Co-construction of meaning, creative processes and digital curation: the transmission of music with live electronics

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Abstract

Purpose – The preservation and curation of music with real-time or live electronics is challenging. The goal is not to preserve a recording of the performance but to keep the work alive by providing the means to re-perform them. This paper presents the theoretical and practical outcomes of the Documentation, Dissemination and Preservation of Compositions with Real-time Electronics (DiP-CoRE) project.

Design/methodology/approach – The methodology combines methods stemming from work psychology and ergonomics with conceptual frameworks constructed according to grounded theory. Data were collected during a six months' creative process. Subsequent interviews were conducted during confrontations with documents, including observational recordings, sketches and technical specifications.

Findings – This article demonstrates the relevance of the proposed documentation methodology for the preservation of contemporary music with live electronics, focussing on the notion of intelligibility. It brings into light the multiple perspective of the documentation of the activity in a multi-agent creative process, which encompasses what was done but also what could have been done.

Research limitations/implications – The DiP-CoRE project bring to light connections between the notion of intelligibility, the thickness of the activity and boundary objects. The paper proposes further directions of research in order to embed the designed framework within digital repositories.

Practical implications – The documentation methodology, designed and tested in this paper, proposes a framework for practitioners, building on video-stimulated recall as well as documents produced during the creative process. This framework requires less expertise (but a more important technical setup) than a traditional interview-based documentation framework. It thus provides opportunities for various size organizations to build methodical documentation processes and to further build on distributed expertise with computer-supported collaborative work.

Originality/value – This article proposes a new interdisciplinary documentation methodology relevant in the artistic domain, which brings together transmission with objects and by practice. It specifically defines the relation between this proposal and a high-level model for digital curation, namely, the Mixed Methods Digital Curation (MMDC) model. It further creates a link between documentation best practice and the ongoing research in the tracking of creative processes.

1 Introduction

In Fall 2012, the contemporary music percussion ensemble Sixtrum started the production of three works of mixed music—a combination of instrumental and electroacoustic music which grounds trace back to the 1950s—by three world-renowned Canadian composers: Robert Normandeau; Serge Provost; and Laurie Radford (Boutard & Marandola, 2014). The works were performed in May 2013. All three works comprised a live electronics part that is embodied in a piece of software specifically designed for each work. This piece of software is implemented on top of a software development framework used in different artistic contexts: music, dance, theatre, installation art, and so on. This framework provides the creative process with a set of possibilities, that is to say intentional affordances (see Conein, 2005). Still, "because equipment comes to embody one set of conventions in such a coercive way, artists frequently exercise their creativity by trying to make equipment and materials do things their makers never intended" (Becker, 1982, p.58).

The question of idiosyncrasy in artistic production would not be such a problem for the sustainability of the repertoire were it not for two other critical notions, which is to say performance and obsolescence. On the one hand, the issue with this repertoire is not to preserve a recording of a performance of the work but rather the ability to re-perform the work (Bernardini & Vidolin, 2005). This situation is similar for all performing arts: "live performance art cannot be preserved as such. Recordings of such events constitute new and different (often, documentary) events whose meaning cannot be reduced to the first, particularly when the art work intends to make manifest or otherwise critique the representational status of such types of recordings" (Day, 2008, p. 1649).

On the other hand, digital technology, and the associated notion of technological obsolescence, introduce an instability, which makes the issue of the preservation of the repertoire much more complex: "music technology is a new stakeholder in the production of music with the most striking feature possibly being its indefiniteness. Whereas the tasks of performers, composers and publishers are defined by tradition and their responsibilities have only become blurred since the advent of electronics, music technology is yet undefined and encompasses a wide variety of activities from balancing the sound on a mixing console to being a recording engineer to being an expert in music informatics" (Berweck, 2012, p. 198).

The combination of these two factors has a critical effect on preservation of the repertoire. Bossis (2006) summarizes the situation: "the collection of electronic instruments is very heterogeneous and lacks the temporal stability necessary for the emergence of techniques, signs and musical languages that match their diversity" (p. 102). In this context, the research in Digital Curation may benefit the sustainability of the repertoire of contemporary music with live electronics, as well as other artistic domains, with an interdisciplinary view of the issues at hand. As Rinehart and Ippolito (2014) put it in the context of new media arts, "the preservation of new media may inform the problem of preservation in other fields, from government records to the music industry to video games, and will, in turn, be informed by those related efforts" (p. 20). From this perspective, some research has already been developed in multiple contexts: performing arts (Molloy, 2014); digital arts (Innocenti, 2012); and contemporary music (Boutard, Guastavino, & Turner, 2013).

> These art forms [new media arts] have confounded traditional museological approaches to documentation and preservation because they are ephemeral, documentary, technical, and

> manifold in nature and because their media formats are variable and become obsolete rapidly. [...] Owing to a lack of preservation and documentation methods, and thus access, such artworks often are not used in research and instruction; they become invisible to history. If we don't design strategies for preservation, many of these vital works—and possibly whole categories, such as early Internet art—will be lost to future generations. (Rinehart & Ippolito, 2014, p. 22)

In this statement, Rinehart and Ippolito emphasize the intricate link between documentation, transmission and preservation, which is a starting point for the research project Documentation, Dissemination and Preservation of Compositions with Real-time Electronics (DiP-CoRE). DiP-CoRE aims at providing a documentation methodology (Boutard, 2015), which explicitly addresses the dual question of idiosyncrasies and technological obsolescence, and questioning methods of transmission. The second goal of DiP-CoRE is to develop this documentation methodology on top of a digital curation lifecycle model integrating technological as well as social views on preservation and curation as advocated, notably, by Innocenti (2013). Technological preservation, emphasized by strategies such as migration and emulation, tends to diminish the social dimension of the human machine relation by either considering that technology is a self-sufficient knowledge container (and thus can be harvested through automatic and semi-automatic processes, see Barthélémy, Bonardi, Boutard, and Ciavarella, 2008, with the idea to create a *digital organology*, see Dufeu and Bonardi, 2014) or that it is a medium with no acting power, failing to recognize "how machines produce as well as get produced, enable as well as constrain, act as well as react" (Prior, 2008, p. 314). Prior, informed by Latour's (2005) Actor Network Theory, further states that, "one needs to be guarded against work that claims a self-organized, machinic evolution and genesis of technology independent of its uses and meanings amidst social spheres of practice" (p. 315).

The DiP-CoRE project builds on a curation model (as well as participated to its definition) which is based on multiple epistemological frameworks, namely, the Mixed Methods Digital Curation (MMDC), proposed by Boutard (2015). This high-level model (see figure 2) does not constrain its implementation but proposes to 1) complement digital preservation models, such as the Open Archival Information System (Consultative Committee for Space Data Systems, 2012), with replicable documentation methods grounded in qualitative research methodologies, and 2) to further specify digital curation lifecycle models such as the DCC Lifecycle (Higgins, 2008) in order to manage the various types of actions and agents involved along the lifecycle. DiP-CoRE project (2012-2014) addresses primarily the first point however we will propose elements in relation to the second in the discussion. DiP-CoRE conceptualizes and implements a documentation methodology, as part of the curation lifecycle, focusing on creative processes and the co-construction of meaning of the multiple agents of these processes, in relation to digital technology, composition and performance.

2 Documentation, Dissemination and Preservation

2.1 Objects and practice

Traditionally written music is transmitted by a combination of notation, instrumental practice education and organology (the science of musical instruments). The introduction of electronics, especially digital

instruments, transformed this context of transmission, putting it at risk. Chadabe (2001) summarized the situation: “since electronic instruments are not played in standard ways, and further, since rapid changes in technology lead to a steady turnover of electronic instruments, notation can not serve as a way of preserving performances of electronic sounds” (p. 303). There are two critical dimensions for transmission in this statement: the performance and the physical artefacts (scores, instruments, etc.) sustaining this performance. From a music sociology perspective, Hennion (1993) distinguishes between transmission with objects and by practice. In relation to an expertise, the transmission with objects refers to the transmission of all the objects produced in relation to this expertise. In the case of music, it comprises the instruments, the score, the multiple texts of analysis, and so on and so forth. The transmission by practice refers to the subjective and tacit knowledge involved in the expertise, the know-how of the expertise, such as the knowledge of the use of the instruments and the score to produce a performance. Hennion relates the former with a re-production that is authentic but ‘dead’, and the latter with a constant betrayal which keeps the works ‘alive’, putting the emphasis on the continuous historical construction of performance. But transmission with objects and by practice are complementary and both necessary for the transmission of musical works. Transposed to the repertoire of music with live electronics, Bernardini and Vidolin (2005) also emphasize these two dimensions. First, in terms of objects – which, in this context, include scores, acoustic instruments, but also electronic and digital instruments (see Lee, 2000, for a list of digital documents related to the work that need to be preserved) – they propose that “every item should have: an algorithmic description; an impulse response; an audio example”. This first point relates closely to best practice in digital preservation, specifically to the notions of representation information (see CCSDS, 2012) and significant properties (see Hedstrom & Lee, 2002, Hockx-Yu & Knight, 2008). Second, in terms of practice, the same authors state that we need “active communities of co-operating performers which will be conscious enough to share and document their experiences [...]”. This statement is closely related to digital curation’s emphasis on use, re-use and transformation (see Pennock, 2007).

2.2 Intelligibility and intentionality

MacNeil and Mak (2007), focusing on the notion of authenticity, remind us that “in [Walter] Benjamin’s account of the relationship between authenticity and art objects, the aura of the original defies reproducibility and implies fidelity to the original intentions of the artist and to the passage of time” (p. 30). Intentionality is often emphasized in the literature, especially in relation to authenticity and performance, in multiple artistic domains such as dance (e.g. Pascual, 2013), new media arts (e.g. Hunter & Choudhury, 2003, Depocas, 2013), digital arts (e.g. Rinehart & Ippolito, 2014, p. 171), and music with live electronics (e.g. Wetzel, 2006). Reid (2002), with a specific focus on the performance activity, states that “performers must tread the difficult path between the need to respect the score, which represents the composer’s intentions, and the desire to exercise their own creative insights” (p. 106). Also in performance studies, a similar point of view is proposed by Ritterman’s (2002): “stylistic integrity demands this wholeness of approach, in which composer’s ideas are complemented by performer’s understanding – understanding of themselves as well as of the music they play” (p. 84). This statement introduces two notions which, we argue, diverge from the previous quote: 1) the notion of intelligibility, brought into light by the historical and social context, is critical for the performance of

the work and, 2) the collaborative construction of meaning, emphasized by the verb *to complement*, is constitutive of the notion of integrity.

A focus on intentionality leads Emmerson's (2006) to state that, "if the composer has intentions, so too the work itself may be said to have intentions [...] and sometimes the two may, in time, be at odds" (p. 216). While this statement does not reject the notion of intentionality on the basis of the principles of intentional fallacy, famously put forward by Wimsatt Jr. and Beardsley (1946), it questions its relevance in relation to preservation and curation. It entails that the hermeneutical process has to move from poietics (the ways of doing) to poetics (the ideas, intuitions)—a division used in musicology by Merker Castellani and Sedes' (2013) on the basis of French writer and essayist Paul Valéry's theorisation. This process involves various expertise relating to all agents of the production process as well as academics such as musicologists, who, according to Battier (2003), may also question the status of technology and its mutation process along its curation lifecycle. An interesting approach, in this regard, is the one described by Muntadas (2013), in the context of new media arts. During this experiment on translation and interpretation of new media works, several agents with different expertise, namely, an art historian, a sociologist and a philosopher, were asked to interpret a work and to provide a verbalization of the process, leading to multiple perspectives on the same work. While our theoretical framework is different, the processes that we develop methodologically share some similarities with this experiment from the perspective of the knowledge production.

From an interactionist linguistics perspective, Mondada and Dubois consider that "[...] categories and objects of discourse are characterized by a constitutive instability, that may be observed through cognitive operations grounded in practice, verbal and non-verbal activities, negotiations during interactions" (Mondada & Dubois, 1995, p. 269, our own translation). The co-construction of meaning is a critical notion for interactionist sociology (in its multiple manifestations, see Denzin, 1992). As Blumer (1969) puts it, symbolic interactionism "[...] sees meaning as arising in the process of interaction between people. The meaning of a thing for a person grows out of the ways in which other persons act toward the person with regard to the thing" (p. 4). This last statement brings back into light the question of intentionality. At the level of the activity, Licoppe (2008) remarks that activity theory acknowledge the significance of intentionality in agent's actions. Clot (1993), whose research in psychology of work builds on activity theory, considers this to be a difference with interactionism, which, according to him, steps away from the myth of interiority in relation to the analysis of human activities. Still, Blumer adds: "[...] the use of meanings by a person in his action involves an interpretative process. [...] interpretation should not be regarded as a mere automatic application of established meanings but as a formative process in which meanings are used and revised as instruments for the guidance and formation of action. It is necessary to see that meanings play their part in action through a process of self-interaction" (p. 5).

2.3 Creative processes and intelligibility

The musical creative processes, build on use, re-use and transformations on multiple timescales (see Donin & Theureau, 2007). Following Levinson's (1980) revision of Goodman's (1976) famous distinction between *autographic art* and *allographic art*, we may state these works are historically and socially situated, which means that they are only partially determined notationally. For Dunsby (2002),

“all the evidence point to the fact that performers are and always have been aware, although perhaps not fully, that their work takes place in a cultural context” (p. 227). In the context of musical works involving digital technologies, the creative processes involve multiple agents with various expertise, namely, composers, performers, sound engineers, computer music designers, and researchers (see Born, 1995, Zattra, 2006).

According to Menger (2009), creative work is specific in that the outcome is not predetermined by an aim that may have been specified conceptually from the start, further stating that this would turn the creative process into something purely functional (p. 460). The path followed by the creative activity is an emergent property (Menger, 2015) ; following Becker (1982), the successive choices are critical for the creative process and making sense of the artist’s work requires situating it in the whole production process (p. 548). Menger (2009) thus emphasizes the relevance of the study of sketches, or any document produced to support the creative process, which in the context of production of music with live electronics may include software. As Prior puts it, in the context of avant-garde electronic music, “[...] it is certainly not the case in music production that sociological questions are more relevant at the point at which the product finds its way through distribution processes, leaving the creative process itself to aesthetics or musicology’’ (Prior, 2008, p. 315). We argue that the situation is quite similar for preservation and curation questions.

According to the project V2 (2003), which, similarly to the DiP-Core project, emphasized the preservation of process over product, “first of all, the environments in which electronic art functions need to be well documented. Compared with other forms of modern art, electronic art often has an even more direct relation to the appearance and behavior of the work itself [...]. Secondly, sketches, drawings and the original proposal written by an artist, are important in understanding the artist’s intention” (p. 6). While the DiP-CoRE project shares a focus on creative processes in relation to documentation, our intention is neither to understand a potential artist’s intention at the level of the work, nor is it to deny the intention at the level of the activity, but to provide a framework for the transmission and the preservation of the intelligibility of the work grounded in the construction of meaning through interaction along the creative process—involving both human and technological agents—and the curation lifecycle. Similarly to Deliège and Richelle (2006), from the perspective of psychology, who advocate to “get rid of *creativity*, and look at *creative acts*” (a quote emphasized also in Donin, 2012), we advocate to get rid of *intentionality* and look at *intentional acts*, within a process of negotiation of meaning as a purveyor of the intelligibility of the work.

2.4 Creative processes and thickness

As stated previously the goal is not to preserve the recordings of the performance, but to provide the means to re-perform the work. While limited (see for example Grubbs, 2014, for a discussion about the value of recordings in relation to free improvisation and contemporary music), musical recordings are not worthless, Johnson (2002) reminds us that composer Hindemith claimed that “every performance is a corruption of the work, but recordings demonstrate the importance of the performer’s voice as a complement to the composer’s” (p. 209). In this paper, we propose also another role for documents, beyond (or beneath) its proof value, namely, a role of mediation: “[...] video recordings can be returned to the field in order to generate feedback, making video, in essence, a medium for reflection (Suchman

& Trigg 1991)" (Schubert, 2012, p. 122). Schubert in his analysis of videography practice, further adds that, "the aim is not to study the reaction to a stimulus, but to use the stimulus as a starting point for a problem-centered talk, [...]" (p. 122-123). The document (performance or observational recordings, the first one being well-known in performance studies, see Clarke, 2004), in this sense, is a medium for reflection and collection of new data. A practice that is not new to the music domain and used, notably, to study performance practice (Miklaszewski, 1989).

Following the seminal work of Vygotski as well as Bakhtin, the work of Clot (2001) in psychology of work builds on the argument that the lived experience of a human agent is not accessible directly but through traces of the activity (notably, but not limited to, documents such as observational video recordings). For Clot, the activity is not limited to what is done; it also encompasses what was not done, what could have been done differently, what should have been done, or what was done in error. Engeström (2014), with a similar theoretical background, refers to this as the *here-and-now* and the *there-and-then* of the situation. Clot (2008) refers to this notion of multi-layeredness of the *here-and-now*, i.e. what is done, and the *there-and-then*, i.e. what could have been done (and so on and so forth), as the *thickness of the activity*, a notion which forms the grounds for the original methods of documentation advocated by the DiP-CoRE project.

Clot (2008) subsequently argues that this thickness of the activity should be incorporated in the analysis of the activity. The methodological correlate of this notion of thickness is Clot's method of *cross self-confrontations with traces of the activity*. In order to capture the thickness, the use of traces of the activity, such as video recordings and documents produced during the creative process, as a recall stimulation tool is critical. The video-stimulated recall has been used, notably, in educational research (see Lyle, 2003), but, as Engeström (2014) reminds us, in this context, "[…] the aim of using video recording is not to recall the event as it originally appeared in the consciousness of the individual involved but to mediate and transform the experience into an object of inquiry (Engeström & Heikinheimo, 2010)" (p. 124). Figure 1, summarizes the data collection methodology advocated by Clot: in a first step experts (designated as operators in figure 1) are confronted with a video recording of their own activity. The second step is to bring a second expert to comment on the activity of the first one in his presence. These two steps are conducted also by inverting the order of the participants. The discussion will start in relation to similarities and differences and the thickness of the activity will emerge from this discussion (referred to as controversy in figure 1).

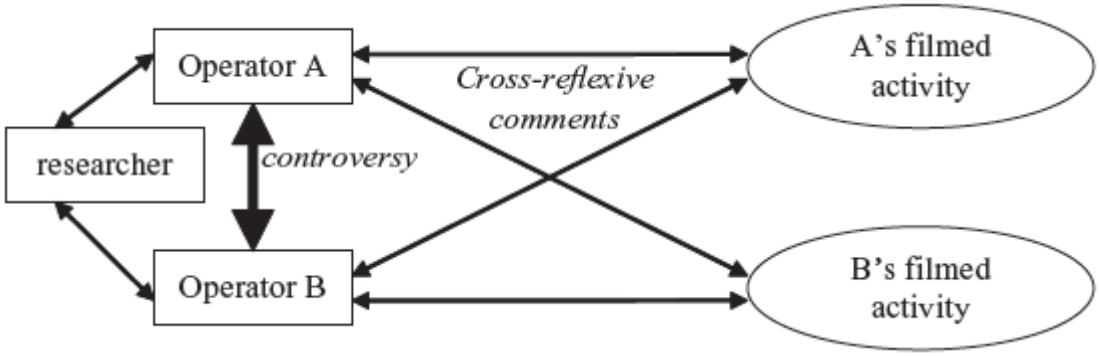

FIG. 1: Cross self-confrontations methodological setup. Adapted from Lorino *et al.* (2011)

It should be noted that from this perspective the notion of expertise (for a discussion about the boundaries of the notion of expertise in relation to music, see, for example, Morange, 2009) regulates the field of investigation in terms of the range of agents incorporated in the analysis of the creative process, and therefore the range of participants in the co-construction and the transmission of the intelligibility of the works.

Clot's (2008) method is used for the investigation of the activity of several experts, with the restriction that they share the expertise of the same work activity. The question of the multiplicity of expertise in the creative process requires also a relevant framework. Specifically, Lorino, Tricard and Clot (2011) have proposed, in the context of organizational studies, to use a similar method in a multi-expertise context, specifying the limitations it entails. This approach, notably, grounded the DiP-CoRE project. Our goal in the DiP-CoRE project thus was to import these methods stemming from psychology of work—and used in organizational studies—to the domain of digital curation, especially in relation to artistic creation.

2.5 Synthesis

Coming back to transmission by objects and practice, especially as exemplified by Bernardini and Vidolin (2005), we may distinguish between two different uses of documents. On the one hand, the transmission of objects focuses on the document as a proof, related to MacNeil and Mak (2007) description of "[...] authentic as trustworthy statement of fact" (p. 27). On the other hand, practice transmission requires documents as mediations in the process of curation, where experts' "[...] reflexive exposure to traces that are 'external' to their experiences put them in a situation where they have to work interactionally to reappropriate them in a way that resolves possible gaps and tensions. Traces of activity thus constitute a privileged mediation in order for actors to develop a viewpoint on their activity in interaction with others, under the constraints of intelligibility that are specific to the situation" (Cahour & Licoppe, 2010, p. c). From this perspective, the curation process involving the methodological documentation of the creative process is always in a process of completion, within the broader context of the co-construction of meaning through negotiations during interaction.

In light of the previous discussions, we base our approach in a few arguments:

1) the notion of intelligibility is critical for the preservation of the work,

2) the creative process is our best object of research for investigating the intelligibility of artistic works and its transmission with objects and by practice,

3) the creative process is not limited to the composer but involves all agents of the production comprising computer music designers, performers, sound engineers, and researchers, and

4) the process of transmission, deeply intertwined with the creative process, and its methodology should account for the thickness of the activity, which is not limited to what is done.

3 DiP-CoRE

3.1 Theoretical framework

The Documentation, Dissemination and Preservation of Compositions with Real-time Electronics (DiP-CoRE) developed in the context of the production of three works of music with live electronics for a percussion ensemble Sixtrum: *Baobab* (for 6 percussionists, 4 voices and electroacoustics) by composer Robert Normandeau , *Le rêve d'ahmed* (for percussion ensemble) by composer Serge Provost, and *The body loop* (for soprano and alto voice, six percussions, audio signal processing, and video) by composer Laurie Radford. As previously stated, the DiP-CoRE project is grounded in the conceptualization of Mixed Methods Digital Curation (figure 2; see Boutard, 2015, for a thorough explanation of the MMDC model). Specifically, the main focus is on level one and two of the model. Level one relates to the work of Lorino, Tricard and Clot (2011), the notion of thickness, and what they refer to as non-representational epistemologies, that is to say an epistemology which doesn't assume that the human mind can reproduce reality in a way that corresponds to the real world (Lorino et al., 2011, p. 771). Level two relates to conceptual frameworks, guiding the data collection process at level one. These conceptual frameworks are not a primary goal for the documentation (such as the classification of the works in the variable media approach embodied in the variable media questionnaire, Ippolito, 2003. See Dekker, 2013, for a presentation of the pitfalls of this approach) but a mediation in the documentation process (see Boutard, 2015). Therefore, they do not pretend to provide the methodological framework with a representational quality in a realist ontological perspective, as emphasized by Compton (2013), discussing thoroughly the limitations of the naturalist fallibilist realist adequatist perspectivalism (NFRAP) in information science in relation to applied ontologies and information systems. In the context of the DiP-CoRE projects, the conceptual frameworks emerged from a previous study relying on Grounded Theory (Boutard & Guastavino, 2012b), from the perspective of Strauss and Corbin (1998). From this perspective, the use of Grounded Theory to guide the data collection parallels the method advocated by Schubert (2012).

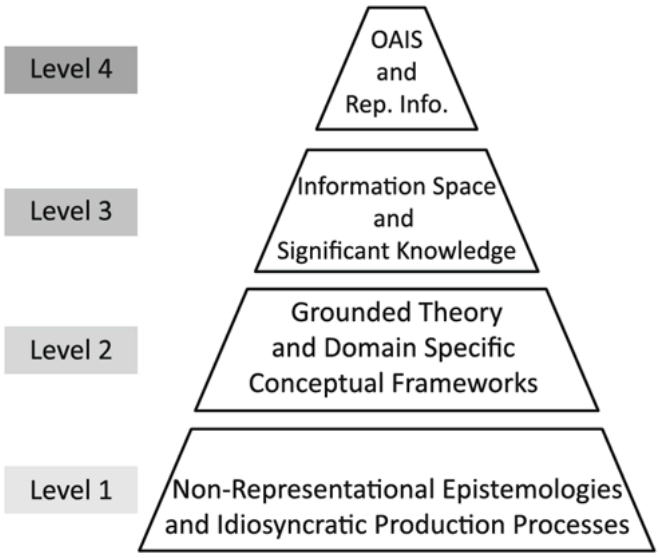

FIG. 2: Mixed Methods Digital Curation model. Adapted from Boutard (2015)

3.2 Data collection

The data collection methodology, designed for the project DiP-CoRE, consisted of four steps:

1. Observational data collection:

From December 2012 to the concerts in May 2013, we collected observational data. We video recorded the workshop of December 2012. During this workshop the percussion ensemble Sixtrum, without the singers, performed the three works still at an early stage of their composition. We then video recorded multiple rehearsals sessions, as well as the dress rehearsal, and the actual concert performances (see table 1). In parallel, we collected 4.5 Go of documents produced during the creative process: sketches (digitized), performers' annotations (digitized), diagrams, pictures of the setup (non-compressed pictures), software implementations (live electronics and computer-assisted composition patches), and the final scores.

Production phase	Duration
Workshop	2h20mn
Rehearsals at Université de Montréal	9h
Rehearsals at McGill University + Performance	7h30mn
Total	18h50mn

TAB. 1: Data collected during the production process of three works of music with live electronics

2. Segmentation and selection:

During the second phase we segmented the video data collected relying on the conceptual framework (Boutard & Guastavino, 2012b) specified previously which corresponds to the level two of the MMDC model. 101 excerpts were selected in relation to the composition of Robert Normandeau, using 21 descriptive categories stemming from the 4 main categories of the conceptual framework (see figure 3); 97 excerpts, using 16 categories, in relation to the work of composer Serge Provost; and 48 excerpts, using 18 categories, for the work of composer Laurie Radford. Subsequently, we relied on a panel of experts (one performer and one composer) to select the relevant excerpts. One of the experts (the performer) was part of the percussion ensemble and was thus able to contextualize the video excerpts when necessary. Two questions were asked in relation to the material: 1) is this relevant for documentation (see column 2 of figure 3), and 2) is this relevant as a support for confrontation interviews (i.e. is there a thickness to this activity that is relevant for further enquiry; see column 3 of figure 3)? The panel added complementary comments to the selection.

			Production	Production	Production	Production	Production	Production	Production	Production	Composition	Composition	Composition	Composition
			Collaborations	Collaborations	Collaborations	Collaborations	Collaborations	Etapes	Etapes	Workflow	Choix et specifications	Choix et specifications	Choix et specifications	Choix et specifications
			Interaction instrumentistes	Interaction interpretes / rim	Interaction compositeur / interpretes	repartition des taches	Conflits d'intérêts	Repetition en situation	Processus de composition	Sequence	Chant	CAO	Partition	Electroacoustique
	document	use	1G-1B	1G / 2G	4Y-4G-2B / 2O 2G	/ 2O	___	___	1Y / 2O 2G	/ 1O 2G	3G-1B / 2O 1G	1O 1G	2Y-1G-1B / 1G	2Y-2G-1B / 1G
CARTE_4_915_0315_01a.mov	X	–												
CARTE_4_915_0323_01a.mov	X	–												
Untitled_909_0077_01a.mov	–	–									X		X	
Untitled_909_0099_01a.mov	–	–												
Untitled_915_0016a.mov	X	X												X
Untitled_915_0016b.mov	X	–												X
Untitled_915_0016c.mov	X	–												
Untitled_915_0016d.mov	X	–			X				X					
Untitled_915_0016e.mov	X	–												
Untitled_915_0108_01a.mov	–	–												
Untitled_915_0109_01a.mov	–	X												
Untitled_915_0175_01a.mov	X	–												X
Untitled_915_0184_01a.mov	X	X			X									X
Untitled_915_0185_01a.mov	X	–												

FIG. 3: Excerpt from the grounded theory-driven segmentation and selection table used for segmentation and selection in relation to Normandeau's work. The three first lines correspond to the conceptual framework

3. Confrontation interviews:

From the previous phase, we selected the relevant interviewees, the documents to be used, and the topics of the interviews: 7 for Robert Normandeau (singing and onomatopoeias, performers' position and electroacoustic sound, percussions and onomatopoeias, Mix and acoustics, control pedal and cues, diffusion and spatialization, interaction with the tape); 6 for Serge Provost (software a.k.a. patch, lifecycle and re-production, mix and electronic sound for performers, control pedal, acoustic instruments, room acoustics); and 6 for Laurie Radford (sound capture, acoustics and re-performance, interpretation, software a.k.a. patch, instrumental setup, electronic score).

We conducted two types of interviews, either with two different experts following the work of Lorino, Tricard and Clot (2011), or with the composers following the work of Donin and Theureau (2007). Donin and Theureau conducted *interviews within situation simulations through material traces* (a method stemming from ergonomics; see also Donin and Féron, 2012, for an example of implementation). During these interviews the composer describes his creative process relying on the documents she or he produced at that time such as sketches. Typically we used this method for investigating the creative process in relation to the software production as well as the score. During the first type of interviews we presented the two experts (such as a composer and a performer or a composer and a sound engineer, etc.) with video excerpts, sketches, pictures of the setup, diagrams, and so on, according to the pre-established interview configuration. Table 2 summaries the data collected during both types of interviews.

Work	Approximate duration
Le rêve d'Ahmed (Serge Provost)	2h50mn
Baobabs (Robert Normandeau)	1h45
The Body Loop (Laurie Radford)	1h10mn
Total	5h45mn

TAB. 2: Data collected during the interviews

4. Selection:

One goal of DiP-CoRE was to specify the documentation methodological framework within the larger framework of the four levels of the MMDC. DiP-CoRE, while investigating level one and two, didn't implement levels three and four, closely related to digital repositories (except for some metadata presented in the following sections). The physical outcome, focusing on short-term dissemination, is a DVD collecting the data described previously, while the theory and practice for relating this content to digital repositories is conceptualized in the MMDC approach (Boutard, 2015). In order to fit the limitations of the material format selected, we presented one expert with the potential content to include for a final selection (videos but also sketches,

software, sound examples, picture and so on). Table 3 describes the content selected in terms of video.

Work	Observation videos	Interviews
Le rêve d'Ahmed (Serge Provost)	7mn	43mn
Baobabs (Robert Normandeau)	15mn	15mn
The Body Loop (Laurie Radford)	15mn	20mn
Total	37mn	1h18mn

TAB. 3: DVD selection in terms of video

Non-sustainable in terms of support, with a focus of DiP-CoRE on dissemination, the DVD is also unlikely to be considered as an OAIS' relevant information package (see CCSDS, 2012),. The content forming a high-level complexity object, the breakdown between Archival Information Collections (AIC) and Archival Information Units (AIU) needs to be specified. Nevertheless, we produced metadata consistent, but not sufficient, with OAIS' Archival Information Packages AIPs and Dissemination Information Packages DIPs, for all content, so that the transfer to a digital repository at level one is manageable. As Niu (2014) puts it, "the quality of metadata and documentation affects the values of resources, and the costs and feasibility of preservation" (p. 70). We selected the PREMIS metadata format to implement basic requirements in terms of the OAIS in relation to the Preservation Description Information (PDI) and the Representation Information (RI). Similarly to previous projects, such as Seamless Flow (Ball, 2010, p. 19), we used Digital Record Object Identification (DROID) software to retrieve the PDI's fixity information and the RI from the PRONOM registry. The content was then mapped to PREMIS.

3.3 Analysis

3.3.1 Intro

Dissemination, documentation and preservation are intricately related. Sharing of expertise is critical and must be methodologically defined in documentation procedures. In the context of performance with digital technology in relation to digital curation, the argument of Sant (2014) is especially relevant:

> I believe that performance scholars and practitioners need to broaden the discussion on performance documentation so that it moves beyond the theoretical argument – which revolves around corporeal presence – still privileged by many academics. We need to question the relegation of the cultural significance of performance documentation or the activity of documenting performance as secondary to the artists' works. (p. 4)

The literature provides us with several proposals in relation to documentation in the artistic domain (e.g. Bénichou, 1994, Ippolito, 2003, Winget, 2009, Innocenti, 2012, Obermann, 2013). DiP-CoRE proposed a framework that defines specifically the methods but also the broader theoretical and practical context in which it takes place. The goal is to define replicable methods which conditions of replicability are specified by the theoretical framework.

As presented previously, this framework relies on the collaborative construction of meaning during interactions involving multiple expertise (similarly, in the new media art context, and in relation to the last point, Lorrain, 2013 advocates for the participation in the documentation process of software designers, assistants and so on). The cross self-confrontations give access to the thickness of the activity in relation to the creation, the production, and the performance of the three works investigated during the DiP-CoRE project. A few examples will bring into light this notion of thickness and how it relates to the intelligibility of the works and the creative processes.

3.3.2 Interaction with documents

The interview setup is visible in figure 4 and figure 5b. In the background, a large screen displays several observational videos captured during phase 1 of the project and selected according to the theme of the current cross self-confrontation interview. Each video excerpt is played once so that the participants may comment on the specific topic of the interview. They can play them again if necessary. On figure 5b, on the left side screen, several documents are presented including the list of microphones provided by the sound engineer Padraig Buttner-Schnirer. On the right side screen, some other documents related to the spatial disposition of performers, instruments and electroacoustic technology (i.e. speakers, microphones, and so on) including initial diagrams of the setup and pictures of the final setup. The participants are: 1) on the right, Robert Normandeau (RN), composer; 2) on the left, Fabrice Marandola (FM), percussionist in the Sixtrum ensemble.

FIG. 4: Fabrice Marandola uses the pictures in his argumentation of the changes in the spatial setup of instrumentalists

On figure 4, Fabrice Marandola, percussionist of the ensemble Sixtrum, rely on the documents provided to support his argument (our own translation):

FM You see, if you look at that [FM points his finger at the picture on the screen, cf. figure 4] on the picture, there are a lot of people, there is space on each side. And at the beginning it wasn't like that...

RN ... you were close to the side.

FM But at the same time we had more of the left side and the right side, so the stereo effect [...]

This very simple example shows clearly *what was not done* and *what was done* instead. It shows also how documents trigger the discussion, a discussion that is grounded in the activity itself. A similar argument emerges between composer Laurie Radford (LR) and sound engineer Padraig Buttner-Schnirer (PBS).

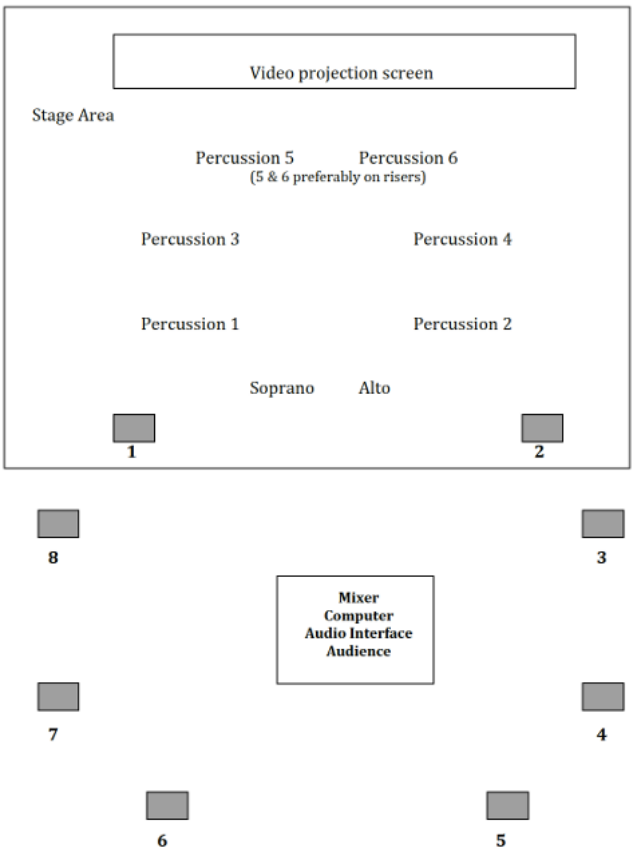

FIG. 5A: Initial stage initial plan

FIG. 5B: Laurie Radford explains his stage spatial setup modification during the workshop

LR [...] I changed the position of the instruments [LR points at a previous diagram of the setup] and [...]

PBS at the workshop?

LR During the workshop, because the decision we made, in order for it to be efficient, meant that I had to change where certain instruments were and it actually ended up being the reverse: instead of being 1, 2, 3, 4, 5, 6 [LR draws a pattern in the air with his finger, that corresponds to the percussionists' positions in figure 5a], it ended up to be 1, 2, 3, 4, 5, 6 [LR draws a reverse pattern in the air with his finger, which in figure 5a corresponds, sequentially, to: 6, 5, 4, 3, 2, and 1], and first I... Because it was in the workshop and the piece wasn't finished, I could then go back and re-orient how I was going to write the piece and how I was going to capture it [i.e. capturing the sound of the instruments that feeds the live electronics], in order to... not compromise on the concept.

3.3.3 Collaborative workflows

The work Baobab of composer Robert Normandeau builds on onomatopoeias (Woloshyn, 2014). The initial idea was to assign vowels to singers and consonants to the percussionists, showing another example of what was not done (our own translation):

RN It's true that the initial project was to have the percussionists do the consonants and the singers do the vowels but it didn't work that way [...]

In relation to the onomatopoeias, Robert Normandeau provided sound examples to the four singers so that they may practice. The participants in this interview are: 1) Robert Normandeau (RN), composer; 2) Marie-Annick Béliveau (MAB), singer.

RN Yes, this is a role that is meant for performers who are half way between actors and singers. [...] At the same time, it is true that there is an action of projection of oneself in the onomatopoeias. And with more time, I would probably have given you more guidelines, saying: 'this is a cat, this is this, this is that...', because there are many metaphors...

MAB But for that purpose, the audio tracks helped a lot because there was a lot of personality, and even more in *Le Renard et la Rose* [i.e. the recording of the electroacoustic work that RN composed previously, Baobab being an evolution of this work for mixed music].

This example shows what *could have been done* in relation to the production process. Another important aspect is the role of sound examples used as mediation between the composer and the singers. During the rehearsals, the singers questioned the relation between the score and the sound samples as well as the recording of the electroacoustic piece that grounded the composition of Baobab. In this environment where questions arise in relation with the interpretation of the onomatopoeias and this ambiguous role between actors and singers, the samples act as boundary objects, as defined by Star and Griesemer (1989), "[...] which both inhabit several intersecting social worlds [...] and satisfy the informational requirements of each of them" (p. 393). The composer and the singers negotiate the translation of the original material into singing practice without having to reach consensus but rather showing this interpretative flexibility described by Star (2010).

3.3.4 Creative processes

Following the work of Donin and Theureau (2007), we also conducted interviews with composers. For this type of interviews, the setup is different: the participant describes her or his past activity (that is to say, the creative process in this context) based on the traces presented by the researcher (such as sketches, software versions, and so on). The researcher is guiding the interview rather than another expert. One interesting example emerging from these interviews is the approach to software development in relation to the work but also to previous works.

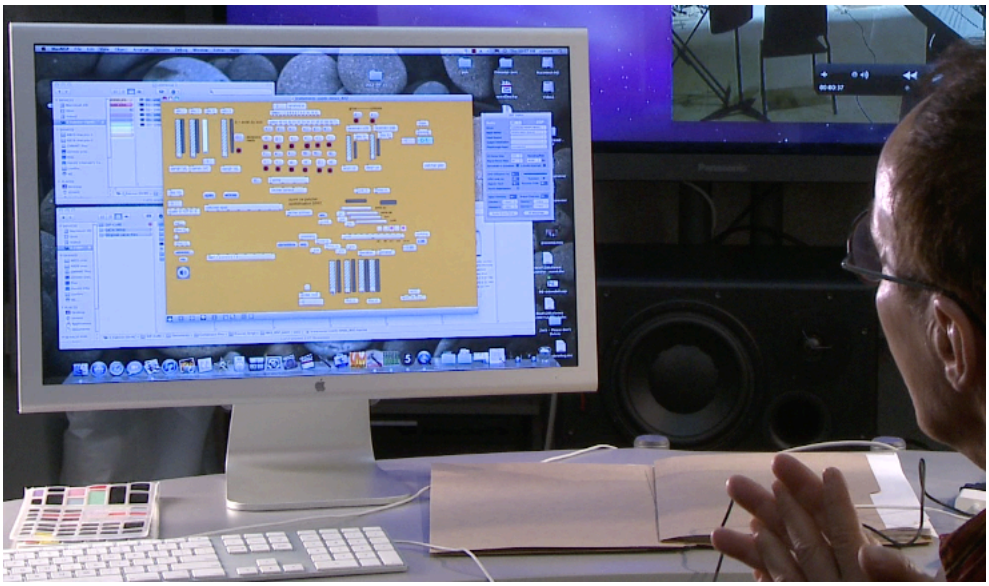

FIG. 6: Serge Provost describes his live electronics software

FIG. 7: Laurie Radford describes his live electronics software

For L.R.:

> **LR** Some of these patches [i.e. the live electronics software, see figure 7] have been with me for ten years, or some of these sub-patches. And they get adjusted just a little bit in terms of their parameters, in terms of how many signals are coming in, how many signals are going out. For instance, the pitch shifter, I had the same pitch shifter for a number of years and then I started disliking the sound or the quality of the pitch shifter so I rebuilt it with a slightly different configuration. So it's like pitch shifter version two.

While Serge Provost states that (our own translation):

> **SP** Some of the tools in this patch [i.e. the piece of software developed specifically for this piece, see figure 6] existed already in previous works and I brought them back. For instance, here [SP points at the screen showing the software], the delay system, the microtonal harmonization [...]. These are tools that are part of my toolbox where I pick up several elements and connect them together in order to create a network that fits the needs of the new piece.

In this discussion, we see an example of what Donin and Theureau (2007) refer to as *situated music composition*:

> [...] the particularity of situated music composition is that many important elements of the composition situation have been constructed in the past by the composer himself. This explains the essential role of memorisation, inscription, and re-reading and their corresponding techniques, which participate in the construction of an ensemble of which the realized work is only one of its most obvious manifestations. (p. 236)

Nuhn et al. (2002) defined three categories of composers in relation to the use of technology. While both composers belong to the category of composers "for whom creation of computer related tools (i.e. software, hardware interfaces) is a natural accompaniment to composition and is inseparable from the process of composing", a crucial difference of approach emerges from the interviews. On the one hand, Serge Provost describes a situation where he develops independent tools forming a library of software elements. On the other hand, Laurie Radford describes an instrument that evolves with every new work.

This relation to previous creative processes is critical for the intelligibility of the work in relation to potential preservation strategies. Furthermore, the interviews bring to light the fact that the semantic network connecting several works of a composer, include not only previous works but future works as well. Laurie Radford explains how he foresees future evolutions of his patch for future works:

> **LR** I think that probably what's going to happen with this [the output module] is that it's going to have another one [routing system] so that the manipulation of multiple signals becomes even more fluid and complex.

The workshop of each composer (see Donin and Theureau, 2008, for a discussion about the various meanings of the term workshop, in relation to the creative process. We refer here to the ensemble of tools and resources that the composer mobilizes during the creative process) is designed differently in these two cases. This difference impacts the creative process in terms of affordances and in terms of lifecycle. These statements exemplify the relation between the composer and his workshop on the one hand and his career on the other hand.

3.3.5 Outro

Beyond the specification of a qualitative documentation methodology—the primary goal of DiP-CoRE—the analysis of the interviews of this triple case study revealed a few dimensions of potential emphasis for the acknowledgment of the idiosyncrasies of creative processes in relation to the intelligibility of the works in this repertoire:

1. the relevance of the notion of *thickness*, critical point of the proposed methodology;
2. the potential identification of *boundary objects* in a multi-expertise creative process context (which requires to include all agents in the creative process), as well as the conceptualization of their use;
3. the impact of the notion of *workshop*, in relation to *intelligibility*, on the preservation, documentation and dissemination of the repertoire.

4 Discussion

4.1 Obsolescence and collaboration

According to Serexhe (2013a), the faster the technological evolution, the shorter the artwork lifespan. He adds that software become obsolete every ten years in this context. In the digital age, the lifespan is thus compressed, but the geographical span extends; the time dimension shrinks and the space dimension expands. This situation is well known in new media arts curation. This approach grounded

the preservation of video games in terms of user experience (Newman, 2011), but also technologically (in relation to migration and emulation strategies, an example in new media arts is provided in Kaufmann, 2013 in relation to computer Texas Instrument TI-99/4), leading Rinehart and Ippolito (2014) to state, controversially, that "[...] by far the biggest success story for new media preservation comes not from an institution—not even from an institution collaborating with a community—but from a community bootstrapping a preservation initiative on its own" (p. 115). This position also brings up issues of practice sharing. Mansoux (2013) urges museums, artistic institutions and archives to evaluate various models of sharing which may regulate and distribute content preservation.

To compensate for the fast obsolescence by engaging a distributed community with multiple expertise in the context of the curation lifecycle is arguably the next step in the development of the DIP-CoRE project. Noel de Tilly argues that re-exhibition of new media works with the transformation they require redefine their authenticity, a context that will have to continue when the artists are involved anymore. The question thus shifts from authenticity to intelligibility in relation to the transmission and transformation process for each production (similarly, Serexhe, 2013a, argues that technological obsolescence remove the sense out of the notion of sustainability and authenticity, a position that converges with the notion of variable media defended by Rinehart and Ippolito, 2014). The question of co-construction of meaning becomes critical in a process where multiple expertise are needed. Bringing methodologically this emphasis of co-construction of meaning in a distributed environment represents another challenge and an opportunity for future digital curation project. Relating to the DIP-CoRE approach, this potential framework may be best investigated with the notion of collective controversies, which represents an extension of the cross self-confrontation at the organizational level (see figure 8). The goal is then to push this collective controversy in a distributed environment, investigating Computer-Supported Cooperative Work (CSCW)—a research domain that developed since the 1980s (Grudin, 1994)—in a curation environment.

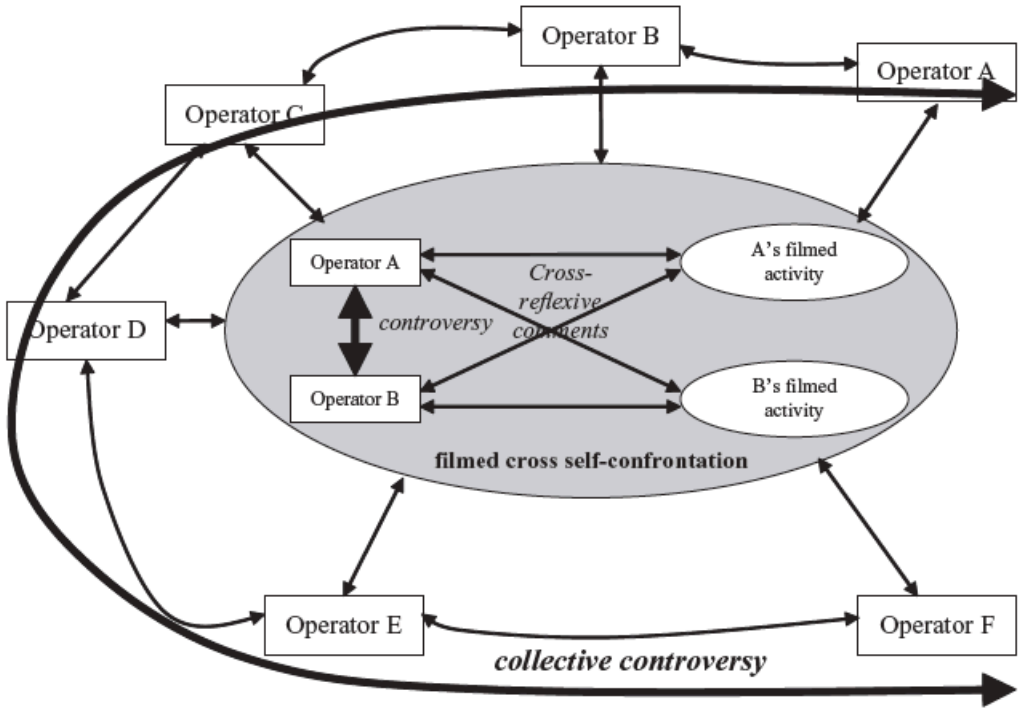

FIG. 8: Collective controversies investigation framework (adapted from Lorino et al., 2011)

As Schmidt (1991) puts it:

> Like any other computer system, a CSCW system is based on a model of an aspect of the world, in this case a model of a social world. And like any other model, a model of a social world has an application area within which it is a valid – abstract and limited – representation of the world. That is, there is a boundary beyond which the model is invalid. Thus a CSCW system is inevitably placed in a situation beyond the bounds of the underlying model. (p. 9)

This argument converges with the emphasis of Lorino, Tricard and Clot (2011) on models as mediations rather than models as representations. It emphasizes the fact that the convergence of collective controversies and CSCW is a challenging direction of research, a primary principle being that "[...] the system should make the underlying model accessible to users and, indeed, support users in interpreting the model, evaluate its rationale and implications" (Schmidt, 1991, p. 13).

4.2 Digital curation

Digital curation is a relevant domain of research in the context of artistic production (see Molloy, 2014). Tibbo and Duff (2008) state that "digital curation is essential not only for the sciences, but also

for preservation of cultural heritage materials as well" (p. 2). Outcomes of the analysis emphasize the notion of lifecycle, at the core of digital curation. Composers develop, re-use and transform the software created for each work. In this context, Abbott (2012) best describe the relation to the curation lifecycle:

> The development of holistic, high-level curation strategies in recent years, such as the Digital Curation Centre's Curation Lifecycle Model (Higgins, 2008), offer a structured approach which is more appropriate to open-ended works such as performance and interactive artworks. The explicit acknowledgement of an ongoing cycle of curation which includes elements of transformation is particularly useful for addressing the challenges of work in this domain. (p. 69)

During DiP-CoRE we developed the first and second levels of the MMDC model (designed as a relation between digital preservation models such as the OAIS and digital curation models such as the DCC Lifecycle). DiP-CoRE did not address the relation to the OAIS model at the fourth level of the MMDC— the level corresponding to digital preservation models and strategies—except for the metadata in compliance with partial OAIS requirements for information packages. In the artistic domain, other relevant metadata formats could be selected, such as MANS (Rinehart, 2004) in relation to *significant properties* (or *transformational information properties* in OAIS terms), or the Functional Requirements for Bibliographic Records-object oriented (FRBR-oo) (Le Bœuf, 2012) in relation to context and provenance information. The third level, relating to realistic knowledge management models requires further investigations, beyond the scope of this project, it relates to the notion of *significant knowledge* (see Boutard & Guastavino, 2012a) and the creation of risk management tool (based on statistical analysis of similar cases).

The DVD produced during DiP-CoRE represents this focus on the qualitative part of the MMDC model, emphasizing dissemination over curation (from a strict technical perspective, an example of failure in relation to documentation support on CD is described in Serexhe, 2013b). A future goal is thus to work at the fourth level of the MMDC model, which implies working directly with the specification of digital repositories. This task could benefit from a converging effort in relation to the previously stated goal of CSCW, with the consequent goal of establishing methodological rules for the design of participative digital repositories (PDR). The goal of PDR would be to mobilize distributed expertise (the artist being one important part of this network) in the context of digital curation, impacting on every level of the MMDC approach, especially in relation to *collective controversies*. The question of distributed expertise may include the organizational level as emphasized, notably, by Caplan, Kehoe and Pawletko (2010): "there is wide agreement in the international preservation community that responsibility for long-term preservation of scientific and cultural heritage materials must be shared among many organizations" (p. 35).

5 Conclusion

DiP-CoRE articulates two forms of transmission, with objects and by practice, across an interdisciplinary theoretical framework stemming from work psychology, organizational science and music research, with the intention to bound together documentation, dissemination and preservation. In

this paper, we emphasized several notions relevant to the preservation and the co-construction of the intelligibility of a repertoire, where the goal is to provide the means to re-perform in order to keep the works alive. We further provided several future directions to complement our approach towards mixed methods digital curation, pointing at the core notions emerging from the analysis for the three creative processes, namely, the *thickness*, *boundary objects*, and the *workshop*. The investigation of the relation among these three notions in relation to curation is an exciting direction of research.

While building on a specific high-level model of digital curation, the methodological framework we proposed and described stands on its own. It provides the research community, as well as practitioners, with a relevant and effective method for addressing the co-construction of meaning and the transmission of the intelligibility of a work based on the expertise of the agents of the creative process. As such this framework may also benefit the information science research community for better understanding the connection between information seeking behavior and creative processes (Medaille, 2010, Lavranos et al., 2015) with a specific attention to qualitative approaches (see Cibangu, 2013, for a discussion of theoretical and methodological shortcomings in information science).

The research presented in this paper has brought into light elements of three specific creative processes which could only emerge through methodological enquiries such as those proposed in this paper. These elements include the strategies of software development by composers throughout their career, the adaptations of composition elements to the context of production, the collaborative work strategies mediated by objects such as audio recordings, the conceptual changes during the creative process and their historical grounds, and so on and so forth. The production of an exhaustive list of these elements pertains to the domain of music research and is beyond the scope of this paper. The goal of this research is to define the methodological framework which enables the provision of documents and methods to access these elements. We have further argued that the documentation of these elements participate in the transmission of the intelligibility—and subsequently, the sustainability—of these specific works in relation to the use of technological frameworks. The goal of the qualitative research-based DiP-CoRE project is thus not to generalize the outcomes but rather to generalize the methods, that is to say to provide a methodology that is transferable to similar contexts of artistic production, always emphasizing these idiosyncrasies that defy a priori models of creative processes. It is because of this transferability that we may include this framework in a larger one building on mixed methods.

In our framework, experts build on their expertise in a collaborative process where the involvement of the researcher or the practitioner (archivist or documentalist) is reduced to a minimum. From this perspective Lee's (2011) statement about descriptive and curatorial practice, advocating for practitioners to decide "what aspects of the digital objects' creation and use environment are important enough to warrant capture, documentation, and preservation over time" (p. 115), is significantly modified. According to our framework, the decision process is distributed among peers as a joint effort. This situation provides us with a method that is easier to transfer to other creative processes and more powerful in terms of adaptation to various institutional contexts. We also argue that this situation will be further improved when put to work in the context of computer supported collaborative environments and in relation to specifically designed digital repositories able to support such methodologies grounded in mixed methods digital curation.

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