The paradox of de/contextualized information:

The case of video production at the BBC Digital Media Initiative

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Abstract

The unfolding of the paradoxical interplay between overarching institutional orders and domain-specific, situated practices has been a central theme of organization studies. With the rise of information and communication technology (ICT), digital infrastructures and the standards they foster are disseminating on a global scale based on the computational rationale of binary-based digitalization. The following paper will delve into this paradoxical interplay by studying digital video as it travels across work practices of broadcasting qua computational standards and processes. Using BBC's Digital Media Initiative (DMI) as a case study, we seek to assess how work practices are affected by the use of digital video throughout the editing process. In particular, we take a semiological approach in order to understand two distinctive image-intensive practices, news and long-form productions, and the ways they changed due to the implementation of a digital infrastructure. Thus conceived, we demonstrate how digitalization as a technical process decontextualizes digital video information, while the work practices related to their management rely on highly contextualized and situated information.

Keywords: digital video, practices, digital infrastructure, information, media semiotics

Introduction

The advent of information and communication technology (ICT) and the diffusion of its computational rationale of bits and bytes into virtually all walks of life is the latest step in a process of standardizing information. Digitalization, in general, has proven to be a resourceful technique to span contexts and domains over space and time (Giddens 1990). From this perspective, the simplification of writing into consonants and vowels was the first comprehensive digitalization effort as analogue sounds of speech were rendered into a set of discrete, i.e. digital, symbols (Borgmann 1999). In contrast to pictograms, phonetic writing introduces the communication of novelty since it does not require extensive contextual knowledge to be read (Esposito 2002) and, thus, can travel across domains and contexts far easier. In fact, phonetic writing can convey something a reader did not already know allowing for the reader to learn or, in more general terms, to be informed (Esposito 2004).

As the example of phonetic writing illustrates, there is a close relationship between the standardization and context-independence of information bringing to the surface a paradox that has become the fundamental driving force of modernity – the paradox of decontextualized systems of standardization and contextualized, situated practices (Bowker and Star 1999; Cooper 2005). The standardization of communication media, most notably writing, printing and now binary-based digitalization, allows for information to cut across traditional loci of practice (Kallinikos 2006; Gleick 2011). Indeed, modernity can be understood purely from the perspective of developing mechanisms to cope with this paradox and the dynamic forces it has unleashed (Beniger 1986) giving rise to phenomena particular to modernity such as the differentiation of the institutional structure of society into functional systems (Luhmann 1998) or the emergence of the formal organization (Wildavsky 1983).

It is against this backdrop that we observe binary-based digitalization as the latest and most radical step in standardization leading to a re-evaluation of established modes of resolving or rather unfolding the paradox between overarching institutional structures and locally situated, contextualized practices. In particular, we report the findings of a revelatory, embedded single case study (Yin 2003) on the changing work practices at the BBC triggered by the implementation of a digital production infrastructure (DNI) and the shift towards digital video. The case is revelatory insofar as it focuses on the

binary-based standardization of a primarily pictorial medium and its recontextualization into situated practices. In contrast to the majority of research studying the digitalization of textual or numerical media, the paper contributes the study of video as a digital object (Manovich 2001; Kallinikos and Mariategui 2011).

In detail, the paper sets out to discuss information as an event of informing that serves as a conceptual device to frame the central paradox between decontextualized systems of standardization and locally embedded practices throughout the craft editing operation of DMI. The section that follows elaborates on binary-based digital media with a particular focus on digital video and its distinct semiotic structure. In the third section, we will briefly introduce the case and its methodology and report empirical evidence. We analyse the distinctive management of digital video in news and long-form productions respectively and the impact the introduction of digital video has on work practices. Finally, we conclude our study by analysing the friction between the context-free attributes of digitalized information and the work practices built upon contextualized information based on a semiotic approach to the study of digital video as a narrative genre.

Information and Paradox

Our theoretical point of departure is the conceptualization of information predominantly developed in 2nd order cybernetics (Foerster 2003). To paraphrase the renowned definition by Gregory Bateson (2000), information is a difference, which makes a difference to persisting knowledge based on the discriminatory categories applied by an observer (Luhmann 1997; Bowker 2005; Kallinikos 2006). In other words, information is an event of surprise or novelty that only occurs in contrast to what is expected, ultimately, alluding to a paradox of expecting the unexpected. Novelty, after all, can only arise in contrast to expectations triggering change in what is known (Boland 1987). As a consequence, information does not last but turns into non-information the moment it occurs or rather the moment a difference makes a difference and, thus, ceases to be novel. Hence, what is stored in a repository, paper- or binary-based, is not information; it is data that can be assembled and organized in ways to bear or even increase the potentiality of the repository to inform (Foerster 2003). Thus conceived, data alludes to symbolic tokens or signs, such as the letters of

an alphabet or binary digits, which are defined in terms of their difference to other tokens and signs within the respective semiotic system they are a part of (Saussure 1974; Borgmann 1999).

The perspective on information as a paradox of expecting the unexpected points towards an intimate relationship between paradoxes and information in general. Defined as a concept that is contradictory within itself, a paradox contains elements that are analytically clear in isolation but contradictory when brought together into a unified form (Lewis 2000). To be precise, the conception of a paradox as a unity is in itself paradoxical. If conceived of as a difference between two contradictory elements, a paradox signifies both sides of the difference. Attempting to solve a paradox like a puzzle or mathematical problem would result in oscillation between the two sides of the difference turning the notion of unity into absurdity. For instance, the statement "Believe me I am a liar!", an example for the liar paradox, is a lie when taken to be true and true when taken for a lie (Hughes and Brecht 1978). An observer trying to solve the paradox ends up switching back and forth between accepting the statement to be true, which makes it a lie, and accepting the statement to be a lie, which makes it true (Andersen 1994).

While the previous paragraph approached the relationship between information and paradox from the perspective of information as a paradox, the relationship can also be observed from the perspective of a paradox as information. As established above, information alludes to novelty and, thus, to learning. A paradox as such, however, fails in that respect, because it refers only to itself. For instance, in order for the statement "Believe me I am a liar!" to trigger learning, an observer would need to be able to choose whether the statement is true or a lie; only then would the statement be a difference that makes a difference to an observer (Bateson 2000). In case of a paradox, an observer does not have a choice, since selecting one side of the difference between true or a lie indicates the other. A paradox is a difference that makes a difference, which is again the very same paradox. In other words, the potential of a paradox to inform turns out to be infinite (Krippendorff 2009), because it signifies itself in a self-referential fashion.

Being a paradox, information itself is a phenomenon that is infinitely informative. Anything can be a difference that could potentially make a difference (Wildavsky 1983; Bowker 2005); even something that did not occur but was expected to. As Bateson (2000) puts it: "The letter which you do not write can get an angry reply." Thus conceived, the argument comes full circle. Information is paradoxical as it signifies both sides of a contradiction – expectation and surprise, what is known and what is novel. Unsolvable as it were, the difference of two contradictory elements can only be dealt with by being covered, hidden, ignored or, in more general terms, by being unfolded into constructive but provisional workarounds (Bateson 2000; Luhmann 2002). As we will discuss in the following section, it is those workarounds, which take the form of taken-for-granted assumptions and institutionalized expectations, that are the main concern of this paper, as they reduce the complexity of anything into something that can be informative (Bowker 2005; Ekbia and Evans 2009).

Unfolding Paradoxes

Given its paradoxical foundation, information turns out to be a problematic concept, since its observation results in oscillation between what is novel and what is known. In a social context, the paradox becomes even more apparent, when two actors interact or, in other words, inform each other. Two actors communicate in the sense that one's utterance and behaviour is a difference that makes a difference to the other actor and vice versa (Brier 2008). Of course, one can say and do whatever one wants, but in order to interact with the other, one has to submit to social expectations that ascribe meaning to mere behaviour, thus, transforming it into social action (Mead and Morris 1934). If such social expectations do not exist, both actors find themselves in a situation, in which anything goes. The paradox of mutual information becomes apparent, since nothing is expected, hence nothing is novel (Vanderstraeten 2002).

A situation bereft of social expectations is a situation flooded by contingency. It is a paradox - infinitely informative - and, therefore, may lead to paralysis, since neither actor can make a meaningful choice of what to say or do (Luhmann 1998; Krippendorff 2009). However, such a situation is very sensitive towards random events *because* any difference has the potential to make a difference. Any behaviour may appear to be a meaningful selection that can be followed up by another action

and so forth. Each subsequent action relates back to the previous action and, thus, contingency is reduced step by step leading to the emergence of social structures (Vanderstraeten 2002). A difference makes a difference that makes another difference and so forth transforming an indeterminate situation into a determinate one (Luhmann 1997; Ekbia and Evans 2009). Paradoxically, it is due to information being a paradox that information occurs and socially structured expectations emerge, in contrast to which novelty becomes observable. In other words, information occurs not *despite of* being a paradox but rather *because of* being a paradox (Esposito 2004).

Conceived of in such a fashion, information lies at the very heart of the social sciences and organization studies, since it addresses the central question of agency and structure; social action and institutions (e.g. Berger and Luckmann 1966; Giddens 1984). However, as the result of historical, hence, contingent processes, institutionalized expectations do not solve the paradox of information once and for all but provide provisory workarounds, which gain the status of institutional, taken-for-granted facts by being collectively accepted and recognized as such (Searle 1995). The paradox remains hidden unless the contingent nature of an institution becomes apparent and one raises the question why certain expectations are socially accepted on not others (cf. Garfinkel's (1967) breaching experiments). If an institution lacks collective acceptance and, thus, fails to unfold the paradox, new structures emerge to provide an alternative workaround. Thus conceived, the paradox is the fundamental driving force for social dynamics and, ultimately, change (Luhmann 1998).

Social structures turn unlikely information into a very likely occurrence by reducing infinite contingency to a horizon of expectations in contrast to which novelty can be observed (Bateson 2000). The paradox of information is unfolded by means of a second difference that distinguishes between meaningful events within and meaningless events beyond the horizon – information (a difference that makes a difference) and noise (a difference that does not make a difference) (Shannon 1993). This line of argumentation resembles what Ekbia and Evans (2009) refer to as *regimes of information*, which are constituted by particular rationales as to what is informative. Following the work of Boltanski and Thévenot (2006), they identify a variety of social domains or worlds with different concepts of information. For instance, in the world of markets and commerce information is a commodity while in

the civic world of laws and archives information is documentation. In a locally situated social practice, a variety of these regimes come together and intermingle leading to a mix of rationales for decision-making. The main point, however, is that regimes of information are not sources of information but rather it is through them that information is constituted in the first place by means of local enactment and situated practice (Garfinkel 2008).

In our terminology, a regime of information distinguishes between information and noise. Laws are not commodities while commodities are not laws. Of course, in a particular social practice, such as corruption, laws can be commoditized but then they cease to be part of the civic world and become subject to the rationale of pricing and money. By the same token, this is not to say that one cannot make laws about commodities. However, this can only be achieved through legal mechanisms rather than market mechanisms. As a consequence, what is information for one may be noise for the other. Furthermore, the same event or object may mean very different things within different contexts of social practice. Indeed, if an observer is only informed by what makes sense within the context of a practice, one may even question whether there is such a thing as the same event or object – the same difference – that makes different differences to different observers (Maturana 1988). The conclusion of this line of argumentation is then to observe information as created by and through social practices (Ekbia and Evans 2009). There is no information without an order generated by actors and the constitutive practices they use to produce that order (Garfinkel 2008).

From the perspective of situated practices, information occurs within the local bounds of social practices and the situated contexts they establish (Brown and Duguid 2001; Ekbia and Evans 2009). Information, however, also occurs across situated practices and contextual boundaries. In particular, the proliferation of standardized categorization and classification schemes gave rise to possibilities for the de- and re-contextualization of information. For instance, the phonetic alphabet is based on the classification of sounds of speech signified by a limited number of symbols or letters. As a result, writing takes the form of text, which is context-free and autonomous (Borgmann 1999). Indeed, it was the innovation of the text that introduced the distinction between text and context in the first place (Esposito 2004). This is not the

case with image-based tokens such as pictograms. Allowing for a wide range of phonetic, semantic and grammatical interpretations, the signification of pictograms requires adequate knowledge in terms of, for instance, the events and objects pictograms are referring to or how events and objects are called. By contrast, reading phonetic writing requires only knowledge in terms of how to pronounce a combination of letters. Indeed, text can be read even without understanding the meaning of the words and, thus, affords learning and the conveyance of novelty (Esposito 2002). Phonetic writing was the first communication medium as it allows for the mediation of information across space and time (Giddens 1990; Esposito 2004). However, bereft of the immediacy of face-to-face interaction and the context it is embedded into, writing does not only refer to the rules of grammar and orthography but, more importantly, to mastering the skill of composing a text in such a fashion that it can be informative to somebody who does not share place and time nor context with the writer.

An assemblage of standardized categories and classification systems (e.g. phonetic alphabet), rules (e.g. standards of grammar and orthography) and conventions of genre (e.g. how to write a letter) need to be already in place in order for information to occur across but also within contexts of social practice as well as regimes of information (Ekbia and Evans 2009). Law may have its own genres and conventions of writing but those derive from more fundamental standards of communication media such as text. Thus conceived, information is not created through social practices but rather occur in contrast to overarching standards or, in other words, social expectations that reach beyond regimes of information (Kallinikos 2006). This becomes even more apparent with respect to mass media. Be it books or television, mass media unilaterally informs a mass audience. A news broadcast, for instance, has to be produced in such a fashion that it can be made sense of not by specific individuals but by the masses containing individuals who are not personally known to the producers.

Mass Media and the Digital Image

Mass media can neither be personalized nor can it be considerate with respect to the myriads of contexts within which it will be received. Furthermore, video is based on images, which have a high level of ambiguity compared to other types of media

tokens (i.e., text). While the same newscast is interpreted differently in different contexts, at a more fundamental level, a newscast is still recognized as a newscast genre irrespective of the context. In more abstract terms, a communication medium has to be recognized as a communication medium first, given the assemblage of standards discussed above, before it can be locally interpreted. Thus conceived, the practices of producing mass media, as is the case with the BBC DMI, provide an excellent opportunity to observe the paradoxical interplay between decontextualized systems of standardization and contextualized, situated practices, since the product of these practices needs to be autonomous from the context within which it was produced as well as the contexts within which it will be received. As we will discuss in our empirical research, this is even more the case with the increasing involvement of ICT and digital media in the production process of televised video as the computational rationale of binary classification propels standardization to an unprecedented level (Bowker 2005). Let us explain.

The internet pervades our social and daily practices, generating a rather distinctive consumption of digital tokens, particularly in the form of digital images (e.g., photos, videos). The characteristics of the digital image changed the conditions of its production, circulation, transmission and manipulability. The emphasis on manipulation is important for the understanding of how the digital image is managed as an information token through the use of computer software packages and how such programs replace work practices with a series of computerized tasks. A digital image is managed through the identification or contextualization of those aspects from the real world that it is supposed to represent; hence, it is managed through the identification of its semiotic elements and the relationships it references.

As discussed further above in terms of pictograms, the relationship between image-based tokens and what they represent is highly ambiguous (Mitchell 1980; Mitchell 1994). For centuries, a common way in which this level of ambiguity has been reduced was by categorizing images through schemas and metadata. The pictorial value of the image from a physical point of view vanishes by prioritizing its description or the rules it represents. Rules and descriptions are used to manage a digital image. As digital images become a predominant part of online interaction, more metadata is required to organize its information accordingly. However, images

are highly context specific and may become ambiguous if recontextualized through metadata's discrete values. Therefore, digital images are complex to categorize, evidencing the difficulty of codifying them as information tokens: as soon as the digital image is contextualized it becomes part of an information system that assigns classification and order into it (Sontag 1977). Technical systematization has been incorporated into image-based databases so they can be interoperable with other information sources. Thus, in order to interoperate digital images its visual meaning is diminished and its descriptive meaning is increased.

Being highly ambiguous, images depend on their semantic characteristics in order to be contextualized. The semantics in which digital images are based on makes reference to cultural artefacts both in terms of their content and the way they are produced. For example, a historical documentary, in terms of its content is usually based on a chronology of events presented in the form of past material (i.e., photos and films). By including such elements it is contextualized for an audience that will identify the content as a documentary genre. At the same time, the historical documentary pertains to particular work practices (i.e., searching for historical footage on a video library, professionals that specialize in the managing of information upon an agreed technical definition). In the following section we will illustrate our arguments using our case study.

Case Study

The main field research was conducted at BBC Northern Ireland (BBC NI). Headquartered in Belfast, BBC NI is the second 24-hour newsroom in the UK. BBC NI also produces some of its own news and long-form programs. The news team at BBC NI has a reputation for cutting-edge journalism and original programming. The main program is *BBC Newsline*, a regional news service that also covers Northern Ireland politics in a separate segment. In the case of long-form productions, additionally to regional arts programs, weekend chat shows and special coverage of events, the BBC produces several regional political programs, notably: *Spotlight, Hearts and Minds, Inside Politics, Today at the Assembly, Let's Talk, Sunday Morning Live* and *Wanted Down Under*.

BBC NI was the last tape-based newsroom in the UK. Their legacy systems were mostly based on videotape, adding unnecessary maintenance costs. Most of the costs included the time spent by broadcast engineers to repairing and replace legacy machineries. Therefore, the pre-existing production workflow was becoming increasingly expensive and unsustainable. The lack of a centralized digital archive also led to missing tapes, problems with multiple tape formats, inconsistencies in logging material, as well as media security issues. BBC NI proposed a new digital production workflow, DNI (Digital Northern Ireland), based on DMI, a BBC wide scale media convergence strategy which aspired to rely entirely on information that is available in digital format. The pilot project was based for both news and long-form productions. In April 2009, DNI's pilot project started with the news workflow and in December 2009 it sprung four pilot projects on the long-form productions workflow.

An important element of DNI's implementation was Cinegy, an off-the-shelf software. The Cinegy solution was selected for its ability to support open standards and a myriad of video formats; it also included components for capturing and editing digital video. By 2009, Cinegy was already installed on more than 100 desktop systems in BBC NI.

Methodology

Qualitative data was collected through participant observation, semi-structured interviews (both in-depth interviews and on-site visits) with a total of 47 in-depth transcribed interviews and secondary sources. Data collection has also entailed the study of company documents, industry journals, and periodicals. Data collection took place between January 2008 and June 2011. Interviews were done at the BBC headquarters in London (mostly with executive and managers) and at the BBC Northern Ireland in Belfast (specific interviews on the deployment of DNI). BBC employees interviewed included executives, managers, and senior-level engineers; most of the interviewee's work had job positions directly related to the management, acquisition, engineering, project management, media management, and support of the technologies deployed by the DNI. The interview questions tried to elicit information about how BBC staff understood the changes associated with DNI, both at the technical and organizational levels. The interviews were loosely structured around a list of topics and questions composed by the researcher, as well as a research project

fact sheet given to each of the participants. The validity of the key arguments was established by triangulating the answers given in the first visit to BBC NI site with questions related to those matters discussed with key managers at the second visit to BBC NI site. This form of validation permitted only the most relevant aspects of the implementation to be taken into account in the analysis while biased and minor or short-lived situations were not pondered. Our embedded single case study compared the news and the long-form implementations by defining a common set of research questions in order to analyze both implementations in similar ways.

Long-form productions are defined as video products of long running times (usually no less than 30 minutes) that take the form of a drama, series, TV shows, documentaries, or film. Long-form productions take several months to produce and require long hours of shooting, editing, and post-production. In contrast to long-form productions, news productions take the form of news stories, sports coverage and other brief journalistic style content. News productions take only few hours to produce. Their content is made out of shot footage as well as archived material.

DNI operations

The DNI operations consist of a set of procedures through which digital video content is assembled and distributed, constructing a workflow. These are subsumed under six operations: 1) Shoot, 2) Work in Progress, 3) Craft, 4) Share, 5) Bundle and Package and 6) Archive. DNI operations underlying the production and distribution of news as well as the operations for long-form video productions were based on Cinegy. Similar workflows were already in use in newsroom environments for more than a decade. Long-form productions have until recently been deployed using digital workflows, which in most cases were customized depending on the facility conditions or production requirements. In this paper, we focus on craft operations since it brings together a wide range of activities as dissimilar as scripting, shooting or composing. It is also the operation that entails a variety of specialists who participate in most of DNI's operations (from shooting to delivery) to develop a new array of intellective skills for the digital workflow, such as composing and editing video content into narrative structures. We will now explain in detail the processes that the craft operation entails.

Craft Operation

Craft entails the process of editing segments of video footage, adding special effects, colour correction and grading as well as voice and sound recordings (i.e., sound editing, design and mixing). Finishing and post-production are also catchall terms that describe the entire family of these activities including digital manipulation, transformation and remix of video content through the use of software packages.

Video editing is defined mainly as the selection and order of scenes from rushes that create a video story. Craft editors organize video scenes into a coherent narrative. In the analogue broadcasting world, a craft editor worked throughout the editing process in collaboration with a producer and a cinematographer (or a film director) among other professionals. Interaction and collaboration was crucial since much of the story's structure originated from group discussions while reviewing several hours of footage. From the empirical study, we recognized that the interaction between producers and editors was absolutely fundamental in order to assemble the desired shots into a coherent video narrative. Hence, video as a final product results from the negotiations that occur between different actors. Craft editors maximize the impact of the elements at hand (i.e., the idea, the script and the shots) by getting the most out of technical tools (editing suite, special effects, post production techniques). Editing is a highly creative process, particularly with long-form productions or complex news stories, as the construction of a narrative demands a vast number of decisions.

Manipulating and mixing moving images has always had a high level of ambiguity. After all, craft editing is not a concrete process; it depends on the shots, the script, the discussion among team members and the available technology. Thus, the craft editing process can be regarded as one of the most rudimentary practices of the DNI workflow since its artistic essence did not change with digitalization. When DNI workflow was deployed it brought an automated and streamlined selection and editorial process; face-to-face interaction was reduced in order to gain operational efficiencies. The new DNI workflow reduced the level of group interaction that had been fundamental to the analogue broadcasting environment.

During the discussions at the research site, the new craft process based on DNI was mentioned as an example of how technology obstructed the *techno-aesthetic* value of a video narrative. The term *techno-aesthetic* refers to the confluence of technical features being used (the *technology*), the appropriate level of expertise required in using those technologies (the *craft*) and the final product generated from the process (the *art*). Certain aspects of the craft process changed since DNI's implementation, while others remained. As part of the DNI workflow, the new craft process not only established a narrative, but also addressed technical aspects of video production that had to be considered during the shooting and planning phases. Finally, the craft editor had to acquire the skill to search for video content based on its descriptive metadata, a topic we discuss in greater detail in the next section.

Manipulating Digital Video through Craft Editing: A Semiotic Approach

From the perspective presented in the previous section, craft editing emphasizes the standardization, sequentialization and situatedness of digital video production. We now study craft editing throughout the DNI workflow by taking into consideration the particular semiotic characteristics of digital video. Our aim is to analyse how work practices are affected by the semiotic nature of the digital image as it pertains to the management of digital video.

A craft editor has the ability to improve the meanings in an audiovisual narrative and enrich the emotions linked to it. The following observations are based on our empirical work but are also reinforced by the literature on film and video editing (Murch 2001; Ondaatje 2009; Chang 2011; Goodridge and Grierson 2011; van Oosterhout, van Rossem et al. 2012; Farocki 2013).

All audiovisual narratives are composed of different pieces of video (mostly in the form of video shots). The craft editor analyses the video material available in order to create an intelligible sequence that prefigures the narrative possibilities of the final story (Laurier, Strebel et al. 2008). This is done through the appropriate use of software packages such as Cinegy but also via a series of work practices. In terms of work practices, participation and collaboration is performed mostly during the planning and editorial stages.

Before and during craft editing, there are certain aspects that enable the development of the video scenes into a narrative, such as screenings, discussions, repeated rewinding of tapes, meetings and note-taking (Murch 2001). The craft editor is one of the few people working on the production of an audiovisual narrative that does not know the conditions under which the material was shot. However, craft editors have a fundamental influence on the final story. Craft editors can be seen as a hinge or an interface between the shot material (based on the initial idea or script) and the final story that is delivered to the audience.

One of the initial tasks craft editors perform is the reviewing of the material (in the form of video rushes or shots) in order to learn more about it. At BBC NI, some of the interviewees indicated that shot reviewing was one of the most creative moments of the editing process, as it helped craft editors familiarize themselves with the material (Murch 2001; Ondaatje 2009). Generally speaking, shot reviewing is a central moment in which an array of preceding and subsequent editing practices are performed in a repetitive way (i.e., capturing of clips, logging, rewinding, playing, stopping, repeated previews of the same shot) (Laurier, Strebel et al. 2008; Farocki 2013).

In DNI, however, the reviewing stage was no longer based on rewinding or fast-forwarding the video material, as this process was generally replaced by the search functionality. Search as a function means looking up something that one thinks one is looking for, or rather, for what one thinks one needs (Murch 2001). The mediator between the video content and the search functionality is codified text of a particular type - metadata that describes the shot and its technical characteristics (Laurier, Strebel et al. 2008). Metadata is produced through computer-based systems or by algorithmic and automated procedures and is thereby prone to possessing one literal meaning.

However, during DNI's craft editing, the shot reviewing process is performed by editors in a fairly random fashion; there is no sequence in the way editors search for a selection of shots. It is important to consider two issues related to the shot reviewing process; first, the image as a cultural artefact (in both news and long-form productions) is different from codified text. Browsing for a video image is a complex

act that is very different from searching for a video through metadata. The conjunctive character of the video image means that its elements are not decomposable and independently analysable, as it is made of a series of images whose meaning requires multiple visual scans. Second, audiovisual craft editing is never a linear process; it is accomplished through a series of unpredictable tasks. Streamlining any kind of unpredictable task into concatenated procedures such as DNI or selecting video content through its metadata would destroy the art and craft of editing practice.

The work of craft editors is based on the arrangement of an inseparable complex of image tokens. In semiotic terms, craft editing entails both paradigmatic analysis (comparing selected video images, not necessarily consciously, to alternative shots) and syntagmatic analysis (comparing video images with preceding and following shots) (Saussure 1974; Barthes 1977; Farocki 2013). As much as syntagmatic tokens redefine and organize the sequence of work, paradigmatic tokens, such as audiovisual narratives, reinforce the need to work collaboratively and resist the linear definition of order.

Digital editing systems, such as Cinegy, achieve most of their speed and automation from the ability to retrieve the requested material instantaneously, either by selecting (browsing) or searching for it. In DNI, this task was seen as one that would allow craft editors to work effortlessly. Instant access depends on knowing exactly what one is looking for, which originates from metadata. However, many craft editors do not possess the verbal skills to describe an image through text. Their explicit awareness comes from visual patterns found through the extensive reviewing of video shots (Farocki 2013). In many cases, limiting the reviewing process to the use of the search functionality may not exercise the creative talent and visual imagination that craft editors possess. Reviewing is based on discovering what one needs, without previous knowledge of what that might be. By contrast, searching is only useful when one knows what one is looking for. Hence, the reviewing and searching processes depend on how the craft editor's cognitive patterns relate text with images since the cognitive processes of reading images is quite different from reading text.

Good craft editors need to perform an exhaustive review (through rewinding or fast-forwarding) of the video rushes available in order to get an adequate perception of the

video material and to use it to the fullest extent (Murch 2001; Ondaatje 2009; Chang 2011; Goodridge and Grierson 2011; Farocki 2013). Therefore, for long-form productions, DNI's craft editing process became difficult to automate, speed up or streamline

There were also issues related specifically to the DNI workflow that limited the work practice of creative craft editing. DNI divided the craft editing process into a sequence of concatenated tasks. Organizing the editing process into a series of tasks prompted two major problems. First, the audiovisual narrative was seen as a final phase of a process that depended heavily on a script and a pre-defined structure of the content centred around the producers' initial shot selection. However, relying only on the script or on an initial storyboard oversimplified the work practices that are part of the craft editing process. The news or audiovisual narratives did not reflect the grammar of complex interactive exchanges that occur during the shooting and continue throughout the DNI workflow. In addition, by streamlining the workflow, DNI reduced the number of opportunities for teamwork, discussion and collaboration.

Furthermore, craft editors create an audiovisual narrative by taking into account the language of the particular genre as part of the creative work of producing it. This is done in order to enhance an audiences' response accordingly (Barthes and Heath 1977). In the DNI's long-form productions, one shot could give different readings depending on the sequence of shots surrounding it. Filmic syntagms are not confined to the sequencing of shots but include other specific semiotic aspects of the shot (such as cut, fade, dissolve and wipe). It is during the editing process that each of the scenes and the structure of the audiovisual narrative are defined and described. Thus, craft editors did not deal with moving images through rule-based systems or searchable syntagmatic routines like the ones deployed in DNI. Their way to analyse, use and manipulate video content was not analytic or rational, but was based on experience and intuition.

Discussion: De/Contextualizing Digital Video Narratives
In the previous section, we presented the practices of craft editing as a non-linear process of creating a coherent narrative along the paradigmatic as well as syntagmatic dimensions of a specific genre. The constant switching between the source material of

video shots and the gradually emerging narrative is indicative of the paradoxical situation a craft editor finds himself or herself in as he or she is engaged in the creation of a narrative that is universally understood by a mass audience, thus, accomplishing signification irrespective of the specific context a viewer is situated in. In other words, craft editing is a gradual unfolding of the paradox between the local context in which the video production takes place and the overarching conventions of a genre. Initially, the craft editor deals with the amassed video shots in a rather random fashion. However, as the final product is gradually brought into shape, the video shots are more and more assembled according to the rationale of a specific genre. Decontextualized and autonomous from its production context, the final product is constructed in such a fashion to be a difference that makes a difference to the masses. Returning to our conceptual point of departure, the craft editor is faced with the paradox of information. The source material can be arranged and edited in an infinite number of ways. In order to break the indeterminacy of the paradox, the craft editor proceeds the only possible way by randomly but thoughtfully combing through the source material. Once a shot is selected, every subsequent selection relates back to the previous selection increasing the determinacy of the process step-by-step.

Craft editing is a specific way of unfolding the paradox of information. Due to its long standing history and professionalization, the practices described above have been institutionalized and rely on well-established rationales of division of labour and organizational routines. However, with the implementation of DNI, the established way of doing things is invaded and challenged by the technological rationale of computation and digitalization. The possibility to randomly comb through the source material is replaced by a search functionality enabled but also determined by meta-data, which in turn rests on the computational logic of numerical calculation. Admittedly, the impact of information systems on work practices and routines is a well understood field of research (Zuboff 1988). Computer-based technologies were the first steps toward answering the demand to *textualize* and *routinize* social and material relations, which drastically transformed the tangible and social character of work practices. The cognitive significance of information in reconstructing perceptual and action habits of work is described by Kallinikos (2011) in two respects: First, the cognitive transformation of the contemporary workplace is the outcome of computer technology processes that bring to organizations an abstract mode of thinking through

systems of information, tokens and codes that are embedded in software packages. Second, the systematic use of computer-based technology generates an immense output of data and information tokens that need to be managed and organized.

These findings are supported by our empirical research. However, our analysis goes one step further as DNI also submits the source material – video - to the rationale of computation. As we established above, images are highly ambiguous tokens and require contextual knowledge for their signification. Digitalizing video means to classify some characteristics, such as colour, according to two classes – 0 and 1. Binary code, however, is completely autonomous from any context resulting in a meaningless series of bits. Structured into data, files and databases, bits are then rendered qua agnostic computation into an audiovisual representation that is recognizable as a video. A first consequence that can be drawn at this point is that video production becomes the subject to computational considerations through some technical characteristics such as sampling rates and compression standards.

Some media scholars have lamented that digitalization results in the drop in quality and the degradation of features in video that derived from its legacy cinematic aesthetics (i.e., size, colour, sound) (Manovich 2001; Cubitt 2008; Wasson 2008). For example, when digitalized, the audio is flattened resulting in a significant reduction of its sound quality (e.g., the reduction of sound channels from stereo to mono, or from four channels to two channels). The same occurs with digital images. By going through digitalization the compression scheme impacts on the quality of the original raw footage decreasing not only its resolution, but also some fine colour adjustment done during the shooting. After all, digital video is made from a conjunction of images (frames) and compression bitrate provides the quality in which the difference between one frame and the other are digitally stored. The quality of digital video depends on its compression scheme, but is also contingent to the transmission of information in the particular device it is played on. The agonistic rationale of computation does have an impact in the aesthetics of what is conceived as a final video narrative. In order to improve the quality of the digital image, new software packages were introduced. Those software packages no longer manipulate the original image in itself, but are grounded in the manipulation of the digital video artefact,

which comes with its own technical limitations based on the technique in which it was digitalized.

A more conspicuous consequence of digitization, however, is the recontextualization of digital videos' data layers by means of descriptive metadata within the confines of a digital library. Being nothing else than data itself, metadata is subject to the very same agnostic calculations, which are supposed to bring order into the digital library to enable findability and accessibility. No matter how sophisticated they may be, metadata schemes cannot capture the context constituted by craft editing and its practice of gradually creating a coherent narrative described above. Craft editing unfolds the paradox of information in a stepwise process switching back and forth between source material and the conventions of the genre. With digitized video, the source material and its organization is surrendered to computational calculations and mathematical logic. Thus conceived, the random nature of combing through the source material is made impossible and, as a consequence, the unfolding of the paradox of information through that practice. Hence, the paradox must be unfolded in a different fashion. The first selection made by the craft editor that broke the indeterminacy of the paradox is now made by algorithms. They reduce the infinite number of paths according to which a craft editor could previously browse through the source material to a list of items calculated to be relevant with respect to search terms, which themselves are preselected based on the metadata scheme in place. As a result, the creative process of editing a coherent narrative, which follows the conventions of a specific genre, is now embedded into practices of information retrieval, which follow the agnostic rationale of computation and decontextualized binary codification.

We analysed two important characteristics of digital video based on the agonistic rationale of computation. The first one is the digitalization of source material which compresses and reduces the quality of the digital video image. In order to alleviate the drop of image quality and to adhere digital video to the cinematic aesthetics of a particular genre, a series of work practices based on the manipulation of digital image processing software are performed. The second characteristic is the decontextualization of video descriptions, which requires descriptive metadata in

order to be managed and recontextualized. New work practices belonging to the domain of information retrieval had to be executed.

Work practices, such as craft editing, are based on interactions and communication, which are embedded into social practices. The cultures of both news and long-form production are profoundly institutionalized and have already a well-established social division of labour. However, in order to construct narratives from digital video, a new set of work practices based on image processing and information retrieval are required. The standardized infrastructure based on layers of metadata can be optimized constantly through computational processes. The agonistic rationale of digital video generate a resistance among professionals who still conceive video as a *techno-aesthetic* construct more than only a set of layers of data. As Manovich (2001) states, new media reverses the semiotic relationship of cultural audiovisual narratives: the decontextualized database is given a material existence and pervades our reality through the manipulations of digital tokens rendered in computer screens.

It would seem impossible to overtake the significance of the rationale of computation in digital video production and the impact it has on work practices. The codification of information taking place in work environments requires workers to acquire trust and knowledge of events they are not able to see directly, but through the signification forms of decontextualized computational processes and digital artefacts.

As much as digitalization decontextualizes video images, its recontextualization is based on a complex combination of linguistic signs that are represented both by their syntagmatic and paradigmatic dimensions (Barthes 1977) along with the *praxis* embedded in the production of video narratives. During the craft editing process, digital video objects are manipulated in a timeline that forms a visual narrative marked, in semiotic terms, by strong conjunctive elements. Hence, the decontextualized and agonistic character of digital video (i.e., metadata, computational aggregation or compression quality) is diminished as the paradigmatic and syntagmatic dimensions are exercised throughout the work practice of craft editing. As paradoxical a phenomenon as this might seem, the same work practice can be extended to the way most internet users search for online video content (i.e.,

YouTube, Vimeo) and remix digital video to form new hybrids based on paradigmatic, synchronic and conjunctive characteristics.

Studying video production only from the perspective of standardized, decontextualized information and machine-enacted rules give us only a narrow definition of how technology impacts on social practice. Technology does matter not only because it is possible to use it throughout standardized production infrastructures based on resources and outcomes that can be optimized constantly. In our case, the management of digital video is based on manipulating a much more complex artefact based on semantic structures that impact on how work practices are performed. Information is based on how it is perceived and acted upon (Ekbia and Evans 2009). Therefore, the semiotics attributes of technology are fundamental to understand its outcome.

The paradox of information is based on two dissimilar but complementary accounts. On one side, digitalization is grounded on the agonistic rationale of computation which is a further step for decontextualized information, but at the same time brings the standardized properties embedded in technology. On the other, social agency supposes that context is essential for constructing and articulating a video narrative that corresponds to the expectations of mass audiences. There is a constant friction between these two accounts: verbal language dominates the organization of information, but at the same time images displace verbal language into the ambiguity of visual representation.

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