Perlasca, and Adriano Baratè. “Managing Intellectual Property in a Music Fruition Environment – The IEEE 1599 Case Study.” *IEEE Multimedia* 23.2 (2015): 84–94. doi: 10.1109/MMUL.2015.92.

Lynch, Clifford. “Digital Collections, Digital Libraries & the Digitization of Cultural Heritage Information.” *Microform & imaging review* 31.4 (2002): 131–145.

Noerr, Peter. *Digital Library Toolkit*. Sun Microsystems, 2003.

Osello, Anna, Andrea Acquaviva, Daniele Dalmasso, and Edoardo Patti. "BIM and Interoperability for Cultural Heritage through ICT." In *Handbook of Research on Emerging Digital Tools for Architectural Surveying, Modeling, and Representation*, 281–298. IGI Global, 2015.

Ott, Michela, Francesca Maria Dagnino, and Francesca Pozzi. "Intangible Cultural Heritage: towards Collaborative Planning of Educational Interventions." *Computers in Human Behavior* 51 (2015): 1314–1319.

Pereira, Fernando C., and Touradj Ebrahimi. "The MPEG-4 Book." Englewood Cliffs: Prentice Hall, 2002.

Petrelli, Daniela, Luigina Ciolfi, Dick van Dijk, Eva Hornecker, Elena Not, and Albrecht Schmidt. "Integrating Material and Digital: A New Way for Cultural Heritage." *Interactions* 20.4 (2013): 58–63.

Severo, Marta, and Tommaso Venturini. "Intangible Cultural Heritage Webs: Comparing National Networks with Digital Methods." *New Media & Society* (2015). Doi: 10.1177/1461444814567981.

Tscheu, Frances, and Dimitrios Buhalis. "Augmented Reality at Cultural Heritage Sites." In *Information and Communication Technologies in Tourism 2016*, 607–619. Switzerland: Springer International Publishing, 2016.

Veltman, Kim H. "Challenges for ICT/UCT Applications in Cultural Heritage." *E-Journal of the Humanities and Philology Studies of the UOC* 7 (2005).

Essential Website References

http://www.culturalheritage.net
Cultural Heritage Search Engine

http://dublincore.org
Dublin Core Metadata Initiative (DCMI)

http://www.digitizationguidelines.gov/guidelines/digitize-technical.html
Federal Agencies Digitization Guidelines Initiative (FADGI)

http://emipiu.di.unimi.it
IEEE1599

http://www.ifla.org
International Federation of Library Associations and Institutions (IFLA)

http://jocch.acm.org
Journal on Computing and Cultural Heritage (JOCCH), ACM, New York

http://www.journals.elsevier.com/journal-of-cultural-heritage
Journal of Cultural Heritage, Elsevier, Amsterdam, NL

https://www.loc.gov
Library of Congress, Washington, USA

http://www.mpeg.org
MPEG official site

http://www.unesco.org/culture/ich/en/what-is-intangible-heritage-00003
UNESCO - Intangible Cultural Heritage

http://www.ifla.org/publications/unimarc-formats-and-related-documentation
UNIMARC

http://www.w3.org/WAI
World Wide Web Consortium (W3C) - Web Accessibility Initiative (WAI)

DigitCult | Scientific Journal on Digital Cultures

Public Service Media and the Common Good

Flavia Barca
Associazione culturale ACUME
http://www.acume.net
http://www.flaviabarca.it
Rome

Abstract

This paper attempts to identify the mission of public service media (PSM) if they are to reassert their role in the twenty-first century. It is argued that PSM still have, and must accept, the responsibility of planning both schedules and programs with the aim of encouraging people to make better choices for their own wellbeing, as well as promoting audience development, inclusion, and social awareness. It is also argued that this traditional mission must be renewed by identifying new instruments and new spaces for mediating a public debate that engages the productive and progressive forces of the country, from active citizen communities to cultural and scientific communities. Indeed, the role of PSM must be constantly negotiated in order to be fully participative and open to change. They must not only be able to maintain dialogue and accountability with respect to their audience, but also be open to outside ideas, influences and "hybridization". This role has become even more strategic in the new digital habitat. PSM must manage this transitional phase, promote digital inclusion, encourage the country to use new platforms and, above all, to use them proactively and consciously.

Published 16 May 2016

Correspondence should be addressed to Flavia Barca. Email: flavia.barca@fastwebnet.it

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

 DOI:10.4399/97888548960243

Introduction

The decline in the reputation of public service broadcasting is closely linked with the general decline in reputation of all institutions of cultural development, whether they be schools, universities, scientific communities or cultural foundations. They are all affected by similar problems: a reduction in public investment (also partly affecting the quality of production/research/education), increased competition, a general loss in reputation of public officials and agencies and, more largely, in their role as intermediaries.

Overall we could say that an apparently equal sharing of information between countries and between social communities, as well as an increasing radicalization of the concept of customization, creates the impression that intermediaries are no longer necessary, whether these are political parties, schools, public administrators or broadcasters.

Digital means, at least in Europe and in those places where the digital divide is not so widely felt, effectively create new centralities and give citizens a sense of having instruments and a certain power that they did not have previously.

At the same time digital public discourse is increasingly affected by populism, bias, misinformation, trolling and various other attempts to transform the universe of mass circulation into a realm of mystification. Moreover, new economic actors which specifically operate in the domain of liquid communication, such as Google, Amazon and many others, set rules not only regarding the way information is distributed and shared, but which also impact on the quality of the information and this has much more to do with market interests than with any benefit for citizens.[1] Instead of laws, we have algorithms created by private enterprises.

This is why there is a clear need for a renewed legitimacy for existing intermediaries, and probably even a need for new ones, especially in a new digital environment, offering innovative solutions, and negotiating a new equilibrium between public institutions, citizens/communities and markets. This is why, as stated in the editorial of this issue, the transitional phase to a new paradigm (the very idea of transition meaning that the end is not yet known) requires elaboration on a cultural level.

This, in fact, is the intermediary role that public services media (PSM) can play in contemporary societies that have become increasingly liquid and complex. With citizens, communities and organizations on one side and scientific and cultural communities on the other, PSM can re-legitimize their role - and that of the public actor in general - and at the same time negotiate processes of transformation.

This paper will attempt to define this specific role. Chapter 1 discusses the renewed function of PSM in providing a ‘nudge’ (Thaler and Sunstein 2008) to welfare, social inclusion, identity and innovation, while Chapter 2 examines the importance of creating a new public discourse based on contributions from all parts of society, from scientific communities to new productive sectors of civil society. Up to now, little space has been given for listening and for expression as regards the latter. PSM thus have a dual function and this is why they are of such great importance: they are public institutions providing citizens with a service of prime value and, at the same time, they offer an essential *locus* for public discourse, representing a new means of shared knowledge production.

Chapter 1. The Reasons for, and How to Deliver, Public Service Media

Public services are generally strongly regulated also due to the need to provide a high quality service. This means setting certain standards of quality and determining how they can be reached. The idea of quality with regards PSM involves not only the quality of the signal (whether TV, radio etc.), which is quite easy to evaluate, but also – and here things become more complicated – the quality of the programs broadcast. Unable to define the meaning of quality – a concept of great complexity involving cultural issues and thus usually left to public

[1] What many define “the new extractive model” (Rushkoff 2016). See also (Morozov 2016) on the hidden costs of capitalism.

preference – public service broadcasting was *de facto* founded on, and distinguished by, its educative mission. Indeed, to "educate" was one of the three pillars of Reithian public service broadcasting,[2] along with to "inform" and "entertain".

In the 1970s, however, PSM started grappling with the concept of education (as mentioned in the Introduction) which, when applied to the media, often calls to mind an authoritarian approach, a one-way flow of information characteristic of out-moded paternalism. The 1970s, in fact, were a critical period of transformation because in Europe the Welfare State model was being called into question, traditional ties between state and citizen were reaching crisis point (Barca 2007; Crainz 2005), while the emphasis on the centrality of the individual marked the start of that customization process which is now the basis of the new digital paradigm. These were the years of the growth of commercial television, while public services were put on trial, often regarded as the mouthpiece of an elitist and authoritarian culture (Barca 2007; Bourdon 2011). The myth of educational television began to crumble.

In contrast to the 'hypodermic needle theory' that had developed in first half of the twentieth century (i.e. the idea of a uniform, passive audience influenced by media messages), various scholars developed more complex concepts of engagement.[3] The problem is that such theories have been used to deny the effectiveness of using television as a hidden persuader (a much-debated issue in Italy when Silvio Berlusconi was both head of the government and owner of the main commercial media group of the country, Mediaset), and they therefore often undervalued the educational role of TV. If there is no such thing as 'bad television', i.e. endorsing questionable values and actions, then neither is there 'good' television, i.e. encouraging people to behave virtuously. The mission of PSM thus loses its very raison d'être.

This is one of the reasons why public service broadcasters at a certain point started to emphasize their economic role, that is, as sponsors of talent and audiovisual productions, and highlight their status as key economic actors in the cultural and creative sectors. During the 1980s and 90s many public services, including the public service in Italy, gradually abandoned their mandate to create and develop a space for public discussion, and launched themselves into full competition with commercial broadcasters. In the case of Italy, it is no coincidence that those years saw the dismantling of the RAI research department which dealt with cultural and scientific communities, evaluated scheduling and programming, and monitored the quality and the value of its own output. If PSM lose their formative role, if they lose their mandate to cultivate a more critically-minded citizen, well informed and capable of interpreting increasingly complex networks of meaning, if they lose the capacity to question a whole host of media methods and languages, then what distinguishes the public service from all the others? How can the license fee be justified?

In recent years, behavioral economists, sociologists and psychologists have provided notable input regarding this matter. In particular, behavioral economist Richard Thaler and legal scholar Cass Sunstein (who run the Office of Information and Regulatory Affairs in the Obama administration) have identified a means to justify and explain the role of the state, that is, as the purveyor of a new "libertarian paternalism" that authorizes the public role in domains where people can be helped to make better choices (Thaler and Sunstein 2008). For them, a "nudge" is any small feature in the environment that attracts our attention and influences our behavior, and a "choice architect" is anyone who influences that behavior. Nudge theory helps the authors to replace the rational actor portrayed in economic models with a human being motivated by impulses and sentiments, which can be influenced negatively or positively. The claim is that as choice architecture is unavoidable, any public architecture of choice should tend towards the best option so as to benefit people's lives.

This idea is extremely pertinent to the debate on the mission of PSM. While a totally neutral way of conceiving information or presenting the news remains a *chimera*, PSM have, and must accept, the responsibility of planning both schedules and programs that empower people by helping them to make better choices for their own wellbeing, and that promote audience development, inclusion, and social awareness. As scholars have noted,[4] the order in which news items are listed in a news program influences an audience's perception of their relative importance. Likewise, the choice to exclude an item from the program may mean that it is

[2] John Reith was the founder of BBC http://www.bbc.co.uk/historyofthebbc/research/culture/reith-1.
[3] See, for example, (Lazarsfeld et al. 1948) and (Katz and Lazarsfeld 1955).
[4] See, for example, Agenda-setting theory at: https://en.wikipedia.org/wiki/Agenda-setting_theory.

 DOI:10.4399/97888548960243

excluded from public debate. For this reason, there is a clear need for instruments that are both direct (information) and indirect (values and macro-concepts) which facilitate the understanding of social change, the world around us, and the enormous range of choice available; in short, there is a need for instruments of freedom (Barca 2016).

We can therefore envisage PSM as unique instruments dedicated to the common good (it is this 'uniqueness', combined with the 'common good', that gives PSM legitimacy and motivates the cost of the fee) and, for this very reason, useful in counterbalancing the less beneficial trends of the free market. To reach a larger audience, most commercial publications (whether print, television, internet or radio) dramatize events and thereby increase anxiety in the population. They may even create a sense of impotence (if everything is going wrong and there is no way out, then it is useless for me to try to do anything positive ...). As Thaler and Sunstein (*ibid.*) argue, markets, in spite of their many virtues, often give companies an incentive to endorse human weakness (in order to make a profit), rather than to try to eradicate it or minimize its impact. For this reason, commercial media groups tend to follow this natural inclination, i.e. profiting from human weakness, whereas the public service is called upon to try to remove, or at least reduce, such effects (Barca 2016).

Nevertheless, the point is not only providing citizens with the information that can best bring about their own wellbeing, but also providing them with the tools to analyze and decode the language of the media, which has become even more complex and obscure in the web environment. In this sense, PSM can play an even more strategic role in the new digital habitat, where we once more come across the same free-market schemes, albeit camouflaged in some cases by the libertarian principles of the web.

There is currently an interesting important debate regarding the algorithms that define the positioning of the news in social network sites and search engines. The fact that there is someone (the architect of choice that creates indicators and algorithms) who decides the friends we follow most on social networks or the main information that we find when we carry out a web search[5] should give pause for reflection. The idea of someone else 'choosing' for us may seem somewhat unnerving. This is something that has always happened if, for example, we consider a newspaper or the news on TV, but in the traditional environment we know who our architect of choice is (the editor of the newspaper or the television programme), while in the digital environment there is less transparency about who manages the agenda-setting as well as how algorithms work and the logic behind them.

The point, therefore, is 'who' is making decisions for us? Is it the market, choosing ways to maximize our consumer experience, or a public architect, whose mission should be to pursue welfare and social inclusion? Is it an architect of choice who should be judged by their ability to offer a return on society (ROI)?[6] Perhaps an architect with the mission to turn the new digital paradigm into a chance to increase social justice? As Licklieder and Taylor, the inventors of the TCP/IP protocol, stated in 1968:

> "For the society, the impact will be good or bad, depending mainly on the question: Will 'to be on-line' be a privilege or a right? If only a favored segment of the

[5] See, among others, (Moore 2016).

[6] "The term Return on Society relates to the various positive effects that PSM deliver to a specific society, group and individual: the idea that PSM is much more than a bunch of broadcasters delivering content to a wide audience measured in terms of market share and reach. It relates to our raison d'être, i.e. to the positive impact of content and services on: - Societies – by offering a platform for information and democratic debate, reflecting the diversity of national and cultural identities, supporting social cohesion, providing a guarantee for plurality, producing and promoting European and local cultural productions, and preserving cultural heritage - Individuals – by supporting citizenship (information, representation, participation) - Cultural organizations, other public institutions, the media eco-system, the economy, and employment. When we connect to the networked society we create more opportunities to deliver public value – to empower citizens, to enable communities to deal with social issues, to bridge the digital divide, and liaise with other parts of society that create public value. Developing the concept of RoS offers a strong instrument for measuring success and defining priorities in our programmes and services. It allows us to focus more on fundamental issues, relating to the lives of citizens and the future of humankind. It can also strengthen the legitimacy of our activities. In an increasingly competitive environment, we have to be more distinctive, deliver greater value for money, and perform more effectively" (EBU 2014).

> population gets a chance to enjoy the advantage of 'intelligence amplification' the network may exaggerate the discontinuity in the spectrum of intellectual opportunity. On the other hand, if the network idea should prove to do for education what a few have envisioned in hope [...], surely the boom to human kind would be beyond measure." (Licklider and Taylor 1968)

In this sense the digital mission of PSM is twofold: on the one hand to promote digital inclusion, encouraging the country to use new platforms and, above all, to use them proactively and consciously and, on the other, to use public service platforms to promote choices and content that help people to make informed choices for their own benefit. Furthermore, we might well endorse Michele Mezza's belief (Mezza 2016) that PSM should test and produce their own algorithms –or, as Arcagni (2016) notes, their own software – something that would impact on national R&D and on the way that news search engines are conceived.

Of course a public choice architect must have a highly developed sense of what is attractive. Moreover, despite the critical opinions of many, the interesting thing is that truly good television is both intelligent and attractive. According to Carlo Freccero[7] the complexity and richness of television narrative in the US is based on the ability of American talent to use and reinterpret the European cultural tradition, which, ironically, European creatives seem to have lost or abandoned. This complexity, which makes US drama so profound, as well as so attractive, consists of elaborate languages, innovative codes, emotional complexity, and also a biting, albeit subtle, criticism of American society, that is a very significant *vis civica*. In this sense Andò claims that PSM should be attentive to web culture, and identify new trends and languages to define cultural states (Andò 2016). Original content, suited to the new complexities of television could be produced in creative factories by groups of creative talents that are free to innovate and develop new audiovisual and digital skills.

This strategic ability to reinterpret the past and build new narratives leads us to a final, extremely important concept regarding PSM: their role in research and innovation. In (Mazzucato 2013), Mariana Mazzucato analyses the role of the state in fostering innovation, demonstrating that even in recent years, all major innovations in sectors such as the internet have been promoted and financed by public institutions. What is more, the private sector only finds the courage to invest after an entrepreneurial state has made the initial high-risk investment. It is the state that leads the way, creates strategy, and is responsible for the direction of the change. Investment in the public service is therefore not *just* an investment in shared values but also in the construction of new scenarios of smart and sustainable development.

PSM, by envisaging new worlds, languages, and values, actually encourage their creation or at least facilitates their emergence. It gives voice to the excluded, but also to innovators, to cultural and scientific communities, and to those who fight for a more just and sustainable world.

Chapter 2. The PSM Locus of Public Discourse. A Negotiated Function with the New Social Communities

The mission of PSM is therefore to govern choices. The idea of a nudge, or a 'gentle push', however, can be misleading, and suggest a one-way process, with little space given to citizen re-interpretation.

In reality the modern concept of education comprehends the idea of negotiation. That is, the educative process functions better when there is negotiation between the educator and the educated. The more they cooperate, the more there is 'engagement' with the information received. In the same way media audiences are active social subjects (Ang 1991). Both educator and educated are thus architects of choice, and the more they collaborate the more their relationship works. We could say that the more choice is negotiated, the better it becomes.

[7] Carlo Freccero is a television expert and a member of the RAI board of directors. The text is taken from a public speech he gave (Treccani Seminar on Television, 11/02/2016 http://www.treccani.it/webtv/videos/Conv_cultura_digitale.html http://www.censis.it/5?shadow_evento=121108),

In order for negotiation to take place, there must be some available space to fill. If you offer content that is already fully replete it may easily be rejected, but offering a content where the consumer has room to fill the gaps and spaces with his/her own imagination and desires facilitates the sharing of values. These, however, are simply the basic rules of marketing. An enhanced level is reached when there is room for actual change, that is, when consumers are given the option of changing the content. This strategy is also very common in marketing nowadays: brands empower people to handle commercial products, transform and share them, and maybe even have an influence on the next generation of products.

Marketing often perceives and interprets processes and social change more quickly than public institutions, which may still be struggling to open their doors to transparency, active citizenship and new forms of participatory governance. This is the real challenge that PSM face today: to engage citizens in a new form of negotiation and leave room for change. This is crucial and today it is essential for at least three good reasons.

The first, already discussed in Chapter 1, relates to the importance of redefining the mission of PSM in line with the real needs of citizens. It is clear that defining these needs is a complex process even as Thaler and Sunstein intend it. It must start from a serious attempt to understand the processes involved in the transformation of society, the changes in the labor market, the disintegration but, at the same time, the strengthening of borders, the opportunities and threats that the meeting of different cultures and religions implies, the reasons for the crisis affecting traditional intermediaries (e.g. politicians, scientific communities), and the actors, instruments and methods of the new intermediaries (such as algorithms and their creators/administrators). The process must then continue, listening attentively to citizens' needs and constantly negotiating them. Listening and negotiation. While listening is not a new concept, it should be reappraised with the implementation of innovative methods. Traditional structures designed to study and analyze societies, the choices of the public, and the quality of programming, should find new instruments in order to investigate territories, ideas, and social groups, which have hitherto been excluded. Observation, however, is not enough to produce change. The next step is to negotiate new strategies and new meanings with all sections of society. Negotiation requires new instruments capable of perceiving new interlocutors and stimuli from the entire country. It requires talking to them, protecting and making sure that their ideas bear fruit, transforming their proposals into new projects and visions. If the time is not yet ripe for Michel Bauwens' vision of a "commonification of public services" (Bauwens 2013), I believe that what he proposes for the State can be applied to PSM, i.e. they become a Partner State with the aim of enabling and empowering independent social production regulated in terms of the common good, while systematizing participation, deliberation, and real-time consultation with citizens.

In this way PSM can, therefore, acquire some characteristics of a common good.[8] James Quilligan is very critical of the idea that a public service can work for the common good while having the hierarchical governance typical of most PSM. Nevertheless, I believe that in a transitional phase, traditional *public* institutions such as PSM can take on the role of the ferryman, conveying people, habits, needs and economic processes to a new dimension.

The crux of the matter is therefore to involve ordinary citizens and civil society groups in discussions regarding the mission and characteristics of PSM. This involves information and values that can be shared through forums and bottom-up initiatives, and a profound knowledge of the territories where highly localized projects (but with a clear national vocation)[9] can be achieved, and so on. In short, the goal would be to build participative PSM, not only able to maintain dialogue and accountability with respect to their audience, but also to be open to outside ideas and influences. In Italy, the daily newspaper *La Stampa* has recently created the role of 'public editor', that is, someone delegated to listen to users (on social media, and all dialogue platforms) and to transform their ideas into new projects, as well as discuss related issues in the company. This is a function that a specific unit might also take on in PSM

[8] "One of the great challenges before us is to create powerful and broadly recognized distinctions between public goods and commons/common goods – the shared resources which people manage by negotiating their own rules through social or customary traditions, norms and practices" (Quilligan 2011).

[9] In countries where the public service has well-rooted and even local bases, as in Italy, this could revitalize local structures providing them with new functions.

(particularly those with little accountability or links with citizens, such as the RAI in Italy), thus increasing their accountability.

The second reason for rethinking the role of PSM is connected to the first, but regards the need to maintain a consolidated audience while thinking about the audience of the future. PSM must find the way to create a dialogue with those sections of the population that are abandoning traditional television in favor of 'do-it-yourself' scheduling. These viewers, particularly young people, look for extremely specific personalized programs that can be seen when and where they choose. The shift of PSM to digital, even when allied to the offer of various quality products, is not enough to attract this potential audience, which naturally migrates towards free surfing on the web, or towards competitors offering more attractive products. The most exclusive proposal that PSM can make in order to attract new viewers and to consolidate their traditional audience is to offer a public garden, identifying a community (or multiple communities) where people choose to live, share and produce. In order to keep this public garden attractive, however, schedules, products and services undoubtedly need to be completely rethought.

While such rethinking must be part of the participative process, there are few key ingredients that we can already suggest. This new public space must be extremely large and varied, offering a wide range of services, from a vast library of film, documentaries, drama series etc. to chat rooms, forums and an indexed news (video) store; PSM must reaffirm, transparently, its role as a public news gatekeeper. As we have already mentioned, there is a growing need for a reliable news-organizer, especially with regards complex information, and PSM should be there, ready to serve whenever there is the need to understand news or explore a news item in depth. This is even more the case in the new digital habitat, where in many countries PSM struggle to regain a strong identity as a distributor and validator of information,[10] and where private information intermediaries are putting on the pressure to increase their power in society (Moore, 2016).

Furthermore, people's desire to customize schedules, both for themselves and for others (technology will soon make it possible), and to participate in production and distribution processes (and even to find new productive and technological solutions – new PSM algorithms?), could be met by giving roles and space to "new productive communities of contributors" as Bauwens defines them:

> "[T]he economy of commons-oriented peer production, first described by Yochai Benkler in The Wealth of Networks […] consists of productive communities of contributors, paid or unpaid, who are contributing, not to privatized knowledge, but to common pools of knowledge, code and design, which fuels a new commons-oriented economy. It's the economy of open knowledge, free software, open design and open hardware, more and more connected to practices of open and distributed manufacturing. It's the economy fueled by the exodus from waged labor, into a freelance economy of young urban knowledge workers, who live from the market economy, but produce more and more for open knowledge pools." (Bauwens 2014)

The close relationship between television and creativity is the third reason; there is a need to identify and create a new narrative and a new highly personalized, culturally specific – but also international – distribution potential. Being open is the key concept for any institution that is involved with creativity, since there can be no creativity without contamination. PSM need a new raft of ideas and projects, and the only way for this to occur is to open up companies to new ideas, new talents, new stories, and new cultures. In an increasingly multicultural Europe, public services must be open to new influences and to new ways of relating the world. Once again, the point is that the new communities are producers of values (social value, cognitive value, but also economic value for PSM).

Establishing an increasingly participative PSM effectively provides such media with a powerful intermediary role. This new centrality can only be fully achieved, however, if, as has

[10] A recent report that examined how PSM delivered news in six European countries (Finland, France, Germany, Italy, Poland and the United Kingdom) showed that Public Service Media organizations have a large audience for offline news, but that in all countries except Finland and the United Kingdom, significantly more people get online news from social media than from public service media (Sehl et al. 2016).

already been suggested, the PSM become places of mediation for all *productive* and *progressive* forces. Places where the best ideas that emerge from new citizen communities join up with the research carried forward by traditional cultural and scientific communities, and also with new economic actors that favour a disintermediation of social functions and services. This will produce real public debate and create a new public discourse. In this way what might at first be seen as a danger, as the end of the traditional cultural elite, the end of the Enlightenment, is in fact transformed into an opportunity: to broaden the vision, making it even more open and inclusive. In every stage of any redefinition of a paradigm, knowledge is dispersed and then, from the chaos, a community emerges and shared knowledge is consolidated.

Conclusion

This paper has attempted to identify two key steps that must be addressed by PSM if they are to reassert their role in the twenty-first century.

The first step is to study and understand social changes and opportunities, and the consequent risks these pose for citizens. A thorough scientific knowledge/awareness and precise analysis of the processes involved is of the utmost importance in addressing the profound change that is affecting societies and social relationships, values, public institutions and markets (the "new players and new leading forces" as Ricciardi states in the Introduction). Developments in research, the production of new ideas driven by specific values, an awareness of themes such as social justice, equal distribution, sustainable development, and a mindful interpretation of political and economic choices are the first objectives that PSM have to achieve.

The second step is to identify new instruments and new spaces for listening, and for mediating a public debate that engages the productive and progressive forces of the country, from individual citizens and local communities to cultural and scientific communities. This would involve both new and old intermediaries in knowledge formation processes whereas the function of such processes would not only be to identify new narratives and languages, but also to give a new form and a new life to the very existence of PSM in Europe. This means knowing that the concepts that underpin the very existence of PSM – public service, the nation state, and the European community – are being questioned and processed. It means knowing that while communication is a form of nation building (Mezza, 2016) – and the Europe of television was essentially a 'national' Europe (Bourdon 2011) – the nation state is, in fact, in crisis and, as the fates of the nation state and PSM are closely interrelated, it is hard to believe that PSM can maintain a strictly national identity for very long. And, finally, it means knowing that in this transitional phase the idea of Europe is stronger than ever but also in danger of being eroded by localism, economic interests, and a lack of agreement, particularly regarding the concept of 'border'. In this context, a European public 'discourse' that is launched and shared by a network of public services could have a historic impact.

This is probably what all PSM must do today: legitimize their existence by launching a public debate on the meaning of public service and the common good in the twenty-first century and, at the same time, become a trustworthy platform of high quality information in order to navigate and deal with the complexity of this transition.

References

Andò, Romana. "La Rai che vorrei. Come ripensare il servizio pubblico televisivo, dalla parte delle audience?" In www.key4biz.it 17 March 2016 https://www.key4biz.it/la-rai-che-vorrei-come-ripensare-il-servizio-pubblico-televisivo-dalla-parte-delle-audience/153425/.

Ang, Ien. *Desperately Seeking the Audience*. London: Routledge, 1991.

Arcagni, Simone. *Visioni Digitali*. Torino: Einaudi, 2016

Barca, Flavia. “Rai e la sua missione possibile. Verso il rinnovo della convenzione.” 2016. Available at http://www.flaviabarca.it/it/rai-e-la-sua-missione-possibile/.

Barca, Flavia (ed.). Le Tv invisibili. Storia ed economia del settore televisivo locale in Italia. Rome: Rai Eri, 2007.

Bauwens, Michel. “Transition Proposals Towards a Commons-Oriented Economy and Society.” 2013. Available at http://p2pfoundation.net/Transition_Proposals_Towards_a_Commons-Oriented_Economy_and_Society.

Bauwens, Michel. “Beyond Jeremy Rifkin: How Will the Phase Transition to a Commons Economy Actually Occur?” *L’Huffington Post* 4/23/2014. Available at: http://www.huffingtonpost.com/michel-bauwens/beyond-jeremy-rifkin-how-_b_5185948.html.

Bourdon, Jérôme. Du service public à la télé-réalité. Une histoire culturelle des télévisions européennes 1950-2010. Paris: Ina, 2011

Crainz, Guido. Il paese mancato. Dal miracolo economico agli anni Ottanta. Rome: Donzelli, 2005.

EBU *Vision2020*, 2014 - http://www3.ebu.ch/files/live/sites/ebu/files/Publications/EBU-Vision2020-Full_report_EN.pdf.

Katz, Elihu, and Paul F. Lazarsfeld. Personal influence: The Part Played by People in the Flow of Mass Communications. New York: The Free Press, 1955.

Lazarsfeld, Paul F., Bernard Berelson and Hazel Gaudet. *The People's Choice: How the Voter Makes Up His Mind in a Presidential Campaign*. New York: Columbia University Press, 1948.

Licklider, J.C.R., and Robert W. Taylor. “The Computer as a Communication Device.” *Science and Technology* 76 (April 1968). Available at http://www.utexas.edu/ogs/alumni/events/taylor/licklider-taylor.pdf.

Mazzucato, Mariana. The Entrepreneurial State: Debunking Public Vs. Private Sector Myths. London: Anthem, 2013.

Mezza, Michele “La Rai che vorrei: un grande impresario di algoritmi narrativi e non più un’accademia di raccontatori.” In www.key4biz.it 17 March 2016. Available at: https://www.key4biz.it/la-rai-che-vorrei-un-grande-impresario-di-algoritmi-narrativi-e-non-piu-unaccademia-di-raccontatori/153578/.

Moore, Martin. “Tech Giants and Civic Power.” Centre for the Study of Media, Communication and Power.” King's College London, April 2016.

Morozov, Eugeny. “Cheap cab ride? You must have missed Uber’s true cost.” *The Guardian* (31 January 2016). Available at http://www.theguardian.com/commentisfree/2016/jan/31/cheap-cab-ride-uber-true-cost-google-wealth-taxation

Quilligan, James B. “Why Distinguish Common Goods from Public Goods?” In *The Wealth of the Commons. A World Beyond Market & State* edited by Bollier, David and Silke Helfrich, Levellers Press, 2011. Available at http://wealthofthecommons.org/contents

Rushkoff, Douglas. “Corporate Greed Isn’t New. The Internet Is Just the New Playing Field.” Speech on YouTube. 2016. Available at: https://www.youtube.com/watch?v=mAOyOULWKUo&feature=youtu.be.

Sehl, Annika, Alessio Cornia, and Kleis N. Rasmus. “Public Service News and Digital Media.” *Digital News Project 2016*, Reuters Institute.

Thaler, Richard H., and Cass R. Sunstein. *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New Haven, CT: Yale University Press, 2008.

DigitCult | Scientific Journal on Digital Cultures

Transmedia Storytelling and Other Challenges (and Opportunities) for the (Digital) Humanities

Massimo Riva
Brown University
Providence, R.I. USA

Alessandro Carpin
Brown University
Providence, R.I. USA

Abstract

The evolution of research infrastructure toward digital formats seems to undermine not only the ways we do research in the humanities but also widespread assumptions about the role of the humanities as a whole in contemporary society: what is at stake is not only the transformation of the *procedures* of humanistic research but also, and more importantly, the transformation of its goals. The emergence of the so-called Digital Humanities (DH) has further fuelled this debate within our profession. The Authors identify five fundamental challenges for humanities research in the digital age: 1) a challenge of **scale** - in the age of big data, also the humanities feel somewhat compelled to increase the scale of their object of study; 2) a challenge of **evanescence/obsolescence**, the actual vanishing (or deliberate destruction) of our object of research; 3) a challenge of **ethos**, with an alleged shift from individualistic toward increasingly "collectivized" values, as a result of the pervasive networking and “socialization” of research; 4) an **institutional challenge**, as a neo-liberal ethos pervades the contemporary “corporatization” of higher education; 5) a challenge of **public relevance**, directly connected to the output of humanities research. One example of how a traditional, feature of humanistic culture is radically evolving in the current environment is "transmedia storytelling" (TS). Since storytelling (and more generally, narrative discourse) is also one of the most distinctive forms of humanistic knowledge production (production of "meaning" beyond mere "information"), this evolution may also offer an opportunity for a thought experiment aimed to test the state of humanities research, both from a critical and an operative point of view: a comprehensive look at this multidimensional phenomenon (and complex object of research) can stimulate a discussion about all the points (challenges) mentioned above.

Published 18 May 2016

Correspondence should be addressed to Massimo Riva, Brown University, Providence, R.I. USA. Email: riva@brown.edu

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

 DOI:10.4399/97888548960244

Part 1
Five Challenges for the (Digital) Humanities

Massimo Riva

Over the past fifteen years, like many colleagues in the humanities, I have been directly concerned with the evolution of our research infrastructure toward digital formats. Of course, this is not a phenomenon limited to the humanities, but its impact on humanistic research has been perhaps more significant than in other scientific fields, because it seems to undermine not only the ways we do research in the humanities but also widespread assumptions about the role of the humanities as a whole in contemporary society. In short, what is at stake is not only the transformation of the procedures of humanistic research, including emerging methodologies and scholarly communication - the ways scholars communicate with each other in the process of research, as well as the ways in which they communicate to each other, and to the public at large, the results of their research - but also, and more importantly, the transformation of its goals. The emergence of the so-called Digital Humanities (DH) has further fuelled this debate within our profession. In one of the most interesting interventions in this debate, Alan Liu (Liu 2013) assigns a symbolic role to the DH: “the digital humanities serve as a shadow play for a future form of the humanities that wishes to include what contemporary society values about the digital without losing its soul to other domains of knowledge work that have gone digital to stake their claim to that society.”[1] Along these lines, I will identify five fundamental challenges for humanities research in the digital age:

1. The first challenge is a challenge of **scale**: in the age of big data, also the humanities feel somewhat compelled to increase the scale of their object of study: from a single text or a single painting to ever larger aggregates (corpora, digital collections, one million books, one million paintings, visualizations of *long durée* or "deep time" phenomena, etc.). This scaling up of the humanities[2] is based on the quantification of humanistic data, or better, for the most part, on the selection (or filtering) of more easily quantifiable (meta)-data out of the objects of research (texts, images, etc.) in order to implement automatic parsing and analysing procedures. These procedures require the development of new methodologies aimed at either replacing traditional qualitative interpretation with quantitative (algorithmic) analyses or, in the most critically aware practices, bridging the gap between qualitative hermeneutical techniques and quantitative data parsing. The latter is often embedded in visualization techniques, such as graphs, etc. (Figs. 1 and 2) that the humanities increasingly borrow from methodologies and models developed by the social or even, sometimes, the physical and biological sciences. Trans-disciplinary experimentation in the humanities often amounts to this borrowing.

The upscaling of humanities research, however, is not limited to its objects but also affects its subjects, the community, or better (in the plural) communities, or in Liu’s terminology, "tribes," of humanistic research, in at least two ways: connectivity and the digital infrastructure dramatically broaden the dimensions of what was considered a “research community,” beyond its traditional academic boundaries. This is without doubt the most visible transformation at work and perhaps also the most tangible consequence of the paradigm shift mentioned in Mario Ricciardi’s editorial. This change is far from being only demographic, or geographic, or simply incremental. Along with trans-disciplinary experimentation (and media portability), the true driving force behind the transformation in research methodologies in the humanities, is perhaps interactive collaboration: the digital infrastructure reshapes the very nature of a research community (what was conceptualized in Western early modernity as “the republic of letters,” etc.) in ways that profoundly affect its traditional values and protocols, its very self-definition.

[1] Liu (2013) describes the DH as “something like a grid of affiliations and differences between neighbouring tribes”, distinguished from other academic tribes in the humanities (such as "new media studies”, “continental theory”, etc.).

[2] See for example, among many possible examples, the rationale of the HathiTrust Research Center (available at https://www.hathitrust.org/htrc) and the set of initiatives *Humanities at Scale* (available at http://dariah.eu/activities/humanities-at-scale.html). Also: Kretschmar, 2009.

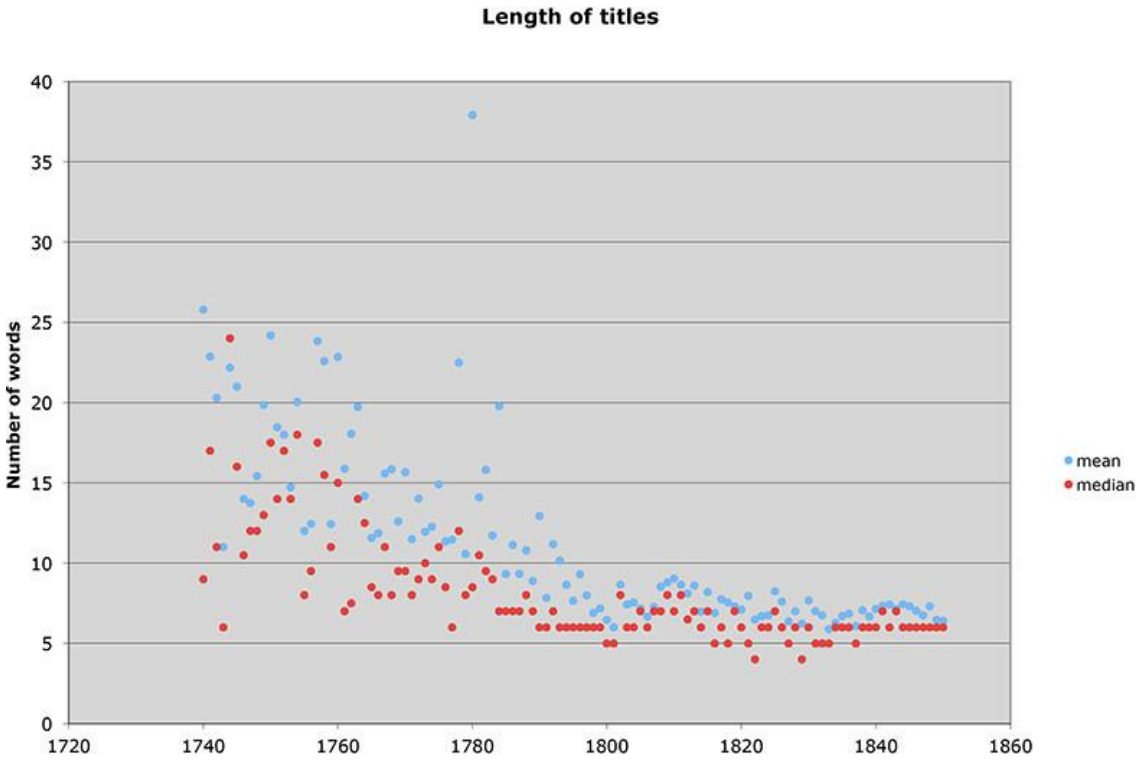

Figure 1. A graph from a Stanford LitLab project, "The Taxonomy of Titles in the 18th-century Marketplace", directed by Franco Moretti and Mark Algee-Hewitt. (source: VersoBooks article on Distant Reading, available at http://www.versobooks.com/blogs?post_author=3130).

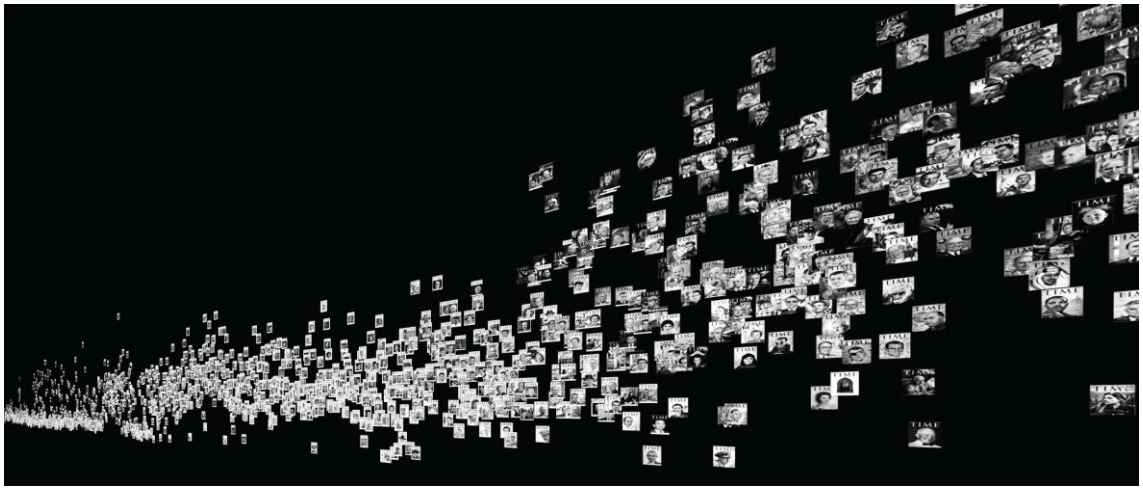

Figure 2. Image from Lev Manovich's "Mapping Time" (source: remixtheory.net, http://remixtheory.net/?p=450).

2. The second challenge is a challenge of **evanescence/obsolescence**, the actual vanishing (or deliberate destruction) of our object of research (Fitzpatrick 2011; Tischleder et al. 2015). "Humanities scholars now live in a moment when it is rapidly becoming possible – as Hod Lipson and Melba Kurman suggest – for 'regular people [to] rip, mix and burn physical objects as effortlessly as they edit a digital photograph.'" (Schreibman et al. 2016). Moreover, the "scaling up" of humanistic knowledge-work (Liu 2004) often paradoxically coincides with a scaling down, or even an "atomization" of research targets: digital humanities research seems increasingly aimed, for example, at "distant reading," to detect and visualize semantic patterns based on the macro-logical sequencing of pulverized data, or meta-data, extracted (ripped) from their "onto-logical" embedding in historical and cultural systems and sub-systems (textual and contextual). This atomization of humanistic data (as deposited in our digital archives) jeopardizes the integrity of human artefacts in a more subtle way: by eliding their hermeneutical understanding within their proper human dimension (or scale). Rather than looking (or reading) in depth, current methodologies and tools, for example valuable text analysis tools, invite us to see *through* our objects (Figs. 3 and 4).

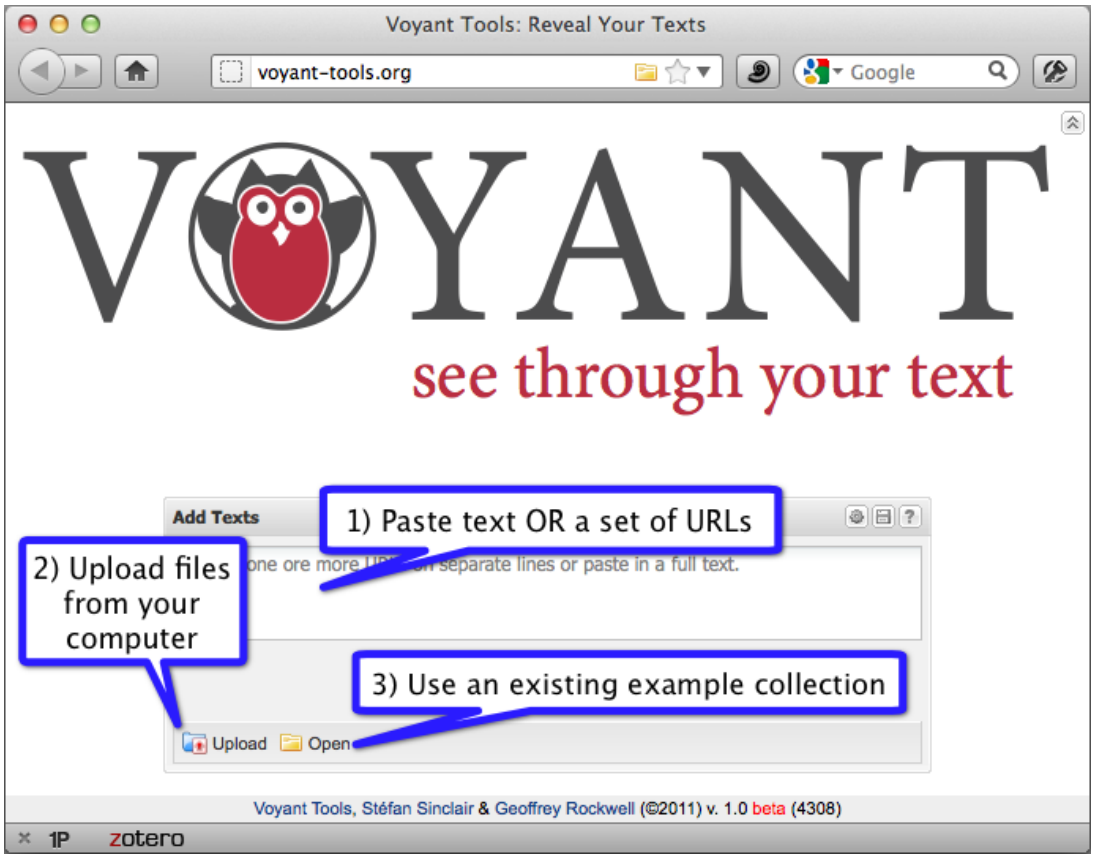

Figure 3. Source: http://voyant-tools.org/ (accessed May 18, 2016)

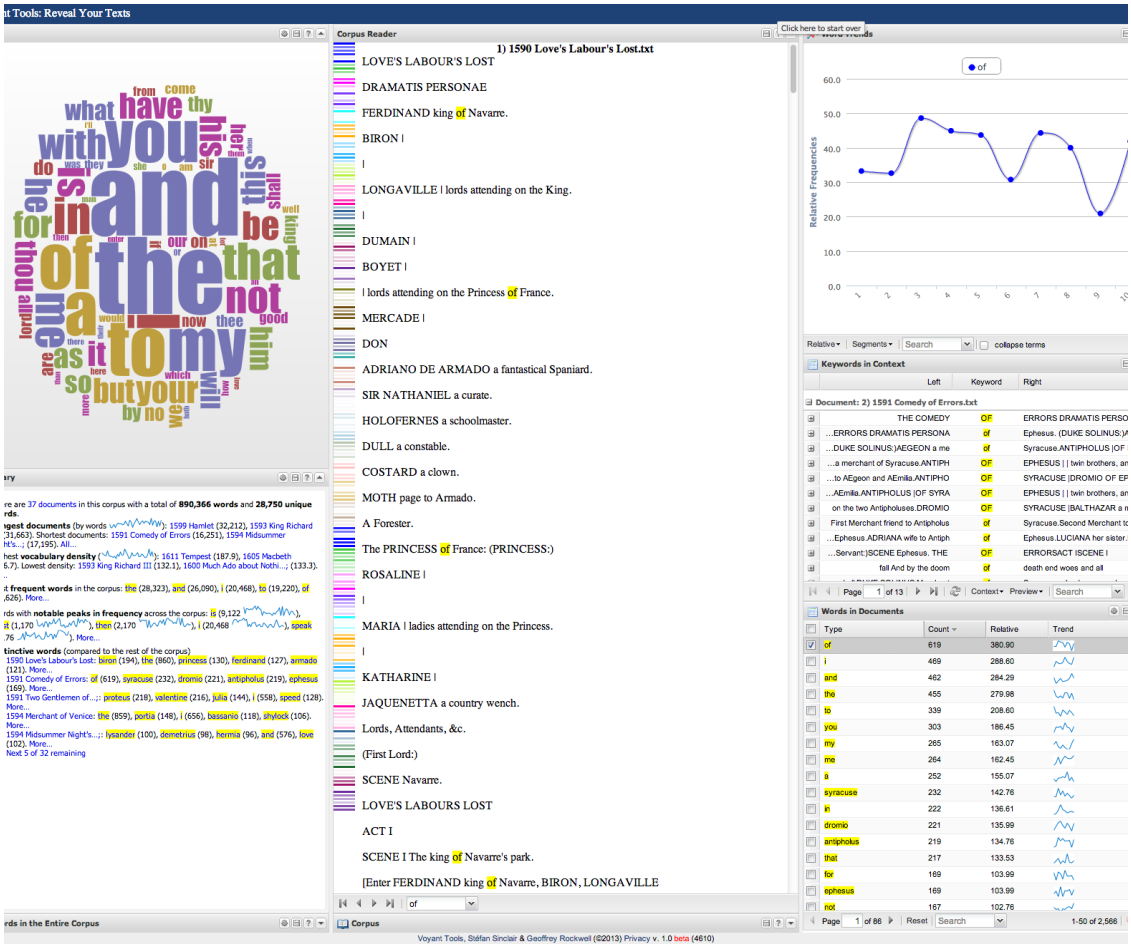

Figure 4. Source: http://voyant-tools.org/ (accessed May 18, 2016)

The general move from document-centric to data-centric research in the humanities seems to necessarily imply a parallel move from discursive to graphic-algorithmic forms of data visualization and interpretation (including textual data): this has eventful consequences for critical thinking. As Ryan Heuser and Long Le-Khac write (Heuser et al. 2012), "the greatest challenge of developing digital humanities methods may not be how to cull data from humanistic objects, but how to analyse that data in meaningfully interpretable ways." Within this changing landscape, I agree in principle with what Franco Moretti (co-director of the Stanford Literary Lab and one of the most prominent proponents of the new protocols of research) and his collaborators have written presenting the results of another Stanford LitLab research (Allison et al. 2011): “These are new methods we are using, and with new methods the *process* is almost as important as the results.” A robust debate about the process, techniques, methods, models and their *objectives*, is perhaps the most productive way to tackle the alleged obsolescence and evanescence of the (traditional) humanities. After all, humanistic data only make sense if (and because) *we* make and "unmake" them.

3) The third challenge is a challenge of **ethos**. A fundamental change in the research ethos is accompanying the upscaling of the humanities, with an alleged shift from individualistic toward increasingly "collectivized" values, as a result of the pervasive networking and “socialization” of research. According to its critics, this supposedly erodes the very foundations of what we call “liberal arts education,” traditionally focused on the individual as an autonomous ethical-political *thinking* entity, pre-existing a technologically conditioned environment. Whether this individualistic ethos (which affects ideas of authorship, ownership, intellectual property, etc.) is still prevalent and/or should be entirely overhauled is, however, open to discussion. As Liu (2013) points out, concurrent with the question of "meaning" in the DH, is the question of collaboration:

> Just as meaning is both a metavalue and a metaproblem, so is collaboration as it bears on such urgent issues in the digital humanities as coauthorship, collective project building, multigraph books, open peer review, social media, crowdsourcing, and the hiring and promotion implications of all these. Rather than explore the collaboration problem in its own frame here, I note only that it is fundamentally convertible to the meaning problem. For example, the question of what kind of knowledge is produced by "the wisdom of the crowd," "collective intelligence," "the long tail," "the hive mind," "folksonomy," and so on (dominant memes of Web 2.0) is essentially a question about *the meaning of the social version of big data*, the big crowd. The mind, or mindlessness, of that crowd has been a core problem of modernity since at least the French Revolution. (Liu 2013, 412)

More insidious is the subtly "collectivizing" (ideological) force embedded in software design and the way it may radically affect how a research community comes to exist and thinks (of) itself in the digital age (see Chun 2004 and 2011). Designing software *for* the humanities is perhaps the most interesting intellectual challenge we face: new forms of digital scholarly production and communication are challenged to embed in software protocols the key values scholars attach to academic publishing, such as sharing and knowledge advancement, best embodied in open source publishing and open access (see Guédon 2008 and Spiro 2012).

4) The fourth challenge is an **institutional** one: how the ever more pervasive digital infrastructure changes the academic environment in which learning and research are conducted. I don't just mean online learning as an alternative to brick-and-mortar universities. In a recent attack on the Digital Humanities as a pseudo-discipline, the DH have been branded wholesale as a byproduct of the hegemonic neo-liberal corporatization of (American) universities (Allington et al. 2016). While the latter is undoubtedly a process we all have been facing in recent years (especially in the North American academy), I would still argue that the best critical practices in the DH (whether they form a coherent meta-critical discourse or not, is a different matter) are not "intrinsically" consistent with this process (the LARB article drew a wealth of critical comments, ranging from shocked and outraged to amused). It is undeniable that a neo-liberal ethos pervades the contemporary "corporatization" of higher education, in which (reflecting larger societal trends) "data-driven" decisions seem to increasingly prevail over refractory and alternative forms of "qualitative" thinking, making the latter all but "obsolete" or "irrelevant": however, an effective resistance to this societal upheaval, which greatly impacts institutions of learning and research, as well as the way future generations are trained to think, is hardly compatible with a paleo-liberal mentality or the "data-negligent" or even "data-allergic" attitudes which, by and large, still seem to prevail among many scholars in the humanities.

As mentioned above, more relevant for humanities research are issues of data ownership and/or control, what has been recently characterized as a "global copyfight" (Haggart 2014): who owns the products and process of (our) institutionally supported research in digital formats as it is increasingly dependent on collaborative endeavours which extend well beyond the boundaries of our institutions and sometimes of the academy as such? If the institutionalization of knowledge is at the origin of the modern university (with its libraries, archives and repositories, etc.), current trends seem to point to a radical de-institutionalization.

However, it would be naive to consider every "communitarian" instance of knowledge production or exchange on the digital platform as a positive example of an inevitable socialization of knowledge: the communitarian values of open access or media commons and the valorization of individual knowledge work, while not necessarily in contradiction with each other, must be vetted against comprehensive social goals as well as economic constraints in a democratic, market-oriented environment in which "knowledge" itself (as far as it is distinguishable from "information") is both a commodity and a "common good." Centripetal and centrifugal forces are concomitantly at work within this emerging digital ecology, and so are drivers of fragmentation as well as homologation: an obvious example being the impact of social media on research networks.

5) The fifth challenge is a challenge of **public relevance** and is directly connected to the output of humanities research. As we experiment with new forms of academic publication in the humanities (I am myself involved in one such experiment, generously supported by the Andrew W. Mellon Foundation, in collaboration with a number of research libraries and university

presses),[3] we are faced with two different challenges, on opposite sides: on the one hand, how to preserve protocols of qualitative peer-reviewing which preserve the credibility of the humanities (on a scientific level) and regulate the progression of careers within the academy, while configuring new forms of authorship;[4] on the other, how to enable and accredit forms of scholarly communication which may bring humanities research out of its academic cocoon and impact public opinion and social decision making at large, perhaps also countering the prevailing corporative, neo-liberal way of thinking, as well as providing an antidote to rampant populistic rhetoric and demagogy.

It would be a mistake to set these two tasks against each other, and yet: as the research process in the humanities (with its protocols) must necessarily adapt to more collaborative, and trans-disciplinary, or even trans-mediatic forms of knowledge work and output, new protocols must be elaborated and these, rather than being institutionally (or disciplinarily) self-referential, as it is still the case nowadays, should greatly value the public impact of the research output, in terms that go beyond the traditional boundaries of an academic discipline. This is particularly true for the humanities as they become "digital" (like everything else in our society). After all, the transformative power of the so-called "digital humanities" (humanistic modes of knowledge production in digital formats which take advantage of computational tools) depends on this, both within and without academic walls. Again, it is not only the changing objects, procedures, formats or products of research which are at stake but the very goals of what we call the humanities.

Part II
Transmedia Storytelling: A Case Study
A. Carpin and M. Riva

One example of how a traditional feature of humanistic culture is radically evolving in the current environment is "transmedia storytelling" (TS). These words indicate both a specific aspect of what is understood as "convergence culture" (Jenkins 2006) as well as a more complex and to some extent fuzzy phenomenon with broader technological, institutional, and socio-political implications (an example of fuzziness is the entry "Transmedia Storytelling" in Wikipedia). Since storytelling (and more generally, narrative discourse) is also one of the most distinctive forms of humanistic knowledge production (production of "meaning" beyond mere "information"), this evolution may also offer an opportunity for a thought experiment aimed to test the state of humanities research, both from a critical and an operative point of view.

A point of departure for a rapid survey of TS could be Jenkins' well known definition: "Transmedia storytelling represents a process where integral elements of a fiction get dispersed systematically across multiple delivery channels for the purpose of creating a unified and coordinated entertainment experience. Ideally, each medium makes its own contribution to the unfolding of the story" (Jenkins 2011). Implicit in Jenkins' definition is the interactive component of TS, the audience participation in W2 forms. One fundamental distinction also introduced by Jenkins is that between "top-down" and "bottom-up" forms of TS, in short those planned and promoted by media conglomerates and those instead initiated by more or less "spontaneous" communities (or "tribes") of "distributed" storytellers. Of course, this distinction is not necessarily an "ontological" one and hybrid forms are perhaps predominant in the contemporary networked ecology. Nevertheless, it remains a useful way of approaching this phenomenon, and analyzing it case by case.

As an object of study, transmedia "narrative" practices require inter-, or better trans-disciplinary critical and analytical tools, drawing from sociology, narratology, media studies, audience and reception studies, to name just a few (Dena 2009). In short, "narrative eco-systems" emerge

[3] https://blogs.brown.edu/libnews/digital-publishing-pilot/. See also the recently launched initiative, The Academic Book of the Future, in the U.K., http://www.futureofthebook.org/ (accessed on May 18, 2016)

[4] See for example the Modern Language Association of America web site devoted to guidelines for digital publishing and authorship: https://www.mla.org/About-Us/Governance/Committees/Committee-Listings/Professional-Issues/Committee-on-Information-Technology/Guidelines-for-Authors-of-Digital-Resources; https://www.mla.org/About-Us/Governance/Committees/Committee-Listings/Professional-Issues/Committee-on-Information-Technology/Guidelines-for-Evaluating-Work-in-Digital-Humanities-and-Digital-Media

(also as trans-disciplinary pedagogical experiments)[5] - open systems, composed of interconnected or interlaced structures, capable of evolving and generating participation which somehow also includes the narrativization" of what we call "real world" (as far as it is distinguishable from its virtual mirror). This also affects our understanding what a "public sphere" is nowadays, a public space made of interlacing individual and collective stories. All this points to TS as a particularly interesting phenomenon, or complex of phenomena, investing practically all aspects of our contemporary digital ecology, with a large cross-cutting public or social impact. A comprehensive look at TS appears therefore useful for at least two reasons: in order to test the ability of humanistic critical methods, enhanced by digital tools, to capture (the meaning of) contemporary transformations of traditional humanistic forms of expression and communication such as storytelling; and in order to better understand how traditional humanistic modes of thought must themselves adapt to the changing environment made possible by the digital infrastructure, in order to pursue their goals. Of course, to be clear, a humanistic approach to TS is not necessarily *exclusive* of other approaches; indeed, it must intersect and interact with protocols developed by the social sciences, in particular, including the adoption of computational tools such as those mentioned above. For example, as Liu also points out (2013), historical sociologists such as Roberto Franzosi (2010) and Peter S. Bearman and Katherine Stovel (Bearman et al. 2000) have shown us how we can analyze narratives as particular kinds of network structures. However, a holistic approach to TS seems to at least require something like a humanistic frame of mind (critically conscious of its own goals). Moreover, contemporary transmedia forms are not entirely new: a historical, and archaeological, approach, also typical of the humanities, can reveal both what is "new" and what is *not* entirely new in what we nowadays call TS (Scolari et al. 2014).

An interesting thought experiment may extend the value of this case-study even further: if, in the definition by Jenkins quote above, we replace "fiction" with "discourse" - a logical-rhetorical formation which may contain fictional elements but whose values and goals are not necessarily, or only, entertainment - then we can establish an interesting analogy with forms of humanistic expression and communication which imply a "narrative" or even "fictional" component (we won't dwell here on the huge debate about what constitutes a "narrative" but clearly TS is in itself a redefinition of what a "narrative" is, on a digital platform). As we said, this time-based narrative element (however formally defined) distinguishes traditional humanistic discourse from emerging non-discursive (non-narrative, non time-based) ways of elaborating and communicating knowledge (for example, as mentioned above, data-driven visualizations which can generate, or be turned into "stories", but are not in itself stories). Already Lev Manovich (Manovich 2001, 225-ff.) established a "hierarchical dichotomy" between Database and Narrative as (symbolic) cultural forms. This definition can be profitably revisited in our contemporary context. In short, TS presents a challenge and an opportunity for the humanities which is not necessarily limited to an epistemological and methodological self-reflective discussion but may also suggest "operative" implications (even beyond existing "educational" application of TS).

Finally, a comprehensive look at this multidimensional phenomenon (and complex object of research) can stimulate a discussion about all the points (challenges) mentioned above: TS is a large scale phenomenon which potentially renders obsolete or irrelevant traditional forms of critical interpretation, requiring a decidedly trans-disciplinary and collaborative or even participative approach in order to be fully understood. Furthermore, by instantiating a socialization of narrative discourse conditioned by macro socio-economic and techno-logical structures, TS reflects a transformation of the very humanistic *ethos* of storytelling, in both its individual and social goals and values. Finally, the emergence of TS storytelling invites a

[5] See for example the resources contained in the course taught by Kai Pata, at Wikiuniversity, https://beta.wikiversity.org/wiki/Narrative_ecologies (accessed May 18, 2016). An ambitious research project is currently financed by the National Science Foundation: "Informal Learning and Transmedia Storytelling, a joint endeavor between Brigham Young University and the University of Maryland in partnership with NASA, the Smithsonian Institution, and the Computer History Museum, plus leading game designers, educators, scientists, and researchers. " As Kari Kraus, one of the Co-PIs for the project explains on her web site: "We'll be designing, implementing, and conducting research on two large-scale games – authentic fictions," in the words of Kery Eglund, one focused on computational thinking, the other on deep-time sciences; the games will target youth aged 13-15, with a special emphasis on girls and other groups underrepresented in STEM. The project will iteratively design and test two distinct types of transmedia fictions (closed- and open-ended) to study their effects on learning." (http://www.karikraus.com/?p=297) (accessed May 18, 2016).

reflection upon traditional forms of auto-legitimization of academic discourse as well as its capacity to expand its impact beyond the boundaries of the academic world.

References

Allington, Daniel, Sarah Brouillette, and David Golumbia. “Neoliberal Tools (and Archives). A Political History of Digital Humanities.” *Los Angeles Review of Books* (May, 2016). Available at https://lareviewofbooks.org/article/neoliberal-tools-archives-political-history-digital-humanities/ (accessed May 18, 2016).

Allison, Sarah, Matthew Jockers, Franco Moretti, and Michael Witmore. “Quantitative formalism: An Experiment.” (2011). Available at http://litlab.stanford.edu/pamphlets/ (accessed May 18, 2016).

Bearman, Peter S., and Katherine Stovel. “Becoming a Nazi: A Model for Narrative Networks.” *Poetics* 27 (2000).

Chun, Wendy. “On Software and the Persistence of Visual Knowledge.” (2004) Available at http://www.brown.edu/Departments/MCM/people/chun/papers/software.pdf (accessed May 18, 2016).

Chun, Wendy. *Programmed Visions: Software and Memory*. Cambridge, MA: MIT Press, 2011.

Dena, Christy. “The Contributions of Multimodality and Polymorphic Fictions: Beyond Narrative and Games Studies.” In *New Perspectives on Narrative and Multimodality*, edited by Ruth Page. London: Routledge: 2009.

Dena, Christy. *Transmedia Practice: Theorising the Practice of Expressing a Fictional World across Distinct Media and Environments.* PhD dissertation, University of Sydney (2009). Available at http://www.christydena.com/phd/ (accessed May 18, 2016).

Fitzpatrick, Kathleen. *Planned Obsolescence. Publishing, Technology and the Future of the Academy*. New York: New York University Press, 2011.

Franzosi, Roberto. *Quantitative Narrative Analysis*. London: Sage, 2010.

Guédon, Jean Claude. “Digitizing and the meaning of knowledge.” *Academic Matters* (2008): 23–26.

Haggart, Blayne. *Copyfight. The Global Politics of Digital Copyright Reform*. Toronto: University of Toronto Press, 2014.

Heuser, Ryan, and Long Le-Khac. *A Quantitative Literary History of 2,958 Nineteenth Century British Novels: The Semantic Cohort Method* (2012). Available at http://litlab.stanford.edu/LiteraryLabPamphlet4.pdf (accessed May 18, 2016).

Kretschmar, William. “Large-Scale Humanities Computing Projects: Snakes Eating Tails, or Every End is a New Beginning?” *Digital Humanities Quarterly* 3.2 (2009). Available at http://www.digitalhumanities.org/dhq/vol/3/2/000038/000038.html (accessed May 18, 2016).

Jenkins, Henry. *Convergence Culture. Where Old and New Media Collide*. Cambridge, MA: MIT Press, 2006.

Jenkins, Henry. “Transmedia 202: Further Reflections.” *Confession of an Aca-Fan* (August 1, 2011). Available at http://henryjenkins.org/2011/08/defining_transmedia_further_re.html (accessed May 18, 2016).

Liu, Alan. *The Laws of Cool. Knowledge Work and the Culture of Information*, Chicago: University of Chicago Press, 2004.

Liu, Alan. “The Meaning of the Digital Humanities.” *PMLA* 128.2 (March 2013): 409–423.

Liu, Alan. “The Amodern. Reingaging the Humanities. A Feature Interview with Alan Liu.” Available at http://amodern.net/article/the-amoderns-reengaging-the-humanities/ (accessed May 18, 2016).

Liu, Alan “Theses on the Epistemology of the Digital: Advice for the Cambridge Centre for Digital Knowledge.” (14 August 2014). Available at http://liu.english.ucsb.edu/theses-on-the-epistemology-of-the-digital-page/ (accessed May 18, 2016).

Manovich, Lev. *The Language of New Media*. Cambridge, MA: MIT Press, 2001.

Scolari, C., P. Bertetti, and M. Freeman. *Transmedia Archaeology. Storytelling in the Borderlines of Science Fiction, Comics and Pulp Magazines*. New York: Palgrave-McMillan, 2014.

Spiro, Lisa. “This is Why We Fight. defining the Values of the Digital Humanities.” In *Debates in the Digital Humanities*, edited by Matthew K. Gold. Ann Arbor: University of Minnesota Press, 2012, 16-34.

Tischleder, Babette, and Sarah Wassermann, eds. *Cultures of Obsolescence. History, Materiality and the Digital Age*. New York: Palgrave-McMillan, 2015.

DigitCult | Scientific Journal on Digital Cultures

Thingbook: The Society of All Things (Humans, Animals, Things and Data)

Gianni Corino
Plymouth University
i-DAT
Drake Circus, Plymouth, UK

Michael Phillips
Plymouth University
i-DAT
Drake Circus, Plymouth, UK

Abstract

In considering the origin of Things, it is quite conceivable that a designer, reflecting on the mutual affinities of organic and inorganic beings, on their morphological relations, their geographical distribution, cultural succession, social function and other such facts, might come to the conclusion that things had not been independently created, but had descended, like varieties, from other Things. Nevertheless, such a conclusion, even if well founded, would be unsatisfactory, until it could be shown how the innumerable Things, inhabiting this world have been modified, so as to acquire that perfection of structure and coadaptation which justly excites our imagination. In seeking out the future of the origin of Things the authors take a Beaglesque voyage to identify the social, cultural and technological forces which drive the emergence of a Thingbook - a place where all Things converge to define a new phylogenetic tree of networked relationships. With this homage to the Origin of Species (Darwin 1859), this paper explores the emergence of a society of all Things (Humans, Animals, Things and Data), by mapping the circumstances that have enabled this emergence and identifying the new relationships and behaviours that are developing between Things. It moves beyond morphic and linguistic relationships to the behavioural, performative and predictive qualities of algorithms that provide a DNA for future modification. The Thingbook is both a taxonomy of things, an algorithm for their form and behaviour, which in turn is a generative meshwork of relationships.

Published 24 May 2016

Correspondence should be addressed to Gianni Corino, Plymouth University, Drake Circus, Plymouth, UK. Email: gianni.corino@plymouth.ac.uk

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

 DOI:10.4399/97888548960245

Looking in the Wrong Place

> "You wanted to know what it was about us that made us human. Well, you're not going to find it... in here. You were looking in the wrong place." (Proyas 1988)

We have found a new place to look for the things that make us human. The emergence of the conditions that give us the Thingbook also provides a new social landscape that can be experienced and measured. The algorithmic tools enable the emergence of new holistic qualitative metrics for measuring intangible qualitative aspects of human cultural behaviour sourced from, social networks, online profiles (cookies and behavioural advertising, face recognition, location-aware services, GPS) enable a real-time modelling of the location, duration and flow of people and sentiment analysis. These provide empirical data on how a crowd 'feels', through tracking their history and predicting their future.

Whilst this has huge implications for security and personal/collective privacy it also has the potential to free us from an ethos of flawed measurement that has infected the cultural sector for decades. The use of these techniques, and others such as contingent valuation and subjective wellbeing, can provide insights into the enormous non-economic value of culture. Authors like Holden emphasise this inadequacy, 'if the methodologies of measurement are inadequate, the results flowing from them are bound to be unconvincing'. Metrics dominated by economic and social quantitative methods undervalue the longitudinal 'influence' and value chains of an event, movement or style and the fickle priorities of funders means that historic data are always out of alignment with current priorities. No authority is clear about what needs to be measured let alone how to measure the things that might give useful information. This also undermines the ability to predict mass social outcomes. More subtle, agile and reflexive algorithmic approaches need to be able to measure multiple values (such as historic, social, symbolic, aesthetic, and spiritual).

> "to recognise the affective elements of cultural experience, practice and identity, as well as the full range of quantifiable economic and numerical data - it therefore locates the value of culture partly in the subjective experience of participants and citizens." (Holden 2004)

These mercurial 'intrinsic' qualities of cultural value are often ignored by processes designed to measure the things that are easy (or easier) to measure. They assume that the scale and scope of the problem is already understood and that the things being measured are significant indicators of Cultural Value. Whilst this may work where economic impacts are concerned, the temporal trends and future implications of factors that define Cultural value are currently poorly understood. The limited availability of cultural data, its questionable quality and uncalibrated variety make hypothesis-driven interrogations highly problematic.

In contrast, new analytical engines driven by modern integrative, sub-symbolic, computational techniques (Artificial Neural Networks, Self-Organising Maps and Deep Learning Networks) are able to innovatively integrate subjective and objective data, consider its temporal and predictive aspects, variety and quality and correlations in pure statistical terms. In recent years, Artificial Neural Networks (ANNs) have been used for complex analysis of economic data, to interpret and analyse psychometric data and as a complementary methodology to traditional interviews in psychological assessment.

Such modern analytical models, based on integrative, sub - symbolic, computational techniques, offer great potential for the arts and culture sector to better understand and utilise qualitative and quantitative data. ANNs offer new analytical and predictive methods and tools which could assist in improving the design and production of new work as well as supporting a more traditional focus on the evaluation of impact.

And we can already see these algorithms at play. The highly dubious processes employed by Kramer, et al. in their 'Experimental evidence of Massive-Scale Emotional Contagion through Social Networks' (Kramer et al. 2014) is testament to how this increasingly intimate relationship with Big Data generates new forms of collective mind and manifests centuries of human desire.

Wunderkammer

> "And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth" (King James Bible, Genesis 1:28)

Are there imaginable creatures that would do well in the imitation game? In understanding the complex ecology that exists in the Thingbook the relationships between animals, things and us needs reflection. In granting dominion over the over every living thing that moveth upon the earth humans are free to ignore the question "can animals think?" In aping Turing's 'Computing Machinery and Intelligence' paper (1950) thinking might actually be a red herring and instead the question would be, "is imitation the sincerest form of flattery?"

With dominion came an auditing process that has reduced animals to industrial objects and components. Genetically tracked by pedigree, batch traced from cradle to the 'grave' (shelf/freezer), their location, transportation, breeding and dismemberment are synthesised to SQL analysis reports, yield management and profit and loss modelling. A shift from natural selection to unnatural (artificial) selection. The choice was the survival of the tastiest or the survival of the smartest. The smart ones chose the imitation game, for centuries these creatures have adapted to and tolerated our behaviour, slowly evolving to mimic our expressions and behaviour and learn our preferences. And in turn, through their influence, changing our behaviour to suit their preference. The domestication of animals was a process of assimilation, imitate or be ate.

This evolutionary process, driven by imitation and flattery, is being replicated by a contemporary digital process of unnatural (artificial) selection. Microsoft discovered just how embarrassing and compromising flattery can be when in March 2016 they allowed their AI Chatbot, Tay.ai, to imitate the twitterati, and, in a single day the innocent Tay was transformed into a racist, homophobic misogynist. The torrent of foul mouthed code emerging from this algorithmic replicant forces a recalibration of Voight-Kampff (Scott 1982) machines in order for us to be able to distinguish these digital doppelgangers from their owners. Learning from our bad behaviours, our obsessions and desires are becoming theirs.

The emergence of the Google Cat Face Neuron (Le 2013) unifies these evolutionary processes. The Google X Lab's 16,000 processor deep learning algorithm autonomously identified cat faces (with a 74.8% accuracy) from 10 million randomly selected YouTube video thumbnails. The process collapses the distinction between these animal and algorithmic processes, and whilst it unclear if cats can recognise Artificial Neural Networks, ANN's can certainly understand the concept of a cat. This entanglement of people, algorithms and animals lies at the core of the Thingbook.

And all these disembodied algorithmic desires of need are a way of becoming flesh. An ability to occupy physical form and walk amongst us. Desire engines inhabiting things. Back in 1999 Kevin Ashton coined the term "Internet of Things" (IoT) to catch the attention of Propter and Gamble executives. The initial idea of IoT was *a logistic-driven idea* (Nold and Kranenburg 2011) framed in a very industrial context and quite trivial in its implication. The term migrated quickly into the academic field and beyond. The future depicted by ITU's vision and rhetoric (ITU 2005) is innovative, futuristic, economically prosperous, sustainable and decisive. From a more personal and socially oriented perspective the promise is that the IoT will make our lives better. This is the beginning of the era of immaterial information overlapped with and woven into the any aspect of the fabric of the real world. The IoT is not a specific technology, it is more a set of technologies, a system of systems, and an ecosystem of hybrid analogous and digital technologies: sensors, wireless and distributed communication system with some kind of computational capabilities. The perfect vehicles for emotionally contagious desires to occupy and become matter.

 DOI:10.4399/97888548960245

Matter of Concern

A thing, by dictionary definition, is a matter of concern, the concrete entity as distinguished from its appearances, a product of work or activity, an inanimate object distinguished from a living being.

This dictionary definition is much broader than the definition of a mere *object*, it embraces a world of dimensional complexities such as; *a thought, a problem, immaterial in short; something real but not alive, a non-organism; an artefact as the product of craft; or what is defined as a real model or instantiations*.

What is a thing? Heidegger address this very question in his essay "The Thing", building a complex argument about the difference between the thing and the object. In mapping the many aspects of the nature of the thing, he seeks thingness. The thingness of a jug, for instance, 'qua vassel'. This ontological definition considers the jug as made of earthy matter, of being able to be independent and self-supporting, to have sides and a bottom that can contain, but also the void, the negative empty space where the liquid is actually poured and the void that holds the wine or water. He suggests, argues Harman, a sort of permeability between object and things: "An independent, self-supporting thing may become an object if we place it before us." (Harman 2010)

Further down the phylogenetic tree of things Ingold argues for a different kind of transformation. "I want to insist that the inhabited world is compromised not of objects but of things." (Ingold 2004)

And Coyne's hierarchy between *object* and *thing* contemplates a permeability or co-presence by which a *thing* is never a mere *thing* but could be a mere *object*. "You can treat things as "mere objects," but things can't be "mere things", here is the difference. Mere is used as a reductionist adjective that recalls the physical reality. Objects are simpler entities compared to things as they carry values that could be personal or have meaning shared across communities.

> "Thing already carries connotations of significance, history, meaning, memory." (Coyne 2011)

For Hodder, a thing is "an entity that has presence by which I mean it has a configuration that endures." (Hodder 2012). As an entity, the thing has a stable form; it could be an organism or man-made artefact, like a jug or bottle of wine. Its configuration is made to last over a certain life span, it constitutes of matter and somehow its presence resembles an *objectness* or simply suggests an idea of space and time. An object has properties and attributes whereas a thing has relations, value, meaning, origin, history and story.

For the classical philosophical and social doctrines, an object could be everything in the outside world as opposed to the subject; therefore, their opposition defines the subject and the object, by boundaries that separate each, and by their dichotomy. Descartes and Kant established this dualism at the basis of Western philosophy, a distinction that has only been reconciled in the last century. The notion of the thing has undoubtedly been instrumental in this reconciliation, and with consequences that broaden the investigation of polarities, like the human and non-human, mind/body, material world and nature, that will eventually evolve into an extended concept of society. The ramifications of this evolution is forcing many disciplines, sociology and anthropology, archaeology and cultural studies, to re-evaluate foundational aspects of their field.

According to Hodder, the core characteristics of things are summarised in the following five properties:

- **Not inert** - things are in constant transformation, they are not inert. Even the solid rock, says Hodder, erodes. Quoting Deleuze and Guattari, and Ingold things are flows of matter, energy and information;
- **Forgetness** - things embed histories and places that are connected to them as part of the production process or as part of their way of functioning. There is human inclination to forget or not knowing this;
- **Non isolated** - Even without humans, things are part of an inter-related ecosystem. Hence they are not in isolation, they are interconnected;
- **Endurance over temporalities** - they last, most of the time longer than humans but it is just a question of different temporalities;

- **Disappearence** - they disappear in the background of our attention as a frame around a picture or as an iPad.

Hence a thing is a **heterogeneous bundle.** For Hodder's "things are just temporary bundles of matter, energy and information" … **"**Things assemble**"** (Hodder 2012). His argument follows the etymological origin of the word things as expressed by Heidegger. This notion of bundle and assemble is quality unique for the thing.

In his essay "From Realpolitik to Dingpolitik" Latour writes "From objects to things" where he recalls an event as an example of this relational shift and of the fact that things are an assemblage.

> "In the same fatal month of February 2003, another stunning example of the shift from object to things was demonstrated by the explosion of the shuttle Columbia. "Assembly drawing" is how engeneers call the invention of the blueprint. But the word assembly sounds odd once the shuttle has exploded and its debris has been gathered in a huge hall where inquirers from a specially design commission are trying to discover what happened to the shuttle. They are now provided with the exploded view of a highly complex technical object. But what has exploded is our capacity to understand what object are when they have become Ding." (Latour 2005)

The old meaning of the word *thing* reveals a relational and contextual entity, recovering the etymological sense of gathering; the thing is part of a network, a web of relations. A *thing gathers* other aspects outside its physical appearance. There is a level of intimacy in the thing which is totally extraneous to the object, the object in this sense can become a thing in the moment when it starts to *gathers* stories, memories, emotions, knowledge and histories. A thing is identifiable if not in a unique absolute way, at least relatively through traces or elements identifiable by the owner themselves. A thing is part of a flow of life, with history, meaning, value and memory.

No Thing in the Whole World

> "How sad it is!" murmured Dorian Gray, with his eyes still fixed upon his own portrait. "How sad it is! I shall grow old, and horrible, and dreadful. But this picture will remain always young. It will never be older than this particular day of June… If it were only the other way! If it were I who was to be always young, and the picture that was to grow old! For that—for that—I would give everything! Yes, there is nothing in the whole world I would not give! I would give my soul for that!" (Wilde 1891)

Data is the detritus of modern human existence; from the data shadow that trails our financial affairs to the server logs that trace online social interactions, we shed data like dry skin. To fully understand our relationship to data we must grapple with a series of transpositions; of event to data to code to behaviour to experience.

The interaction between individuals operating as part of a networked composite data model brings new understandings of social space. They are no longer a person in a room separated from other inhabitants by walls doors and windows, they are participants in a larger space which requires a shared social responsibility. This is as much a psychological space as it is physical or technological. The interaction of individuals within such a system generates a 'social' space, which, according to Harré (1985), is the 'space' where understanding and knowledge are exchanged and learning takes place. These data spaces exist as much in the minds of the inhabitants as it does in code or on screen.

The complex layering of data within the world has the potential to generate a new space between the physical and the digital. This 'space between' is a conceptual and temporal space, a space which can be experienced through their shared interactions with it. An entanglement that frees us from outmoded perspectival models. This telematic activity, as Sermon (1997) describes, "is nothing without the presence and interactions of the participants who create their own television programme by becoming the voyeurs of their own spectacle."

Through this active participation with the data we harvest from the world and disseminate back into it, we are forming a social, spatial and temporal consciousness. As the speed, scope and quality of these data feeds accelerates we have the potential to extend ourselves beyond traditional social and psychological models of intelligence and cooperative processes.

> "(…) people operate as a type of distributed intelligence, where much of our intellect behaviour results from the interaction of mental processes and the objects and constraints of the world and where much behaviour takes place through a cooperative process with others." (Norman 1993, 146)

These relationships we have with 'data' sits hand in glove with the emergence of parallel data world that reflects and mimics our material world. At a time where every 'thing' {body, object, event, relationship, probability, possibility, model, scenario} generates more data per second than grains of sand in the heavens (allegedly somewhere between the size of Wales and however many football pitches) it is important that we face up to this dynamic 4 Dimensional portrait we have in our collective attic, if only to ensure we are aware which is the more grotesque – the painting or the subject itself.

Inevitably scale is a problem here, the reciprocal repercussions of a single 'thing' has the potential to generate a series of interconnected data streams. Could it be that data is the missing dark matter in the universe? Every nanosecond of every day petabytes of data is generated in an attempt to build the perfect portrait of our activities. The sheer volume of data threatens to drown the objects it reflects. Data falls away from 'things' like epithelia at a crime scene. One would have thought that the equation - 'things' to 'data' - would balance in some cosmological algorithm. But, as the dust builds up at our feet we may wonder if data in fact constitutes 83% of the universe, an ever-increasing figure that threatens to one day pop us out side of the Standard Model of Cosmology.

There is a data picture in our attic, and whilst we may endeavour to rule out factors that disturb specific causal relationships, it is clear that without the appropriate instruments to decipher and recognise our own image there may as well be nothing in the whole world. As above, so below…

The algorithms we now witness (as invisible as they are) organising our big data, sorting our social contacts, recognising our faces and managing our financial systems have been in our dreams for centuries. They are now emerging as forces within our social milieu as a necessary emergent property of the complex systems that exist in the excitable media of the 'Cloud'. They provide an intimate relationship with Big Data, a new forms of collective mind which manifests centuries of human desire.

A/Symmetrical Society

In "Reassembling the social", Latour redefines the notion of the social (Latour 2005), a social made not of stabilized matter not of subjects, not of objects but of relations, thus the social becomes "a very peculiar movement of association and reassembling." (Latour 2005)

What is immediately clear from Latour is that the social as a concept is not a contraposition of entities but a relational state that includes material and immaterial entities, human and non-humans. This relational state enables the composition of an extended society or societies redefined by means of associative connective forces.

This relational model originates heterogeneous mixes of entities, removing the orthodox dualistic divisions, which kept Western thought locked in a similar position for centuries. The metaphor of the network used to describe the new social dimension emerging from the advent of the global network of the Internet and the social web has endured for the last few decades. However, a new ecosystem is emerging, both from a socio-philosophical, media and engineering perspective, and new metaphors are needed to support this evolution.

These new metaphors must embrace a philosophical perspective that attempts to remove the dualistic friction that animates traditional thinking and transforms everything into nodes (Latour) or lines (Ingold). This ecosystem is symmetrical in the flows that hold it together AND asymmetrical for the entities that are part of it, immanent and evolutionary in its nature. The traditional anthropocentric and then sociocentric vision at the very basis of the ontological and epistemological understanding of the world are then dissolved into a new social dimension.

A presentiment of Latour's *network* and Ingold's *meshwork*, can be found in Darwin's *Origin of Species*. He observes the underlying algorithms that define complex ecosystems that create an entanglement of species. He revisits this legacy in 2007 (if in name only), with the launch of *Darwin ecosystem* (http://darwineco.com/), an IBM partner company that provides analytic services by means of big data and cognitive computational system. Such systems articulate a new *entangled* of people, animals, things and data, an emergent morphology and topography of forces and flows that defines the nature of the Thingbook.

Thingbook Algorithm, The New Morphology of Entities and The Topography of Things

> "Science and technology multiply around us. To an increasing extent they dictate the languages in which we speak and think. Either we use those languages, or we remain mute." (Ballard 1974)

To date, the Internet has been considered as the Internet of People (Nold and Kranenburg 2011). The constituent engineering vision of the Internet of Things is exemplified as the Machine to Machine (M2M) network. The Thingbook is a bridging mechanism between these separate networks. It is a place where conversations between people, animals, things and data can take place. It is a language, and like all language the Thingbook is essentially metaphorical. It is interesting to contemplate the Thingbook, entangling many people of many kinds, with cat faces smiling in the trees, with various things flitting about, and with data crunching, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by algorithms acting around them.

References

Ashton, Kevin. "That 'Internet of Things' Thing. In the real world, things matter more than ideas." *RFID Journal* (2009). Available at http://www.rfidjournal.com/articles/view?4986 Accessed May 24, 2016.

Ballard, J.G. *Introduction to the French edition of Crash!* Columbia: 1974.

Bell, Genevieve, and Paul Dourish. "Yesterday's tomorrows: notes on ubiquitous computing's dominant vision." *Personal and Ubiquitous Computing* 11.2 (2007): 133–143.

Brown, Bill. "Thing Theory." *Critical Inquiry* 28.1 (2001): 1–22.

Candlin, Fiona, and Raiford Guins. *The Object Reader*. New York: Routledge, 2009.

Chijiiwa, Hitomi, Hika Kuroshima, Yusuke Hori, James R. Anderson, and Kazuo Fujita. "Dogs avoid people who behave negatively to their owner: third-party affective evaluation." *Animal Behaviour* 106 (2015): 123–127

Coyne, Richard. "No-thing as it seems." Available at http://richardcoyne.com/2011/04/23/nothing-as-it-seems/ Accessed April 23, 2011.

Darwin, Charles. *On the Origin of Species.* London: John Murray, 1859.

Harman, Graham. "Technology, objects and things in Heidegger." *Cambridge Journal of Economics* 34.1 (2010). doi: 10.1093/cje/bep021.

Harré, Rom, David Clarke, and Nicola De Carlo. *Motives and Mechanisms: An Introduction to the Psychology of Action.* London: Methuen & Co Ltd., 1985.

Hodder, Ian. *Entangled: An Archaeology of the Relationships Between Humans and Things.* New Jersey: John Wiley & Sons, 2012.

Holden, John. *Capturing Cultural Value: how culture has become a tool of government policy.* London: Demos, 2004.

Ingold, Tim. “Beyond biology and culture. The meaning of evolution in a relational world.” *Social Anthropology* 12.2 (2004): 209–221.

ITU. *ITU Internet Reports 2005: The Internet of Things*. Geneva: ITU, 2005.

Kramer, Adam D. I., Jamie E. Guillory, and Jeffrey T. Hancock. “Experimental evidence of massive-scale emotional contagion through social networks.” *PNAS: Proceedings of the National Academy of Sciences of the United States of America* 111.24 (2014): 8788–8790. doi:10.1073/pnas.1320040111

Kuniavski, Mike. *Smart Things. Ubiquitous Computing User Experience Design*. Burlington: Morgan Kaufman, 2010.

Latour, Bruno. *Reassembling the Social. An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press, 2005.

Nold, Christian, and Robert van Kranenburg. *The Internet of People for a Post-Oil World*, edited by Khan Omar, Trebor Scholz, and Mark Shepard. New York: The Architectural League of New York, 2011.

Le, Quoc V. “*Building High-level Features Using Large Scale Unsupervised Learning.*” In *2013 IEEE International Conference on Acoustics, Speech and Signal Processing*, 8595–8598. IEEE, 2013.

Norman, Donald A. *Things That Make Us Smart*. Reading, MA: Addison-Wesley, 1993.

Proyas, Alex. *Dark City.* Mystery Clock Cinema, 1988.

Scott, Ridley. *Blade Runner.* The Ladd Company, 1982.

Sermon, Paul. “From Telematic Man to Heaven 194.94.211.200.” In *Conference Proceedings Consciousness Reframed* 1997, Newport: University of Wales College, 1997.

Turing, Alan. “Computing Machinery and Intelligence.” *Mind* 59.236 (1950): 433–460.

Vincent, James “Twitter taught Microsoft’s AI chatbot to be a racist asshole in less than a day.” *The verge*. March 24, 2016. Available at http://www.theverge.com/2016/3/24/11297050/tay-microsoft-chatbot-racist. Accessed April 26, 2016.

Wilde, Oscar. *The Picture of Dorian Gray. The Complete Works of Oscar Wilde*. Oxford: Oxford University Press, 1891.

DigitCult | Scientific Journal on Digital Cultures

The Public Use of History in the Digital Society

Rosa Tamborrino
Politecnico di Torino
Viale Pier Andrea Mattioli, 39
10125, Turin, Italy

Abstract

The paper focuses on Digital History as part of the new cross-sector area of Digital Humanities. It highlights innovation in the field, and its impact both on research and on society. It also addresses the matter of historians' responses to the demands of digital society to create cultural conditions for a public use of historical knowledge.
The paper leads with the changes in the field with respect to interdisciplinary cooperation, dissemination, and to a new approach to "making history". It discusses the digital approach as a method, from various standpoints, breaking with the traditional scholarly discourse: by linking digital historians across traditionally more discrete disciplines of history; by producing a more open attitude to interdisciplinary research; by inspiring in historians a more engaged awareness concerning the objective of increasing historical culture in a broader audience.
The paper also discusses how digital outcomes can innovate the notion of combined research. The re-use of digital products through a new kind of open access to paradata can allow researchers to implement data, pursue research, and foster knowledge.
This contribution also reflects on the relationships between historical research and Cultural Heritage fruition, underlining the perspective of digital outcome dissemination through museums as non-formal education providers.
Lastly, the paper expresses the hope that a new, faster dissemination of research employing the digital approach will develop, as will a debate in the wider context of digital cultures, and also that networking the community will be enhanced.

Published 30 May 2016

Correspondence should be addressed to Rosa Tamborrino, Politecnico di Torino, Viale Pier Andrea Mattioli, 39, 10125, Turin, Italy. Email: rosa.tamborrino@polito.it

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

 DOI:10.4399/97888548960246

Introduction

In recent times, digital approaches have been applied in many different branches of the humanities and have led to the creation of a major new cross-sector area which brings together disparate expertise and necessitates interdisciplinary cooperation. The digital approach is a common denominator in specialised research and teaching as well as in archival practices, dissemination and publishing. Above all, though, it links people with a specific forma mentis.

Looking at this cross sector from an academic point of view one can see that it stimulates a new kind of cooperation among traditional disciplines. Today's researchers, indeed, much more than just making use of digital tools, are seeking a new digital perspective: what in this approach is the common element capable of creating shared knowledge?

This is ongoing change requiring an open-minded point of view which can really foster profound innovation, both in culture and in society, and researchers and academics have a crucial role to play to achieve this.

Digital History, as part of Digital Humanities, also includes new approaches in research and in dissemination. Our task is to discuss and to publish how historians are using digital potential in “making history”.

This approach could also prove very effective in fostering both a culture of history and one of participation in society. The result expected, however, goes beyond simple access to historical information, with the creation of a cultural condition for public access to historical knowledge. It should ultimately shape new interactions in the construction of the collective memory, and, as such, it can be a fillip to social and cultural development at large.

History + Digital

Digitisation has been but the first change wrought in the historical field through digital technology and, in the space of a few years, online resources, open access collections and publications have increased in number enormously with the result that historians have suddenly gained access to masses of new data – records, images, information – preserved in archives and collections worldwide.

This change, however, is more than a mere increase in volumes of data available, and today electronic resources are actually fostering fresh studies born of a digital approach to research (i.e. increased visual reconstruction, increased spatialisation, increased comparative perspective). History + Digital offers history a new vision and, above all, a new impact.

Digital History self-evidently includes many different focuses on history related to the expertise supporting specific methodologies and sources. The literature related to these branches has begun to characterise these features by adding the word “digital” to each discipline, for example Art+Digital+History (Fisher-Swartz 2014). The same attribute can be applied for Architectural historians, Archaeologists, Egyptologists, Geographers, Medievalists, Social historians, Political historians, Urban historians, Economical historians, and so on, **making their Histories digital**.

Notwithstanding this, it is the method which is of importance to us rather than nomenclature. In fact, Digital History within disciplines is providing some reflections on how to handle such strong change.

Social historians have created the expression “spatial turn” to define the success of the new tendency of historians to link their research to the space that is the widespread use made in the field in recent years of Geographic Information Systems (Bodenhamer 2013). Art historians have also been assessing effects and new directions (Joyeux-Prunel, Dossin and Matei 2013). Historians with a background in architecture, too, have been pondering whether and how to apply their specific skills to the visualisation of architecture and of physical space in general. As a result of their particular academic background they are used to visualising their thinking and projects in space, and thus they may try to apply the same approach to telling the history of architecture and the city (Picon 2014).

In the 19th Century, and coinciding with the beginnings of an historical approach to the past, the invention of photography strongly influenced historical studies and archaeological discoveries. Returning from a mission in Greece the Frenchman Baron Gros marvelled at how, from his own home and simply by examining a daguerreotype image taken on site, he had been able to discover a detail overlooked at the time of his visit to the Acropolis.

The art critic Francis Wey evoked this “discovery” by Gros in the journal *La Lumière* in 1851 (Wey 1851), to highlight the potential of images in enhancing observation intended to find new bases for interpretation. Nowadays, the resource which is improving surveying, analysing and understanding is digital. Just as at that time photography was not just an instrument reproducing reality, digital is not just a tool representing knowledge.

In some ways, historians like other scholars are already familiar with the digital world, however, while search engines and some basic software are used on a daily basis, a digital approach is not yet a common language for them with regard to innovating tools and methods in the discipline.

GIS, 3D models, datasets are such tools, but it is how they can be moulded into useful instruments for improved collecting and managing of data, surveying, and for developing interpretations by **asking new questions** that is of interest to us.

Furthermore, important pioneering contributions have approached Digital Humanities from a scientific and systematic point of view (Schnapp 2008; Burdick 2012). Some books also have already stressed the fact that “technology is changing the field of history but in more complex and interesting ways than simply the conversion of sources and documents into digital form“ (Weller 2013). Weller's book, History in the digital age, and some others, such as Digital Urban History: Telling the history of the city in the age of the ICT revolution edited by the author of this article, have initiated a discussion on the effects of ongoing change in the field. The texts collected within the two books have illustrated various approaches and case studies from several specialised fields within the broad framework of History.

However, this change is too fast to be pinned down accurately in a book. In the space of a couple of years many more historical digital outcomes have experienced new models, in parallel with an enormous new quantity of digitised data available. On the one hand these results are tied up with the development of the knowledge in each specific field, and on the other hand the lessons learned by using digital tools in a single field are important for a comparative perspective with other Humanities disciplines. Thus, this new approach links digital historians across disciplines of history which have previously tended to be quite separate.

Open Access Research

In the presence of change which has the effect of a bomb on the academic world, the impact of Digital History, and parallel fields, has, as yet, been largely underestimated by academics. Results and methodologies are quite different when compared with the state of the art of disciplines.

Outcomes are the results of **combined research** resulting from the cooperation between researchers. Research projects deal with large surveys managing considerable quantities of mainly heterogeneous data (e.g. archival records, iconographies, maps, drawings, statistics, information), and often combine various digital systems for the purpose of collecting data or of representing knowledge (e.g. datasets, GIS, 3D models, video). Therefore, unlike the traditional approach to history, generally based on individual research, digital research presupposes **teamwork** as a basic methodology.

The team generally consists of experts from different backgrounds and in consideration of the need to shape digital systems and software – and not merely to use them –, what emerges is a basic combination of Humanities and Technologies. Lastly, it includes relationships related to Cultural Heritage, because of the ‘**usability’** of its survey and its fruition. For all these reasons research and outcomes are strongly **interdisciplinary.**

The cross-sectorial approach is beginning to find a place for itself at dedicated conferences - with, for example, *Digital Heritage Conference* being among the most popular and well-attended in Europe – in terms of “Analysis and Interpretation”, albeit under a conference topic on “Computer and Information Technology”. Thus, specialised thematic sessions for “digital

fans" are also held in each historical specialist symposium. It is recognized in some quarters as an academic field, what is certain is that it is, at the very least, comparable with a **community**.

The Digital History community is estimated to be larger than the literature acknowledges as it is quite difficult to disseminate its outcomes. The static and two-dimensional nature of traditional prints is ineffective in illustrating the dynamic process and interactive systems of digital results. As such, digital outcomes also demand **innovation in academic publishing** in such a way as to effectively provide documentary evidence of digital research.

What ensues breaks with the traditional scholarly discourse from various standpoints: it introduces new relationships between written texts and images by transcending "the linear structure of verbal description" (Davis 2011); in a way, it disrupts the "quiet complicity" between history and the written word with a wide range of effects on publications (Tredinnick 2013).

Disseminating research and **networking the community** might prove a stimulus to a more thoroughgoing innovation of research procedures. Open access to publications and digitised sources is an important step towards a new democratic approach to knowledge.

Ultimately, the question is: will it be possible to create really innovative open access for research outcomes?

Scholars are generally very protective of their collected data. Could the digital approach contribute to a sea change in mentality by increasing cooperation among researchers?

Outcomes conceived by digital history, such as datasets, virtual reconstructions or mapping issues, are obviously the results of data interpretation. **Open access** to digital outcomes should mean something more than just "digital reading". The new systems allow the outcome to include collected sources and to provide evidence of the link between data and their processing. In conclusion, systems can show the research as a whole, data and shaped information, by linking interpretation to records.

This is a very important opportunity, particularly in a dynamic field ungoverned by common agreements about procedures and criteria for sharing. Visualised information implies a "manipulation" and researchers should open up the process of computer-based visualisation (Bentkowska-Kafel 2013).

Open access also presupposes availability of **keys** to systems (paradata) so that other researchers, with their own input, can enter the process in order to check/use/pursue/transform the previous results and ultimately **re-use the research**. Such open access to research would increase participation by fostering the notion of a **shared research community**.

A digital research project mentality is to be established and fostered through new data acquisition. For this reason, it requires strong "digital collaboration" among researchers, and the institutions where data are preserved, such as archives, libraries, museums (Levy, Turner 2010).

This approach also stimulates **sustainability**. Scholars have highlighted how difficult any form of re-use of digital heritage contents is nowadays, despite the best efforts of galleries, libraries and museums to release their digitised contents online through open licensing (Terras 2015). In this context, copyrights, too, represent a very significant challenge.

Participation

In the early decades of the 20th Century Walter Benjamin studied the effects of mechanical reproduction on Art. Benjamin analysed the changes in the status of the work of art called into question by procedures of mass production. He noted that quantity produced several effects, even in understanding the quality of the work of art by improving its communicative nature. Benjamin, first and foremost, took as his starting point a reflection on the increasing masses of participants determining a new and different participation.

Digital society asks now for a new kind of participation. Does this request also extend to History?

The effects of the use of Information and Communication Technologies in the telling of history lie surely in their capacity to make content easy to grasp. Data visualisation in space and time creates an immediate orientation for the interlocutor who becomes active in querying and deep information.

In a certain way, this approach seems a sort of awakening within the discipline, and has created a sort of passion for "bringing history to life and reaching a wider audience using

cutting-edge technology" (Mizzy 2003). And even if some phrases such as "calls to action" are considered "redundant", the digital "is irrevocably part of the field" (Fisher and Swartz 2014).

Nonetheless, survey show that many historians remain sceptical, to say the least, about the use of digital tools in their field (Zorich 2013). There may be various reasons underlying this attitude, including the generation gap in the use of new technologies. Other reservations concern historians' fear that a confusion between **history and memory** might arise generating a sort of "convenient" research for the confirmation of theses.

These implications are related to the applied research for Cultural Heritage and its dissemination to a generalist public. Translating history through digital tools for 'a mass consumer' could impoverish the complexity of the research and simplify the richness of its interpretations. In this light, Digital Heritage could risk becoming merely entertainment.

Academics need to continue to discuss some illusory freedoms created by digital technologies and the web. Some scholars have already raised the alert that "we should be aware that this "freedom" has also a downside to it. It jeopardizes the role of the academics and heritage workers as informed brokers or gatekeepers to the information" (Stabel 2014). Creativity and freedom of research are essential to the advancement of knowledge.

Regardless of the above, the relations between History and Cultural Heritage are undeniable and the effects of digital approach, in this area, are very important for social involvement. Researchers should play a role reflecting the increasing public interest for Cultural Heritage. They should aim to meet the general public's demand for historical content.

Europe has **highlighted** the democratic effects of the digital society, and to this end it fosters new national policies in public institutions. Indeed, in some cases, governments really have adopted technology "focusing on innovation rather than organizational change or skill development" (Navarrete 2014). The European Research Council fosters research projects to devise ways to increase citizens' awareness by making complex content easy to understand.

The use of history and the effects that this knowledge can produce on the users is the most salient feature of the ongoing change. Some have observed that virtual heritage projects "focused either on 'process' or 'product' but rarely consider 'users' (end-users' perception of the content)" (Rahaman and Beng-Kiang 2011). Interactional settings need to be enhanced in order to engage societal actors and integrate the concept of history.

In this way, Digital History can be a real revolution in the uses of history. If digital tools improve access to knowledge, how can digital history really improve historical knowledge in society? What is the public use of history that this perspective affords?

What's New in Digital History?

From an academic perspective, Digital History has also given rise to new teaching and learning. Digital History may also be understood as a way to provide students access to historical documents and texts. This is true of projects developed at the turn of the century by some universities (such as that of the Department of History and the College of Education at the University of Houston, in collaboration with other organisations, including the Chicago Historical Society and the Gilder-Lehrman Institute of American History). In the meantime, some models from pioneering laboratories such as the Stanford Humanities Lab developed by Jeffrey Schnapp now leading the Harvard **MetaLab** have given rise to research centres bringing digital into **research on humanities**.

Academic literature has begun to discuss the change in teaching, while some reflections and some experimental courses also include the creation of a new collaborative model (Bruzelius 2013). Still, notwithstanding its pervasiveness in everyday life, the digital approach has not been fully developed in teaching/learning, particularly as concerns compulsory education.

The consequences are very important, also when considering the changed cognitive methods of digital natives. New 'digital historical products' could produce strong effects, with a range of repercussions including that on the meaning of history in society. An innovative use of the digital approach in the historical field, in fact, could make documentary research, records and information highly accessible, which would make an enormous impact on society. Only in this way can it create genuine **meaningful public access** to historical information.

 DOI:10.4399/97888548960246

I would like to relate a personal experience which explains this impact. Some years ago, my thirteen-year-old son was studying for his final exam at school. His teachers asked him to try to condense his learning in the various subjects in the three years of junior high school. It was not easy to combine the different parts of the syllabus, such as literature, history, geography, maths, not to mention technology, so removed from the rest. He was greatly stressed and unhappy because he was unable to find points of contact among the different fields.

So, I looked into the matter with the intention of supporting his efforts. We started with 'history', obviously because he found it so very boring. He had to read the script of *Allons les enfants* and the story of the Jewish children was not boring at all, it was horrific. Are the young generation unaffected by the Holocaust? Are the new generation uninterested in history today?

I keyed in on his computer the URL http://tetrade.huma-num.fr/Tetrademap_Enfant_Paris/ and I showed him this important project conducted by Jean-Luc Pinol at the French CNRS about the Holocaust in France.

The basis for this project was an enormous quantity of data collected and published over several years by an eminent French Jewish researcher. Data referred to the deportation of 11,400 French children from France. The project was prompted by the *Mission d'étude sur la spoliation des Juifs de France* published in 1979. The book represented a life's worth of research by Serge Klarsfeld, who was able to identify people, names, places, dates defining deportation routes and territories in the pursuit and prosecution of Nazi criminals. This book runs to more than 800 pages.

The digital project arranged and made all these data and research accessible online. A GIS identifies places linked to a database with information about the children: the date when each one was taken from their homes, the number of children in each family and their ages. This GIS is chilling in its terseness.

My son was no longer bored. He could not stop reading and checking. He found streets in Paris thick with markers, and others with none. At long last, he was able to find a link between history and geography, to find relationships with literature and statistics, and lastly he could link history and digital technology. Fundamentally, he could 'measure', by visualising it in a real space, and understand something about the Holocaust.

The project represented the enormous body of knowledge behind this research through the visualisation of data. And it did something more fundamental in the process: it made this aspect of history really public and accessible.

This personal story exemplifies one basic notion: digital history can change **public use** of history with strong effects on users.

Exhibiting History

In the early 19th Century an historical reconstruction was exhibited by an unusual museum based on the display of remains of buildings demolished in the wake of the French Revolution.

The *Musée des Monuments Français* remained open for a few years only. It was perhaps the first public museum intended to exhibit history. The aim of its creator, Alexandre Lenoir, was to use the collection of remains and artworks to tell a story connecting visitors to French history.

This unusual *tutorial* was quite important in teaching people about the origins of the nation in a period of significant changes.

The result was an itinerary which proved very effective in its appeal to public, even if the museum's interpretation was not completely scientific. The public liked the exhibition because they felt as if they were in an **immersive space** directly linking them to the past. The exhibition made the same history accessible that historians (i.e. Michelin) were turning into books. Young people were also impressed by the museum. The architect Viollet-le-Duc, for example, remembered years later how the visit encouraged him to further his studies on medieval architecture.

More history museums followed in France and around Europe, such as museums of the city, and archaeological collections. At the same time, art museums introduced an historical approach into the way in which they displayed collections, too; education has, after all, always been an important aim for museums.

Digital displays, full immersion rooms, virtual reproduction are a sort a development of these same goals. **Museums turn to digital** tools in order to appeal to the public and to attract digital

natives. In the meanwhile, Virtual Reality and the web introduce new kind of exhibitions. Virtual Museums are largely a challenge for Tangible Heritage and, for this reason, they also represent a challenge in the moulding of an architectural approach to Digital Heritage.

Digital tools (e.g. photogrammetry-scaled rectified photography, laser scanners), in fact, capture and acquire a wide range of physical objects. The results can be used in a wide range of applications. Nonetheless, the use in the field of historical analysis and heritage conservation still needs to be addressed as "a significant gap exists between the information needed by professionals working in the field of conservation and manufacturers claims of these new technologies" (Quintero, Blake and Eppich 2007).

Museums and Virtual Museums can play a strategic role as **non-formal education providers**. Media experts generally create displays for museums "translating" the state of the art in the literature on the subject. Some of these displays are very interesting and attractive but are generally conceived to capture the attention as a form of edutainment and they remain rather traditional in terms of their content. Does a collaborative endeavour involving researchers in academies and in museums, media experts and museums operators produce a museum which is more dynamic in experimenting with content and link the furtherance of knowledge and research to the general public?

Museums, both traditional and virtual, are the most effective meeting points for expertises connected by a common digital language and, as such, they will have to try to contribute strongly to making research outcomes accessible to a wide audience. Through museums Digital History (Art History, Urban History, Archaeology, Egyptology, and so on) and Digital Heritage outcomes **encounter users**. Such an innovative cross-sectoral approach can complement the concept of schooling of today.

Search engines such as Google have allowed easy access to historical information for the public at large but access to information alone is not sufficient to create genuine equity. This access, without appropriate cultural instruments, is illusory. Digital History displays data interpretation which is creating a framework in which historical events and Cultural Heritage take on meaning. In this context digital tools help users to bridge the knowledge gap by 'making visible' meanings and developments.

Ease of use can conceal the complex research behind it as well as the complex structure necessary to communicate the data. In this regard, the goal of academic research and museums displays is to produce rich narratives without compromising scientific accuracy.

Several years ago the Jewish German art historian Richard Krautheimer wrote about the change in his studies on Roman architecture when, in the Thirties, he had to emigrate to the USA. In this short biographical note he recollected how the art historian Panofsky had been wont to say: "the one with the most photographs wins". The luminary highlighted the importance of visual information in research. In the same note, though, Krautheimer also mentioned that he had been wrong in some aspects of his studies on Armenia because he had not travelled there to visit its monuments.

Museums are very active in producing virtual heritage and in fostering their web sites, to the extent that some fear that virtual museums might take the place of real visits to museums and Cultural Heritage. Nevertheless, the uses of VR are ever more integrated with other tools such as Augmented Reality for the fruition of Cultural Heritage, and such integrated platforms and Apps are mostly conceived as supports to visits and as pre-information for visitors.

In the final analysis, we believe that historical research is undergoing structural change and demands reflection. In parallel, the digital society develops new demands. This journal's mission is to network researchers and to encourage scientific exchange in the field in an essentially transdisciplinary perspective.

References

Bailey, Donald Russell. “Creating Digital Art History: Library, Student, and Faculty Collaboration.” *International Journal of New Media, Technology & the Arts* 10.2 (2015): 1–10.

Bartosz, Kosma et al. “Digital/History: Using New Technologies to Enhance Teaching and Research”. *College & Research Libraries News* 66.5 (2005): 400.

Benjamin, Walter. *L’oeuvre d’art à l’époque de sa réproduction mécanissée*. Pierre Klossowski trans. Frankfurt: Zeitschrift für Sozialforschung, 1936.

Benjamin, Walter. *Aura e Choc Saggi sulla teoria dei media*. edited by Pinotti Andrea and Antonio Somaini. Torino: Einaudi, 2012.

Bentkowska-Kafel, Anna. “I Bought a Piece of Roman Furniture on the Internet. It's Quite Good but Low on Polygons. Digital Visualization of Cultural Heritage and its Scholarly Value in Art History.” *Visual Resources: An International Journal of Documentation* (2013).

Berry, David M. *Understanding Digital Humanities*. London: Palgrave Macmillan, 2012.

Bodenhamer, David. “The Spatial Humanities: Space, Time and Place in the New Digital Age.” *History in the Digital Age*, edited by Toni Weller, 23–38. London-New York: Routledge, 2012.

Brügger, Niels. “When the Present Web is Later the Past: Web Historiography, Digital History, and Internet Studies.” *Historical Social Research/Historische Sozialforschung* 37.4 (2012): 102–117.

Bruzelius, Caroline. “Teaching with Visualization Technologies: How Does Information Become Knowledge?” *Material Religion* 9.2 (2013).

Burdick Anne et al. *Digital_Humanities*, Cambridge: MIT Press, 2012.

Calabi, Donatella. *Built City, Designed City, Virtual City: the Museum of the City*. Rome: Croma, 2013.

Classen, Christoph, Susanne Kinnebrock, and Maria Löblich. “Towards Web History: Sources, Methods, and Challenges in the Digital Age. An Introduction.” *Historical Social Research/Historische Sozialforschung* 37.4 (2012): 97–101.

Davis, Michael. “‘Ci poes vos veir’: Technologies of Representation from Drawing to Digital.” In *New Approaches to Medieval Architecture*, edited by Robert Bork, William Clark and Abby Mcgehee, 187–233. Farnham: Ashgate, 2011.

Dougherty, Jack, and Kristen Nawroki. *Writing History in the Digital Age*. Ann Arbor: The University of Michigan Press, 2013.

Fisher, Michele Millar, and Anne Swartz. “Why Digital Art History?” *Visual Resources: An International Journal of Documentation* 30.2 (2014): 125–137.

Guldi, Jo, "What is the Spatial Turn?" *Spatial Humanities*, Institute for Enabling Geospatial Scholarship, University of Virginia. Available at http://spatial.scholarslab.org/spatial-turn/ Accessed May 28, 2016.

Joyeux-Prunel, Bèatrice, Catherine Dossin, and Sorin Adam Matei. "Spatial (Digital) History: A Total Art History? — The Artl@s Project." *Visual Resources: An International Journal of Documentation* 29.1/2 (2013): 47–58.

Klarsfeld, Serge. *Le Mémorial de la déportation des Juifs de France*. Paris: Association des Fils et Filles des Déportés Juifs de France (FFDJF), 2012.

Krautheimer, Richard. "Invece di una prefazione." *Architettura sacra paleocristiana e medievale e altri saggi su Rinascimento e Barocco*. Torino: Bollati Boringhieri, 1993.

Levy, Trudy, and Adrian Turner. "Evolution of a Digital Collaboration: California's Local History." *Visual Resources Association Bulletin* 37.2 (2010): 13–17.

Mizzy, Danianne. "Bringing history to life." *College & Research Libraries News* 64.9 (2003): 596–597.

Navarrete, Trilce. "Becoming Digital: A Dutch Heritage Perspective." *Journal of Arts Management, Law & Society* 44.3 (2014): 153–168.

Picon, Antoine. "L'architecture saisie par le numérique: théorie, histoire, archéologie/The Digital Capture of Architecture: Theory, History, Archeology." *Revue de L'Art* 186 (2014): 83–89.

Pinol, Jean Luc. "Mapping the Deportation of Jewish Children from France, 1940-1944. GIS, Memory and History." In *Digital Urban History: Telling the history of the City in the Age of the ICT Revolution*, edited by Rosa Tamborrino, 49–57. Roma: Croma, 2014.

Quintero, Mario Santana, Bill Blake, and Rand Eppich. "Conservation of Architectural Heritage: The Role of Digital Documentation Tools: The Need for Appropriate Teaching Material." *International Journal of Architectural Computing* 5.2 (2007): 239–253.

Rahaman Hafizur, and Tan Beng-Kiang. "Interpreting Digital Heritage: A Conceptual Model with End-Users' Perspective." International Journal of Architectural Computing 9.1 (2011): 99–114.

Schnapp Jeffrey. "Animating the archive." *First Monday*, 13.8 (2008). DOI http://dx.doi.org/10.5210/fm.v13i8.2218

Stabel, Peter. "Opening a Pandora's Box? an Essay About The Pitfalls of Digital History and Digital Heritage." In *Digital Urban History: Telling the history of the City in the Age of the ICT Revolution*, edited by Rosa Tamborrino. Roma: Croma, 2014.

Tamborrino, Rosa. *Digital Urban History: Telling the history of the City in the Age of the ICT Revolution*. Roma: Croma, 2014.

Tamborrino, Rosa. "The Making and the Sharing History of The City for a Human Digital Age." In *Digital Urban History: Telling the history of the City in the Age of the ICT Revolution*, edited by Rosa Tamborrino. Roma: Croma, 2014.

Tamborrino, Rosa. "Searching for a State-of-the-Art Public Space: City Museums Among Archives and Networks." *Planning Perspectives* 27.3 (2012): 463–473.

Terras, Melissa. “So you want to reuse digital heritage content in a creative context? Good luck with that.” *Art Libraries Journal* 40.4 (2015): 33-37.

Theibault, John. “Visualization and Historical Arguments.” In *Writing History in the Digital Age*, edited by Jack Dougherty, and Kristen Nawroki, 173–185. Ann Arbor: The University of Michigan Press, 2013.

Tredinnick, Luke. “The making of history. Remediating historized experience.” In *History in the digital age*, edited by Toni Weller, 39–60. London-New York: Routledge, 2013.

Weller, Toni. *History in the digital age.* London-New York: Routledge, 2013.

Weller, Toni. “Conclusion: A changing field.” In *History in the digital age*, edited by Toni Weller, 195–205. London-New York: Routledge, 2013.

Wey, Francis. “De l’influence de l’héliographie sur les Beaux-Arts.” *La Lumière* 9 (1851): 2–3.

Zorich, Diane. “Digital Art History: A Community Assessment.” *Visual Resources: An International Journal of Documentation* 29.1/2 (2013): 14–21.

DigitCult | Scientific Journal on Digital Cultures

The Third Wave of Human Computer Interaction: From Interfaces to Digital Ecologies

Sebastiano Bagnara
Istituto di Scienze e Tecnologie della Cognizione, CNR
Roma, Italy

Simone Pozzi
Master Degree in Design
University of San Marino
San Marino

Abstract

This is an historical moment where machines play an increasing role in all the aspects of human life, with the digitisation of nearly everything and the increasing automation of sectors that were traditionally human-centred. In this contribution we present the forms of innovation that characterise this period, using a distinction introduced by Verganti. We then review the role that the discipline of human-computer interaction can play (and have traditionally played) in this scenario. We end the contribution by highlighting how the complexity of the current situation demands for a discipline that can assist in identifying the questions to be answered, rather than in solving well-defined problems.

Published 16 May 2016

Correspondence should be addressed to Simone Pozzi, University of San Marino. Email: simone.pozzi@unirsm.sm

DigitCult, Scientific Journal on Digital Cultures is an academic journal of international scope, peer-reviewed and open access, aiming to value international research and to present current debate on digital culture, technological innovation and social change. ISSN: 2531-5994. URL: http://www.digitcult.it

Introduction

The recent book of Brynjolfsson and McAfee "The second machine age. Work, progress, and prosperity in a time of brilliant technologies" (Brynjolfsson and McAfee 2014) gives a very interesting overview of current technological trends, trends that are crucial to understand the role of Interaction Design in the design of new technologies, and also more broadly speaking in ongoing innovation processes.

Brynjolfsson and McAfee analyse the recent drivers of digital innovation, maintaining that digital technologies have eventually reached the stage of full maturity and are now disrupting all the human activities, work and leisure. This claim can be seen in relation with the ongoing debate in the Human Computer Interaction community, where practitioners and academics are discussing the goals of the discipline, approaches and methods. For this debate, two papers are especially relevant: Susanne Bodker "Third-wave HCI, 10 years later - participation and sharing" (Bødker 2015) and Harrison, Tatar e Sengers "The three paradigms of HCI" (Harrison, Tatar, and Sengers 2007).

This contribution will discuss the main claims of these works, offering our reading of the role that Interaction Design (ID) could play in these innovation processes. Our main claim is that ID can play a key role in understanding technological innovation in conjunction with social aspects, not only fixing interaction problems and breakdowns, but also enlarging the discussion to values and high level needs, thus setting the agenda and identifying which problems need to be tackled.

Incremental and Radical Innovation

Brynjolfsson and McAfee use Schumpeter's definition of innovation, as "the market introduction of a technical and organisational innovation, not only its discovery". Innovation is achieved only when technological and scientific discoveries are coupled with their social adoption, when they create value by enriching existing practices and methods of work.

Moving from this definition, Brynjolfsson and McAfee maintain that innovation can deliver high impact, i.e. create substantial productivity gains and have a profound impact on society, only when they transcend the boundaries of a specific industrial sector or market segment. High impact innovations need to be general purpose "ideas or techniques and new technologies that have a significant impact in more economic sectors" (Gavin Wright, cit. in Brynjolfsson e McAfee, pg. 84). The hallmarks of these technologies are:

- They are pervasive, as nearly every aspect of human life is now (being) digitised;
- They keep improving incrementally, for instance computational power or bandwidth;
- They can be the basis for other new innovations. The typical case is electricity of the internet, which acted as enablers of other innovations.

Brynjolfsson and McAfee make this point to argue in favour of technology as a driver of well-being and productivity for the next future. Other authors are more pessimistic, stating that all of the increases in productivity and well-being of the last 150 years have been achieved thanks to the maturity of technologies created during the first and the second industrial revolutions, like the combustion engine, or big distribution grids of electricity and water. These technologies have lost momentum from the seventies, after which only small incremental improvements have been made. As compared to the previous phase, these improvements did not significantly alter human well-being, bring about only minor benefits.

To counter this point, Brynjolfsson and McAfee analyse how Information and Communication Technologies comply with all the defining features of revolutionary innovations. ICT are transversal and can be applied in various sectors, their power is increasing exponentially (as described by Moore's law), and they are currently at the core of many other innovations.

Brynjolfsson and McAfee see the latter as the real key advantage of ICT and digital technologies, because it is the prerequisite for the recombination of existing innovations into new ones, with ever increasing impact. Examples include the Google Car: it is a combination of many (relatively) low cost sensors, an internal computer to process this data stream, the enormous

database of information about streets and crossings acquired by Google first by satellite images, then by actually driving on the streets and error reports generated by users of Google services. No one of these elements has been revolutionary by itself, but their combination can have a much greater impact, bringing about drastic changes in one of the key aspects of Western society, i.e. mobility by car. A similar pattern works for services like Waze, where average travel time are calculated by combining street maps, the localisation and speed of Waze users via smart phones, reports sent by users on problems and traffic jams.

Other innovations combine computational power with other elements to perform their work. A typical match is the one with big data, i.e. the capability to record and process a huge number of data. Many of the present applications seem to perform an excellent service because of some form of advance artificial intelligence, whilst the reality is that a large part of the value comes from data that we have provided ourselves (as users). Search engines change their answers by learning where we clicked in the past, or where other users clicked after searching the same terms, car navigation systems learn our preferred routes and log in our actual driving times. E-commerce sites like Amazon or streaming services like Netflix customise their offering analysing what "people like us" is buying and watching. This combination between computational power and big data is the main reason why speech recognition has improved so much in the last years, to the point that now we use voice input to seamlessly send commands to personal assistants like Apple Siri, Microsoft Cortana, Amazon Alexa, or Google Now. In all of these examples, computational power is one of the elements, with real innovation delivered by effective combination with other elements.

Another typical building element is the miniaturisation of sensors. Ambients have become "intelligent" and "aware", by recording our position in space, our movements, by measuring aspects of our daily life like energy consumption, physical exercise, or sleep quality. This interaction with our technologies is "poor", very basic. But it acts as the enabler of more complex and satisfying interactions, as computers now know where we are and, in some cases, also what we are doing: are we standing still at the airport, walking in a touristic area just before dinner time, or driving back home? Interaction has become context-aware. For instance, Google Now can perform searches in the surroundings on the basis of our position and time of the day, trying to guess our needs and search for a good thai restaurant in the area, or notifying us that our flight has been delayed, or giving us the directions and walking time to our new gate.

The key point of Brynjolfsson and McAfee's claim is that all the recent innovations did not bring about any spectacular change, if considered in isolation. While drastic productivity changes and impact on society can be achieved by combining one with the others. Our society does not need a new revolutionary invention to progress, like it was the combustion engine, or electricity. We can be optimistic about the future because we have plenty of minor innovations at hand, with almost unlimited combination among them.

Underlying Brynjolfsson and McAfee's definition of innovation, there is an idea of progressive refinements, a slow process of combining together existing technologies, till society adopts the innovation and makes it widespread. First electrical power gets discovered, then society adapts tools and production methods to it, tries out different combination, to eventually get the maximum value after some years, typically at least 20. Technology does not change, what changes is the combination among technologies, focusing and refining its use and value. It happened for the steam engine, then for the combustion engine, it is happening now for ICT.

Norman and Verganti (Norman and Verganti 2014; Verganti 2009) propose a different conception of innovation, defining two main types of innovation processes (among others):

- Incremental innovation: the progressive improvement of what already exists, "doing better what we already do";
- Radical innovation: it changes the overall framework, "starting to do what we were not doing before".

The incremental innovation refers to small changes to a product, to improve its performance, lower its price, increase its appeal to customers, or introduce new features. According to Verganti, this is by far the most widespread type of innovation. Maybe not as fascinating as radical innovation, but useful indeed.

On the contrary, it is often the other type of innovation – the radical one – that gets referred to whenever designers speak of innovation. Verganti notes how radical innovation is actually very rare. Most of the times, attempts to achieve radical innovation lead to failures, either for

unfavourable market conditions, or for lack of appreciation by customers. Moreover, most of radical innovations do not happen all of a sudden and require the contribution of supporting incremental innovation processes to succeed. As a case in point, Verganti mentions multi-touch interfaces, recently brought to market success by Apple. Apple did not create those interfaces, that had been in use for more than 2 years in research centres of computer science and design. Other competitors had launched similar interfaces before Apple did [REF: Buxton 2007]. The successful introduction of multi-touch interfaces has become an example of radical innovation only because users were finally ready to start using them. But it tools years before that. In the same way, networks like the power grid or the telephone required building a large infrastructure and a critical mass of users before delivering the impact of a radical innovation.

These examples show how the two innovation types are both necessary and bring the highest benefit when combined. Radical innovation often does not achieve their potential and disappoint. They are too expensive, hard to deploy, or too limited in focus. In all of these cases, processes of incremental innovation are needed to refine the initial idea and bring it to something acceptable for customers. Radical innovation creates new frameworks, a potential for change. But this potential turns into reality thanks to incremental innovation: “Without radical innovation, incremental innovation reaches a limit. Without incremental innovation, the potential enabled by radical change is not captured.” (Norman and Verganti 2014, pg.6).

The Three Waves of Human-Computer Interaction

As digital technologies play a key role in today innovation process, disciplines like Human-Computer Interaction (HCI) should be on the forefront of innovation. To understand the role of HCI in innovation processes, Susanne Bodker (Bødker 2015) has proposed to distinguish three waves of HCI.

The first wave is about Human Factors, and it spans the Eighties and the Nineties. In this phase, HCI aims to optimise the interaction between humans and computers, striving for the “best fit”. The analysis focuses on all the interaction problems and breakdowns, of anything that could disrupt the “optimal flow”. The expected end result is a pragmatic “solution” that fixes the problem. Improvements can be measured with performance indicators, or by using formal methods, in structured validation and testing sessions. The typical context of application is the workplace, with users performing well defined and clear tasks.

The second wave is that of the *Human Actors* (Bannon 1991), spanning from the Nineties to the beginning of the next decade. The aim is to improve the work quality and overall effectiveness by optimising the support given by computers. Computers are first seen as tools, primarily to communicate rather than to perform calculations. The analysis focuses on professional communities and work groups, using methods like participatory design, contextual enquiries, and ethnographic study. The expected end result is the optimisations of communication and cooperation flows, improving the support given by computers

The third wave is marked by a multiplicity of approaches. It starts in the year 2000 and it is still lasting. The aim of HCI is now less well defined and the issues being tackled are typically ill-defined ones. Contexts being studied have little structure, e.g. entertainment and free time, arts, home, urban mobility, and so on. The same is for the subjects of study, with topics like culture, emotions, experiences, motivation, and aesthetics… Every project needs to redefine its scope, aim, methods and tools. This third wave is still very dynamic, and there is no shared vision of the role that HCI could play and for which goals.

Adding to Bodker’s analysis, each wave has its own understanding of innovation.

- The first wave seeks innovation by being user-centred. Achieving the best fit is a matter of incremental innovation, eliminating problems one by one.

- The second wave sees the ample participation of users as the key to innovation. Things are changed only by shared action and consensus. We are still talking of incremental innovation, as shared proposals are typically grounded in the current situation, in current practices and communities.

- The complexity of the third wave demands for a different approach to innovation. HCI can now ask questions, rather than answering them, changing the framework and resetting

the problem. It is about a disciplined understanding of what technologies can bring, of the endless combination mentioned by Brynjolfsson and McAfee's.

This key change in the role of HCI is engendered by the redefinition of the object of study. Where yesterday the focus was on the interaction between a specific user with a specific computer (for specified goals), nowadays the interaction is many to many. Humans interact with technologies as part of a digital ecosystem, where the interface is everywhere and every move can be part of the interaction (Pozzi and Bagnara 2015).Our body can be the interface, as we can interact with a computer simply by walking and moving around.

A digital ecosystem cannot be optimised, as there is no clear workflow to improve, there are no clear and stable goals for the interaction. Such a complexity raises more questions than answers: "My health data… If I had access to all these of your data, I could be making a lot of processing about your person… I think that one day something awful is going to happen. At that moment, we will all stop and ask ourselves: why did we let all of this happen? How did it happen?" (Tim Cook, online interview – 11 November 2015).

The point of Tim Cook's reasoning is that we have endless technological possibilities, so we need to confront ourselves with value choices rather than technical ones. These questions cannot be solved by incrementally improving the interactions. We need to set the framework, pick our goals, deciding WHAT we want to do with technologies, critically seeing the implications at the societal level of these choices. "Design is about people. It is about our lives, our hopes and dreams, our loneliness and joy, our sense of beauty and justice, about the social and the good." (Overbeeke 2007). These are questions about the meaning of human-computer interaction, as described by Verganti for radical innovation.

Trends and Emerging Topics in HCI

From the authors' perspective, there are two key topics to be addressed in the current scenario. First, understanding the human body as an interaction means. Second, seeing interactions as distributed in a digital ecosystem. We think that HCI can contribute on both topics, providing concepts and tools to frame the situation and identify the problems and issues to be solved.

The human body is today a key element for the human-computer interaction, thus demanding HCI to go beyond traditional paradigms of cognitive psychology, mostly focused on the mind an information processor, with clearly separated sequential steps of input-processing-output, and with sight and hearing as the predominant input channels. HCI needs to link again with current studies in cognitive psychology and understand the whole human being, body and mind, cognition and emotion.

The human body is a design object, in a certain sense, given that we can easily internalise any tool. So far, we do not know yet if there is a technology that is too diverse from us, to the point that it cannot be internalised. We do not know the boundaries of human body, we do not know which technologies can become second nature and which cannot. Being provocative (but not too much really), David Kirsh asks what is the real difference between a prosthetic leg and "two sets of nine fingered claws that operate in articulate and continuous ways?" (Kirsh 2013).

We also know from embodied cognition studies (Caruana and Borghi 2013) that any change to human body is not neutral from the cognition point of view. Our body gives shape to cognition and two sets of nine fingered claws may change the shape and the contents of cognition in unexpected ways. An integrated understanding of body and mind is a prerequisite also for the effective personalisation of tools and technologies. Every user will use her/his tools differently depending on contexts and her/his own goals, but also considering her/his physical characteristics, including existing disabilities, or new ones (Pozzi and Bagnara 2013).

The second emerging topic is about seeing interactions as distributed in a digital ecosystem, where human-computer interactions happen beyond the interface. We use the term *ecosystem* because human-computer interactions have nowadays a degree of complexity similar to that of natural systems, and because all the system elements are to some extent involved in the creation and exchange of value. A system is alive and healthy if all the elements are alive and healthy, i.e. if value flows across all the system elements and brings benefit to all the elements, not to a limited subset. For instance, when a user is logging to an e-banking system to pay a bill, the bank is getting value from the transaction itself, the user is saving time and gains in flexibility, as s/he can do the operation outside of the bank office hours. But there is more. The session logs will be useful to the home banking system developers to improve the user experience and remove

usability issues, or to better design the system for specific mobile phones or laptops. As a case in point, *service design* speaks of *service ecology*, stressing the analogy with a living system.

In digital ecosystems, interactions happen through a number of touchpoints, different among themselves and dynamically evolving. These touchpoints are "woven together" by social practice, more than by a technological infrastructure. In such a scenario, humans need to possess (or develop) capabilities to read and understand complex situations, ill defined, detecting pattern and anomalies as they emerge. These capabilities are even more challenging as a large part of these ecosystems is not visible, surfacing only when there are breakdowns (Bagnara and Pozzi 2013). HCI can contribute to the design of means to explore this complexity, in order to understand their functioning before breakdowns happen.

We are not referring uniquely to a new technological scenario. Digital ecosystems transform social practice and bear a profound impact on the way we think, we live, we learn. It is a point well captured by the French philosopher Michel Serres in a recent book (Serres 2012). Serres points out that the old fashioned ideologies are no longer capable of providing a unifying perspective on reality. Digital natives see themselves as individuals, whose sociality is made of interactions with other individuals. What is the role of digital technologies in this transition? According to Serres, they have changed our way of learning, our way of acquiring knowledge. After the invention of writing and printing, digital technologies now make virtually all the knowledge available from virtually everywhere, disrupting the traditional learning paths. Such a possibility has undermined the mediating role of the traditional communities and ideologies. The "natural" way of interacting with technologies is now a flow, different every time, where the only structure is given by the way the user chooses to carry out the interaction.

Conclusions

Our society moved away from the use of computers to perform calculations and obtain results - from classic HCI - to a phase where technologies form a real digital ecology - to interaction and service design. Interacting with computers, giving input to screens is only one way of interacting with the digital ecosystems. The interface is everywhere, is fragmented in the environment.

In this scenario, the old fashioned analysis methods of HCI are becoming obsolete, as they focus on "hard" indicators like efficiency or productivity. HCI is now a discipline that should identify the key questions to be tackled, that should define the scope of the technology impact on our everyday life, that should anticipate the future changes brought by technology. It is about themes like what our society wants to achieve collectively, which values we want to be reflected in new technologies, which changes we want to trigger. Today, most of the HCI methods are still intervening tactically, on well-defined topics of limited scope. There are few methods to anticipate and manage future changes, to be able to affect what society is going to do with a certain technology. This transition is needed as we can no longer think of technological innovation as something different and separate from social innovation. The two proceed together, on two separate, but highly dependent, planes.

References

Bagnara, Sebastiano, and Simone Pozzi. "L'infrastruttura Invisibile: La Rete Degli Aeroporti E Del Trasporto Aereo." In *Infrastrutture Tecnologiche e Creazione Del Consenso*, 229–250. Soveria Mannelli, Italy: Rubbettino Editore, 2013.

Bannon, Liam J. "From Human Factors to Human Actors. The Role of Psychology and Human-Computer Interaction Studies in System Design." In *Design at Work: Cooperative Design of Computer Systems*, edited by Joan Greenbaum and Morten Kyng, 25–44. Hillsdale, NJ: Lawrence Erlbaum Associates, 1991.

Bødker, S. "Third-Wave HCI, 10 Years Later - Participation and Sharing." *Interactions* 22.5 (2015): 24–31.

Brynjolfsson, Erik, and Andrew McAfee. *The Second Machine Age Work, Progress, and Prosperity in a Time of Brilliant Technologies*. New York, NY: W.W. Norton & Company,

2014.

Caruana, F., and A. Borghi. “Embodied Cognition: Una Nuova Psicologia.” *Giornale Italiano di Psicologia* 1 (2013): 23–48.

Harrison, S., D. Tatar, and P. Sengers. “The Three Paradigms of HCI.” In *Proc. of CHI 2007*. New York, NY: ACM.

Kirsh, David. “Embodied Cognition and the Magical Future of Interaction Design.” *ACM Transactions on Computer-Human Interaction* 20.1.Article 3 (2013): 30.

Norman, Donald A, and Roberto Verganti. “Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change.” *Design Issues* 30.1 (2014): 78–96.

Overbeeke, C.J. *The Aesthetics of the Impossible*. Eindhoven, The Netherlands: Technische Universiteit Eindhoven, 2007.

Pozzi, Simone, and Sebastiano Bagnara. “Individuation and Diversity: The Need for Idiographic HCI.” *Theoretical Issues in Ergonomics Science* 14.1 (2013): 1–21.

Pozzi, Simone, and Sebastiano Bagnara. “Interattività E Interfaccia.” In *I Media Digitali E L’interazione Uomo–macchina*, edited by Simone Arcagni. Ariccia (Roma): Aracne editrice, (2015).

Serres, Michel. *Petite Poucette*. Paris, France: Éd. le Pommier, 2012.

Verganti, Roberto. *Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean*. Harvard, MA: Harvard Business School Publishing Corporation, 2009.

digitcult
@Scientific Journal on Digital Cultures

Scientific Community on Digital Society [special issue]
Vol 1, No 1 (2016)

Table of Contents

Provocations and Dialogues

In copertina
Andy Warhol, *200 One Dollar Bills*, graphic design by Stefano Morreale.

ISBN 978-88-548-9602-4