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A questionnaire-based investigation of the skills and roles of Computer Music Designers

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Abstract

Throughout the history of electroacoustic music, creative collaboration has been a constant feature due to the complexity of the technology. All laboratories and electronic music studios involved the presence of different individuals with diverse, intertwined competencies. In particular, the embedding of technological tools into the process of musical creation prompted the rise of a new "agent" called the Computer Music Designer (CMD), who can work in writing, creating new instruments, recording and/or performance. Audiences as well as the academia have long been unaware of this emerging profession and its crucial role in the creative process of electroacoustic, electronic and computer music. This study sheds light on the socio-professional profile and expertise of the CMD in order to better understand how computer music design contributes to shaping electronic music as we know it. We present the methodology and outcomes of a questionnaire submitted to several CMDs. The purpose was to investigate this emerging community by means of an instrument permitting anonymity. Findings help to understand how the CMDs perceive their profession; trace common paths and habits among CMDs; and study this community from the point of view of their age, training, tasks, legal status, recognition, skills, professional identity and involvement in technological migration. The questionnaire instrument is appended.

Keywords

Computer Music, electronic music, musical assistant, Computer Music Designer, Réalisateur en Informatique Musicale, collaboration, professional skills, creative process, emerging profession, digital preservation, game music

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Background: What is computer music design?

All the way back into early analogue music (starting with *musique concrète* in 1948 and electronic music in 1950) and certainly throughout the entire history of computer music since 1957, electronic music studios have involved the presence of different individuals with diverse but intertwined competencies, alongside composers and administrative staff. A "[c]ollaborative research project was necessary in order to solve some problems composers came to face with" (Risset, 2014, p. 13). Typical problems were, for instance, the manual simultaneous manipulation of different electronic devices in the early analogue days or, since the birth of Computer Music:

> ... the fact that ... perhaps for the first time in history a composer has to explain and formalize the way he or she develops and manipulates concepts, themes and relations in a musical context in order for technicians (who may have little musical training) to bring them into existence. (Boulez & Gerzso, 1988)

This article focuses on the figure of the composer's collaborator in the digital era. The Computer Music Designer (hereinafter abbreviated CMD), or musical assistant, technician, tutor, music mediator (the profession has been named in different ways over the years; Zattra, 2013), handles the technical setup of a music piece from the early experimentation phases until the concert production. He or she may explain to the composer the latest outcomes in computer music technology or psychoacoustics, the musical potentialities of sound effects; he/she translates the composer's artistic ideas into programming languages; he/she transposes those ideas into a score or a computer program and often takes part in the performance of the musical piece during the premiere as well as subsequent performances.

Despite the CMD's significant presence among music professionals, the vast majority of electroacoustic music studies have overlooked his/her roles, skills and impact. While books and essays dedicated to the history of computer music do agree, in principle, on the interdisciplinary nature of this music and the importance of collaboration (Born, 1995; Chadabe, 1997; Collins & d'Escrivàn, 2007; Dean, 2009; Durante & Zattra, 2002; Manning, 2013; Nelson, 2015), no systematic study of the emerging profession of CMD exists to date. In his report on French music studios in the 1980s, Menger (1989) discussed the ambiguities and paradoxes of the role of the "tutor" (the term for CMD at the time), and highlighted the contrast between some tutors' significant creative contributions, and the fact that public recognition of the work's qualities was oriented exclusively towards the name of the composer (pp. 134–139). IRCAM (Institut de Recherche et Coordination Acoustique/Musique in Paris) members interviewed at the time by Menger wondered whether tutorship should be practised in ways other than as a transitional activity between the apprenticeship and rise of a young electronic composer. Some 15 years after Menger's study, tutors had in fact increased in number and significance at IRCAM and elsewhere; however, one discouraged CMD still acknowledged that "by and large, the public ignores the implications of a musical assistant for the creation of contemporary music" (Poletti et al., 2002, p. 243). As of today, computer music design is not officially recognized by a professional registry.

The aim of this study is to shed some light on the socio-professional profile of the CMD in order to better understand how computer music design contributes to shaping electronic music as we know it. This article provides partial results of a research initially conducted by the two authors at IRCAM in 2012 and continued by the first author in the following years in contact with other institutions and individuals. The general framework of the project addresses the

cooperative creation, the network of agents and processes involved in music making with New Media, the implications of musical mediation and the music's changing ontology.

Studying an emerging profession

We will present the outcomes of an anonymous questionnaire submitted to several CMDs. The purpose was to investigate this emerging community by means of an instrument permitting anonymity. More precisely, we wanted to know how the CMDs perceive their profession; to trace common paths and habits among CMDs; to study this community from the point of view of their age, training and tasks; and, ultimately, to propose a general conceptual framework that describes this profession.

The overall research programme that surrounds this study has been organized into three stages as follows.

1. Preliminary research has been conducted in order to trace the history of the profession, gather a comprehensive bibliography and open an informal discussion with several CMDs working at IRCAM and other international centres or as freelancers (in France, Italy, Germany, United Kingdom and the USA). The two authors conducted this part of the project in strict cooperation (supervision and coordination by Nicolas Donin; investigation and related outcomes by Laura Zattra). It has culminated in the publication of the history of the name and profession at IRCAM (Zattra, 2013); a comparative analysis of the presence of collaboration and CMDs at IRCAM, CCRMA (Center for Computer Research in Music and Acoustics) in Stanford and CSC (Centro di Sonologia Computazionale all'Università di Padova) in Padua (Zattra, forthcoming); other articles have examined cooperative compositional approaches in electroacoustic composition (Donin, forthcoming; Zattra 2014a, 2014b). A strong emphasis on historical evidence and oral sources characterized this part of the project, whose methodological approach was based on historical and philological methodologies.
2. The second phase consisted of contacting and questioning currently operating CMDs to describe their profession according to their own experience and practice. The first author administered a questionnaire (which will be discussed in the following pages) and led several face-to-face interviews that sought to answer the following research questions: What is the trajectory of a CMD career? How is it perceived? To what extent does the denomination fit the content of this profession? (Zattra, 2015).
3. The third phase (to be done) will consist of ethnographic research into the activity of CMDs onsite, allowing for comparison with the findings from the two previous phases.

Questionnaire methodology and design

Rationale

As computer music design is an emerging profession, no previous research was available. The questions described below were thus created on the basis of several non-structured interviews with a dozen French and Italian CMDs, followed by sessions of analysis and debate between the two authors to trace the common paths, ideas, perceptions and histories that emerged from what CMDs said, and compare these with our own musicologically informed knowledge of the world of computer music.

We also strived to take advantage of partial similarities with professions such as music producer or technical assistant in contemporary arts and theatre, although they have been often no less neglected by empirical research than the CMD. Studies on the practice of sound production, such as that of Pras and Guastavino (2011), or in other professional fields (Adhémar, 1939; Demazière & Gadéa, 2009; Dower, O'Neil, & Hough 2001; Pearce, 2014; Sabatini et al., 2000), were used as a repertory of issues that could match, or complement, the main themes addressed by the questionnaire. We designed and tested the questionnaire instrument from July to September 2012.

Instrument

The general structure of the questionnaire derives from the literature on computer music design in the 1980s and 1990s. One significant occurrence summarized the main tasks of the CMD as "1) Assisting the musical production; 2) teaching; 3) compiling an appropriate documentation; 4) having a personal artistic activity on their own" (Szendy, 1996). These roles have been confirmed by all CMDs associated with our preliminary phase of informal interviews. They added two notable observations: teaching can be either prominent or almost absent, depending on the hiring institution and the period within the CMD's career; and documentation has become a crucial issue over recent years, calling for tasks and skills that the first generations of CMDs tended to consider peripheral (Boutard & Guastavino, 2012).

The questionnaire was then divided into three distinct blocks: (1) personal profile (eight questions); (2) identity, tasks, training of the CMD and parallel activities (22 questions); (3) documentation, archiving and porting (i.e., technology migration) (five questions). Singling out the third block helped with distinguishing the CMD's activity *after* the first performance of a music piece, as opposed to his/her work with the composer during the creative process until the premiere.

The questionnaire is reported in full in the Appendix and commented on below. Most questions were multiple-choice questions; seven questions asked to evaluate a statement (24.1–29.7, five-point Likert scale) and seven questions out of 35 gave the possibility to add comments (Q.4, 5, 6, 7, 8.2, 14.2, 17.2). Two extra questions at the end of the questionnaire invited the participants to leave comments on the questionnaire.

Specific hypotheses underpinning the survey

A series of underlying hypotheses, themes and assumptions guided the design of the questionnaire. These can be summarized in four points: time(s) of activity; legal status and recognition; tasks, skills and training; heritage and technological migration. The following chart (Table 1) summarizes the forecast of the four themes we expected to investigate.

For the sake of the step-by-step narrative coherence of the questionnaire, the first author finally placed the questions in a slightly different order from these hypotheses, according to the responses of three early beta-testers.

Target population

During the preparatory phase, the first author also set up a list of professionals working as CMDs worldwide, with two main goals: (1) to address the populations of CMDs at large, instead of narrowing the search to CMDs available via IRCAM or CSC (host of many research projects

Table 1. Keywords and hypotheses underpinning the questionnaire.

Keywords	Hypotheses	Related items
Time(s) of activity	Due to the fast evolution of computer technology since the 1970s, the CMD's birth class impacts the content of his/her tasks.	Q. 1 Q. 3
	Computer music design could be a temporary activity and is more often than not a portion, not the whole, of a life-long professional career.	Q. 2–6 Q. 24.4 Q. 27–30
Legal status and recognition	The absence of a clear legal statutory definition of CMD results in various conditions of hiring as well as a lack of administrative recognition and facilities.	Q. 10 Q. 24.3
	Recognition of the CMDs' work can take different forms because there are no proper, standardized ways of recognizing their achievements and skills.	Q. 12 and 13 Q. 24.5 and 24.6
Tasks, skills and training	CMDs' collaborative working habits grow out from interpersonal relationships. Some collaborations may be much more significant than others. Different collaborations may imply different skills and processes.	Q. 6–8 Q. 27–30
	The activity of the CMD is not only a series of tasks and competences, but also involves social and psychological skills: the dynamics of the composer/CMD relationship is key to understanding the CMD's professional identity.	Q. 14 Q. 25–26
	Much of the CMD's skills are individually developed through self-teaching, mutual learning in real work situations, peer-to-peer oral transmission, etc., but (at least at the time of this research) not as a consequence of formal academic training.	Q. 9 Q. 24.1 and 24.2
	However idiosyncratic they may be, CMDs' skills can be described as a mix of specific artistic, scientific and technological skills.	Q. 15–17
Heritage and technological migration	There is no norm for the preservation of the output of CMDs' work: they may archive or not, conceive the archive as private or collective, subjected to publication or not. Not all CMDs consider preservation as part of their business.	Q. 18–23
	The life cycle of the work is very differentiated with regard to the CMD's involvement after the premiere. He/she may or may not be involved in the subsequent developments of the resulting software, score, devices, etc.	Q. 31–35

Note. CMD: Computer Music Designer.

of both authors), thus allowing to elaborate findings relevant to CMDs in general; (2) to enter into contact with CMDs who might otherwise be difficult to identify or reach, in order to request future interviews. Four different pathways have been followed to identify our target population.

(1) IRCAM's reference online encyclopaedia of contemporary music, BRAHMS (http://brahms.ircam.fr), provides useful information (authors and contributors, dates, programme notes) about many contemporary pieces, with a focus on electronic and mixed music and an international scope. Retrieving data pertaining to CMDs led to a first list of 165 names.

Within this platform, "RIM" (Réalisateur en Informatique Musicale), the official French name adopted at IRCAM, stands for "CMD".

(2) IRCAM's current population of CMDs (12 people) was taken into account. These CMDs (a subset of the previous list) have their own mailing list, which is an essential part of their community of practice and could channel our questionnaire and subsequent inquiries.

(3) Since the presence of CMDs within the computer music community can be discrete or scattered, and CMDs' profiles may be quite diversified (there are examples of composers who are also CMD for other productions), the first author also decided to send the questionnaire to several mailing lists that do not explicitly focus on CMDs, but include computer music professionals interested in computer music research and production: the Sound and Music Computing mailing list, and national associations or leagues dedicated to computer and electroacoustic music.

(4) A few other names of CMDs were added, when still missing, following personal acquaintances.

The introductory message to the final 35-item questionnaire (including a link to the online questionnaire) eventually reached a few hundred people worldwide working in the field of computer music. We estimate that several dozen among them were CMDs strictly speaking.

Administration of the survey

A first version of the questionnaire was submitted to three fellow researchers from the institution hosting the research, leading to greater clarity and additional points. The second version was tested by two CMDs from IRCAM, who confirmed the feasibility and comprehensibility of the questionnaire.

On 9 October 2012, the first author started to send the invitation to participate to the questionnaire to the CMDs listed in points (1)–(4). The process took less than a week, except for some problems that occurred in identifying several personal email addresses. The introductory message commenced with a standard opening, "Greetings! I am conducting a research study about [...]. You are invited to participate[...]," and indicated a deadline of 30 November 2012. The message included a link to a Google Form implementation of the questionnaire.

We obtained 17 responses (most of them from point (2)), over the three first weeks—a relatively shy response with respect to the number of CMDs who had expressed earlier interest in the research. To increase the response, we decided to write more personalized invitations. On 30 October, the first author sent messages (Dear Name/Surname) to CMDs listed in points (1) and (4), with the following friendly reminder: "Some days ago I sent an e-mail to invite you to participate in a research study .... Today I am sending the translated text of the survey (English, French, and Italian), after some of you asked for it." This strategy was fruitful—response increased—but also initiated a shift in the administration of the questionnaire, which proved effective as a tool for nurturing a dialogue with the community over the long term. Originally announced with a 2-months deadline, the questionnaire in fact remained open for 1 year and 8 months to allow for the delayed responses of individuals who become aware of the survey (via the community) long after its initial launch. Whereas the earliest answer arrived on 9 September 2012, the last one dates from 27 May 2014.

Some respondents refused to answer (but kindly wrote an accompanying email supplying the reason) because they defined themselves as "CMD on their own" not CMD per se: they are composers who also have enough programming and sound engineering skills to do the work of a CMD. Particularly among those listed at point (1), some wrote they were composers and appeared as CMD in the database simply because they had diffused their own work during concerts (they were both the author and the CMD of the musical work).

At the end of the process, we had submitted our questionnaire to 91 individuals from our lists and to an unknown number of people from the mailing lists.

Anonymity versus non-anonymity

Consistent with the findings from the exploratory phase, the questionnaire had to address if/how social recognition of the CMDs' contribution is essential to them, with a particular emphasis on the recognition of their creative involvement, often neglected in favour of the composer who is usually credited as the sole author of the music. In view of this difficulty, which also arose during the administration (see above), the questionnaire should enable the respondents to speak anonymously of problematic aspects of their profession as well as overtly comment on peculiar artistic achievements as desired. Henceforth, the questionnaire was anonymous "by default" but allowed the user to reveal one's own name at the end of the questionnaire (which also allowed for free comments in a separate text box).

As a result, a significant number of responses are identifiable. Twenty-six out of 35 usable responses gave an identification (one CMD supplied his answers twice and signed both submissions, 14 months apart): 18 gave their full name; eight offered an easy-to-decipher ID or gave clear indications on who they are through the works and institutions they mentioned within comments; nine of them gave no hint about their identity. This confirmed our methodological hypothesis that both anonymity and non-anonymity were welcome, and even required, in such an exploratory study of this population.

Responses

Among 38 filed answers in total, nos. 8, 19 and 21 were void or incomplete, and were not taken into account. Two were signed by the same CMD. We merged these corresponding data into one single item (quoted hereafter as no. 4). The emailing of the questionnaire yielded ultimately 34 usable responses. Consequently, usable responses were renumbered from 1 to 34. All identifiable respondents are European: French, German, Belgian and Italian.

Limitations

Since the number of CMDs reached by our announcement message cannot be determined (as noted, there does not exist any national or international mailing list specific for CMDs and we had to rely on lists enrolling composers, performers, CMDs, sound engineers and multimedia artists, without distinction), we are not in a position to assess the exact response rate to the questionnaire. However, based on close scrutiny of BRAHMS's list of CMDs, we can estimate that the current population of active CMDs comprises 40–60 individuals (out of the 165 uncritically counted by BRAHMS as CMDs over six decades), which means that our sample represents a significant share of the overall population targeted.

Results

We will focus here on the results of the survey, both through a qualitative and quantitative lens.

Following data collection, all responses have been set together in two different ways: answer-by-answer and participant-by-participant. This allowed, respectively, for the observation of general trends among the respondents and consideration of individual claims and statements, particularly when respondents had chosen to identify themselves and start a dialogue with us through the questionnaire's means for free comments. Quantitative analysis included basic statistical repartition of ages, periods of activity, number of works and collaborations, training, type of contract, dissemination and archiving, and several evaluations of statements; due to the modest number of respondents, these values must be interpreted cautiously in the light of background information gathered before and during the administration, and percentages rarely makes sense. Qualitative analysis included systematic comparison between assertions from the pre-existing literature that had informed the design of the questionnaire, and every corresponding answer and comment by respondents. In the following, we have selected, for each of the four main themes underpinning the survey, the most salient features that added to or corrected pre-existing assumptions stemming from the literature and our informal discussions in the first phase of the research.

Time(s) of activity

The distribution of age ranged from 26 to 36 years old (nine respondents), 36–46 years old (eight) and 46–55 years old (nine), which means that the age of most respondents is equipartitioned in these categories. One respondent is below 25 years old (R. 9). One respondent was more than 66 years old.

Three respondents have acted as CMDs for more than 30 years—nine of them for more than 15 years. The large majority is still active, but Participant 27 (aged between 36 and 45) had practised only during the second half of the 1990s; three participants aged between 46 and 55 (out of nine) practised especially during the 1980s the 1990s; two participants aged between 56 and 65 (out of five) practised during the 1970s and 1980s (Figure 1); multiple answers were possible.

Based on the literature and our preliminary interviews, working as a CMD is a temporary activity rather than the whole of a life-long professional career. Although most respondents steadily confirmed this hypothesis, it does not apply to everybody, and some answers help to sketch a more nuanced view. It is clear from the fact that most respondents have been consistently practising as CMD for years at the time of the survey that, as the years have gone by, professionals now regard this (once) emerging activity as a stabilized, fully developed activity per se. Yet several answers show some willingness to construe computer music design as a path towards greater specialization either in the arts, technology or science. One anonymous participant even adds the following comment to Q. 24.4 (Please evaluate the following statements: "The Musical Assistant activity is a temporary job one should consider before choosing another (artistic, academic, etc.) career"): "Not that 'it is possible to quit,' but *one must* quit!"

Responses to Q. 4 reveal that older CMDs have worked on more than 50 musical works. More than one respondent writes "at least one hundred"; others write: "they are so many I do not have the time to count them". Comments to Q. 4 are significant: Respondent 4 writes that he has been working "not only 100% as CMD"; Respondents 4, 10 and 34 specify that on many occasions they are only one of several CMDs involved in the making of a piece. Respondents 10, 11, 23, 26, 27, 29, 32 and 33 state that a number of projects consisted of updating the

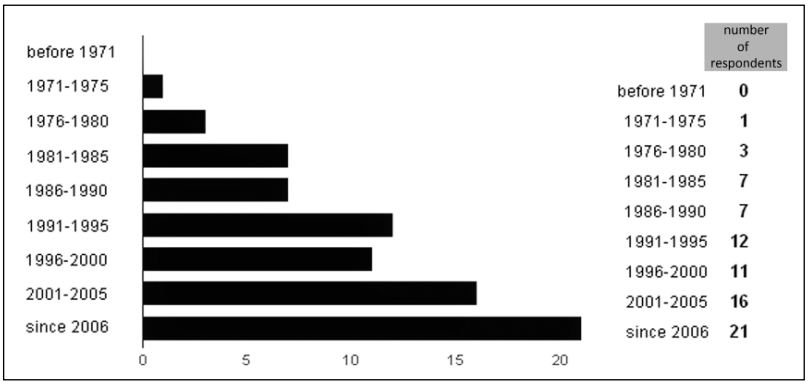

Figure 1. Time span of activity of Computer Music Designers.

technical environment of previous works. This reveals an important mutation through history: the production of computer music has developed to the point where it has a repertoire, and even a canon, calling for regular updating of the technology required to keep the works available for performance. Henceforth, while older CMDs were essentially involved in the creative process in the studio (from their first meetings with the composer until the premiere), younger CMDs, as well as CMDs with a long record of activity, feel the need to make a distinction between their contributions to compositional processes and to new productions of pre-existing works—themselves implying, in some instances at least, specific code upgrading and rewriting (Plessas & Boutard, 2015). Respondent 4 adds a comment also to Q. 8.2: "I'm young [26–35 years old] therefore I don't have many works on my records, but I've worked so many times as an 'interpreter' of electroacoustic music instead." Respondent 26 answers Q. 6: "I've worked with 3 composers as a CMD, but several as an 'interpreter,' and the number of musicians and artists with which I've worked is unfathomable!" Conversely, Respondent 32 stresses that quite a lot of his/her collaborations are not to be considered within the framework of performance but were contributions to "musical research" projects involving musicians, CMDs and researchers (Q. 8.2).

Responses to Q. 27, 28 and 29 reveal that all participants develop multiple activities in conjunction with their work as a CMD. Most typical activities are composition (21 respondents), sound art (13) and research (14). Seventeen respondents have produced more than 10 artistic works on their own. Two among them (signed) have produced 30 and 40 artistic works; the first one defines himself both a CMD *and* a composer, while the second one claims to be a composer with an unintended past as a CMD ("I actually never wanted to be a CMD. It just happened"). Q. 30 investigates the CMDs' later career, that is, if they still are a CMD or, in the case where it was a temporary activity, what they have become instead. Among those who have left the profession, eight are now teachers and professors in a university environment.

Legal status and public recognition

In line with our hypotheses, respondents confirm that there is no clear legal statutory definition of their profession, which results in various conditions of hiring (Q. 10) as well as a deficit of administrative recognition and facilities for the empowerment of CMDs.

We could assume that payment arrangements could take the form of three different typologies: specific project; percentage of rights or patents; steady paycheque. Q. 10 investigated the salary scheme with which CMDs have worked more often (multiple answers were possible). It

Table 2. Q. 10: Salary scheme with which Computer Music Designers (CMDs) have worked more often (multiple answers were possible).

Temporary contract, full time	**12**	37.5 %
Temporary contract, part time	**9**	28.1 %
Open-ended contract, full time	**6**	18.8 %
Open-ended contract, part time	**4**	12.5 %
Internships	**6**	18.8 %
Intermittent du spectacle (in France)	**12**	37.5 %
Voluntary unpaid work	**10**	31.3 %
Voluntary unpaid service assigned within another contract	**4**	12.5 %
Other	**3**	9.4 %

Table 3. Response to Q. 24.5: "The Musical Assistant role in an artistic production should be acknowledged by copyright legislation".

1 (not at all important)	**1**	2.7 %
2	**4**	10.8 %
3	**3**	8.1 %
4	**9**	24.3 %
5 (very important)	**16**	43.2 %

Table 4. Response to Q. 24.3: "The Musical Assistant should be recognized as a professional association".

1 (not at all important)	**1**	2.7 %
2	**0**	0 %
3	**7**	18.9 %
4	**7**	18.9 %
5 (very important)	**18**	48.6 %

was found that the Temporary contract formula (full time) is the most common status (and, in France, the "Intermittent du spectacle" status, cf. Menger, 2005). In the "Other" field, three answered that they work freelance (with VAT number) (Table 2).

However, the fact that the most common framework is a temporary contract does not mean that CMD could only be a profession accompanied by another. In fact, the majority of participants testified to the evolution of their professional status by selecting multiple choices: they had started their work as a CMD with temporary contracts and ended up with more stable positions (within a studio, in the academy or as autonomous freelancers with VAT numbers).

Q. 24.5 asked whether "The CMD role in an artistic production should be acknowledged by copyright legislation or not". As expected, respondents voiced their concern that no author society in the world has suggested the inclusion of CMDs as members or any other form of recognition of their contribution (Table 3).

Asked to evaluate the statement "The Musical Assistant should be recognized as professional association" (Q. 24.3), respondents overwhelmingly expressed their approval (Table 4).

Finally, Q. 24.6 asked whether they think tools/applications/etc. created by the CMD should be protected/patented/marketed. Contrasting with previous responses, data do not display a clear trend, be it pro or contra (Figure 2). While CMDs expect various forms of recognition for

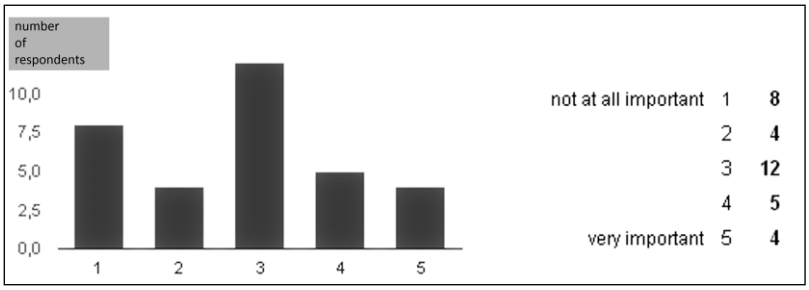

Figure 2. Q. 24.6: Importance of the protection by patents.

Table 5. Response to Q. 12: "Has your name been mentioned in the press, programme notes, etc.?".

Never	**1**	2.7 %
Rarely	**5**	13.5 %
Half the time	**6**	16.2 %
Frequently	**14**	37.8 %
Always	**7**	18.9 %

Table 6. Q. 13: Places where the Computer Music Designer's (CMD's) name has been mentioned.

Programme notes	**30**	96.8 %
Published score	**12**	38.7 %
Unpublished score	**11**	35.5 %
CD	**18**	58.1 %
DVD	**8**	25.8 %
Posters	**14**	45.2 %
Other	**2**	6.5 %

their artistic contribution, it seems that they do not consider their technological contribution in the same way, or have not arrived at a point of consensus among them.

Recognition of the CMDs' work can take different forms because there are no standardized ways of recognizing their achievements and skills. Response to Q. 12 shows that their names have been regularly mentioned in the press, programme notes, etc. (Table 5). The variety of their answers can be analyzed according to the age of participants. Most respondents under 45 years old say they are "Always" or "Frequently" credited as having contributed to the work, whereas the majority of respondents over 45 years old say they are "Never," "Rarely," "Half the time" mentioned. Although the survey refers to the subjects' personal evaluation, it can be said that public recognition of the CMDs has improved over time. All respondents, except but one, have been mentioned in programme notes.

Q. 13 investigates the typology of published media. Programme notes (i.e., textual information related to the musical work, usually published in the booklet of a concert) are the majority (Table 6).

Q. 13.1–13.5 demonstrate that CMDs are also active writers: they contribute to scientific papers. Half the time, they appear as the sole author. In co-authored papers, they are often credited as the first author (13.2).

Tasks, skills and training

Computer music design complements, and hence depends on, another profession—music composition. One is not "CMD" in itself, but "CMD" of somebody, and for some project. This activity involves many collaborative working habits strongly dependent on interpersonal relationships: some collaborations may be much more significant than others and might imply rather different skills and processes. The CMD/composer relationship inevitably raises issues of mutual recognition that we chose to embed into this part of the survey.[1]

Answers to Q. 7–8 reveal how the majority of CMDs have developed tight relationships ("marriages"[2] for more than one musical work) with some composers over the years. Most answers indicate the number of privileged collaborations, or offer more detail (Respondent 6 with eight composers; Respondent 15 writes "a dozen asked expressly to work with me"). The average number is two to three composers. Answers to Q. 8 also help to determine the number of works produced within the frame of these collaborations. The average number is two, which suggests that "marriages" do not last forever.

This value should not overshadow the fact that CMDs may develop long-term strategies other than regular collaboration with a composer. For example, Respondent 2 (signed) mentioned his personal work after contributing a production by George Aperghis. This CMD, Greg Beller, first helped the composer to adapt a pre-existing motion-based sound processing device, then he refined it and published about it after the premiere. Later on, he secured funding to continue exploring the tool with a prominent performer already involved in the initial project, and both of them became artists-in-residence to further develop the artistic potential of the device (Beller, 2014). Yet, this example remains an exception: our data show CMDs being linked to various projects without any possible continuity or the ability to choose engagements according to their own purposes. Respondent 4 deplores that insufficient crediting of the CMD's work makes it difficult to claim a project's output as one's own, thus precluding CMDs from being hired in institutions or companies at a later stage in their career.

CMDs' struggle to make sense of their eminently collaborative activity to their difficulty to identify themselves in the name CMD. Respondent 4 writes in fact in one later commentary "I cannot see the reason CMDs (RIMs) exist. My colleagues and I have been forced to accept this term and the system behind it, but this term does not mean anything. CMD is simply an 'electronic musician,' as simple as that". The discussion touches on the perception of identity and the meaning of collaborative creation itself. One can feel exploited and simply produce a punctual service. Respondents 34 and 4 write (Q. 8.2. comments): "No comment. Does this mean 'service delivery'?" Respondent 8 writes "I am CMD and composer at the same time". CMDs do not share a common identity and have different perceptions of their role.

These free comments (more abundant in number than on any other topic in the survey) tend to confirm that the dynamics of the composer/CMD relationship are key to understanding the CMD's professional identity. Based on the premise that CMDs are able to assess the composer's skills, Q. 14 asked whether the composers/artists they have been collaborating with have computer skills or not. Answers to this question show that the composers/artists possess a wide variety of computer knowledge, from nothing to a high level, although the majority of respondents indicated the composers had "medium" and "quite poor" knowledge. CMDs expect, therefore, some complementarity between the composers' and their own skills. Respondent 14 emphasizes how possessing some knowledge does not equal possessing the corresponding know-whow: composers may have a good understanding of the concept but not the craft to implement it (hence many misunderstandings and losses of time).

Table 7. Response to Q. 25: "Did the collaboration with composer(s)/artist(s) ever experience a crisis?".

Never	**8**	21.6 %
Rarely	**18**	48.6 %
Half the time	**3**	8.1 %
Frequently	**2**	5.4 %
Always	**1**	2.7 %

Table 8. Response to Q. 9: Training.

School, master's degree (specific training)	**15**	50 %
Internship, workshop	**5**	16.7 %
Skills and "knowhow" received from other Musical Assistants	**13**	43.3 %
Other	**18**	60 %

Q. 25–26 investigate psychological factors: tension or even conflict between the CMD and the composer. Q. 25 asked whether their collaboration had ever experienced a crisis (Table 7). More than half of the respondents answer "never" or "rarely".

Asked for the reasons for crisis (Q. 26), they cite problems arising with the planning, problems in communication, indecision (by composers), stress (during creation, immediately before a concert) and misunderstandings. Respondent 33 writes:

> The problem is the relationship between the two. As a CMD, it is very difficult to get into the mind of the composer, who often has "no idea" what he/she is looking for. This results in the composer being insecure, and then… Also, I think composers should change their approach and realise that having a CMD is a *collaboration*, therefore flexibility in the making should be high. Also trust is an issue. Being CMDs means frequently assisting composers born before the 70s who have no computer training. Those composers have a different approach to computer music. In another way, composers tend to approach computer music the same way as instrumental music, but this cannot work!

Q. 9–10 investigate the CMD's training. Responses to Q. 9 stress the fact that much of the CMD's skills develop individually through self-teaching, as the "other" fields demonstrate (taken up and commented on by 60% of participants) (Table 8).

The responses include variations of terms, such as self-taught, field training, mutual learning in real work situations and peer-to-peer oral transmission, and therefore indicate that the training is often not a result of more traditional, academic education. This emphasis on informal learning is particularly noteworthy at a time where seasoned CMDs have been more and more involved in teaching in various contexts, from universities and conservatories to summer courses in music composition, sound design and engineering. Thus, it is telling that it is the youngest respondent (Respondent 7), not one of the oldest, who voiced the following statement in a comment to Q. 9: "Above all, I believe one must teach oneself depending on the particular objectives of each project".

At the same time (which is almost contradictory with the previous scenario), participants think this profession should be officially taught in institutional settings (Q. 24.1). The reason for that could be that present and active CMDs are self-taught. Future generations trained from new courses (such as the one mentioned just above) should be interviewed and investigated in the future (Table 9).

Table 9. Response to Q. 24.1: "Evaluate the following statement: 'The Musical Assistant job can be taught in a formal education programme'".

1 (not at all important)	**3**	8.1 %
2	**3**	8.1 %
3	**9**	24.3 %
4	**8**	21.6 %
5 (very important)	**10**	27 %

Table 10. Response to Q. 24.2: "Evaluate the following statement: 'The Musical Assistant job is characterized by oral transmission'".

Not at all important: 1	**1**	2.7 %
2	**5**	13.5 %
3	**8**	21.6 %
4	**12**	32.4 %
Very important: 5	**7**	18.9 %

Q. 24.2 follows along the same lines: Evaluate the statement "The Musical Assistant job is characterized by oral transmission" (Table 10). The majority still believes it is based on oral transmission.

Heritage and technological migration

There is no norm in the preservation of the output of CMDs' work: they may archive or not, conceive the archive as private or shared with a collective, subjected to publication or not. Not all CMDs are aware of the importance of their traces, and not all of them consider preservation as part of their duty.

Although there is a consensus among CMDs that everyone should pay attention to creating documentation and archiving their work, when asked if they do these activities, only 11 CMDs (29.7%) answer in the affirmative. Others do this rarely or half the time (Table 11). On the other hand, the CMD's involvement changes, often substantially, throughout the life cycle of the work. He/she is deeply involved in the creative process until the premiere; then, he/she may or may not be involved in the subsequent developments of the resulting software, score, devices, etc. Asked if they have been contacted for a re-presentation of the work(s), 25 (67.6 %) answer they had. Asked if they were personally involved in the updating of the work(s), the majority answered yes—some completely, others only partially (Table 12).

Conclusions

The purpose of this study was not to establish the ultimate profile of the CMD, but rather explore how CMDs perceive their profession and investigate this community from the point of view of several hypotheses, with respect to their age, training, tasks, legal status, skills, archiving and involvement in technological updating. A tentative discussion offers the following considerations.

There has been a longstanding tension between the solitary apprenticeship of how to cope with the production of a work in studio (psychology of the composer, management of production scheduling and technical constraints, etc.) and the inherently collective dimension of

Table 11. Response to Q. 18: "During (or right after) the production of an artistic project/work, does the Computer Music Designer (CMD) supply his/her work with documents?".

Never	**1**	2.7 %
Rarely	**7**	18.9 %
Half the time	**4**	10.8 %
Frequently	**11**	29.7 %
Always	**8**	21.6 %
Other	**2**	5.4 %

Table 12. Response to Q. 35: "Does the Computer Music Designer (CMD) get personally involved in the work(s)' updating?".

Completely	**15**	40.5 %
Partially	**11**	29.7 %
Not at all	**4**	10.8 %
Other	**2**	5.4 %

sharing insights and knowhow with colleagues as part of a "community of practice" (Lave & Wenger, 1991; Wenger, 1998). This tension is displayed in the findings presented above: CMDs appear to share a number of workplaces, tools, practices and ideologies, but at the same time emphasize the highly individualistic nature of their skills and experience.

Another distinction between different moments of involvement in the work of the CMD is meaningful: creating electronics in collaboration with a composer, versus performing and re-performing a piece (with or without the presence of the composer, with or without a personal contribution to the creation). Plessas and Boutard (2015) and Vidolin (1997) define those roles as CMD and LEM (Live Electronics Musician). However, according to the questionnaire findings, they represent only two parts of this multi-faceted profession: the "before" and "during", in electroacoustic music creation. We can trace a third part—the "after"—which corresponds to the CMD's contribution to the phase of re-performing, archiving and handling the technological migration of a musical piece.

According to some CMDs, having no personal interest in the visibility of their own musical input and parallel activities while collaborating with composers is key to a successful association. CMDs who state this is not the case feel under-represented. In the opinion of several respondents, a clear legal statutory definition of CMD could provide the solution and regulate various conditions of hiring, define artistic recognition and levels of involvement, help and also mentor composers to enter the world of collaboration as to how assistance can be provided.

It should also be noted that in some places, such as Canada and the USA, the development of the autonomy of composers with respect to the use of technology, is strongly supported and encouraged not only by mentors (during their training), but also by peers (see the case of CCRMA, Zattra, forthcoming). Electronic music classes within the conservatories of music around the world point more and more towards personal autonomy and new forms of collaboration. In this context, the status of CMDs is evolving. The "digital native" generation of musicians, composers and performers alike, is increasingly comfortable with a technology that is becoming progressively transparent. Much of their work nowadays involves music in multimedia, responsive environments, as well as other contexts with large production teams (Faia,

2014). According to Lympouridis (2012), the CMD may soon become a whole body interaction designer.

Computer music design used to be a means to develop an idiosyncratic interest in music and technology rather than undertake an institutional or professional vocation. However, times are changing: a master's degree in Computer Music Design is now being offered in a French university (Master "Réalisateur en Informatique Musicale", Université Jean-Monnet Saint-Etienne, see http://musinf.univ-st-etienne.fr/index.html), fostering the collective (versus individualistic) side of the emerging profession. Founded by a former CMD (Laurent Pottier), this programme provides students with advice and teaching from practising CMDs (e.g., Max Bruckert and Emmanuel Jourdan) and offers a path to internships and job opportunities in the field. It would be worth re-administering our survey after a few years into this process of formalization and institutionalization of CMDs' skills to measure its impact on their activity and career. In addition, future work aims at comparing our findings with in-depth interviews of the (signed) CMDs involved in the survey, as well as ethnographic reports on their activity based on longitudinal observation of studio work.

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Notes

1. One CMD expressed concern about this in the free comment appended to his response: "I think that this survey should have investigated more deeply the problem of the artistic recognition of CMD within an artistic project. This is a very complex matter, you should have considered more items on that problem, which is very delicate and one of the dearest themes to CMDs".
2. This term is casually employed by CMDs to refer to notable collaborations in the field, such as Andrew Gerzso and Pierre Boulez (four works), Alvise Vidolin and Luigi Nono (three works) and Gilbert Nouno and Jonathan Harvey (three works).

References

Adhémar, J. (1939). Les origines du nom de graveur. *Bibliothèque de L'école des Chartes, 100*, 234–238.

Beller, G. (2014). The Synekine project. In F. Bevilacqua, S. Fdili Alaoui, J. François, P. Pasquier, & T. Schiphorst (Eds.), *Proceedings of the 2014 International Workshop on Movement and Computing [MOCO'14]* (pp. 66–69). New York: ACM.

Born, G. (1995). *Rationalizing culture: Ircam, Boulez and the institutionalization of the musical avant-garde*. Berkeley, CA: University of California Press.

Boulez, P., & Gerzso, A. (1988). Computers in music. *Scientific American, 258*(4). Retrieved from http://articles.ircam.fr/textes/Boulez88c/

Boutard, G., & Guastavino, C. (2012). Préservation d'artéfacts culturels numériques. *Les Cahiers du Numérique, 2912/4*, vol. 8.

Chadabe, J. (1997). *Electric sound: The past and promise of electronic music*. Upper Saddle River, NJ: Prentice Hall.

Collins, N., & d'Escrivân, J. (2007). *The Cambridge companion to electronic music*. Cambridge, UK: Cambridge University Press.

Dean, R. (2009). *The Oxford handbook of computer music*. New York: Oxford University Press.

Demazière, D., & Gadéa, C. (2009). *Sociologie des groupes professionnels. Acquis récents et nouveaux défis*. Paris, France: La Découverte.

Donin, N. (forthcoming 2016). Domesticating gesture: The collaborative creative process of Florence Baschet's *StreicherKreis* for 'augmented' string quartet (2006–2008). In E. Clarke & M. Doffman (Eds.), *Creativity, improvisation and collaboration: Perspectives on the performance of contemporary music*. New York: Oxford University Press.

Dower, C., O'Neil, E., & Hough, H. (2001). *Profiling the professions: A model for evaluating emerging health professions*. San Francisco, CA: Center for the Health Professions, University of California.

Durante, S., & Zattra, L. (2002). *Vent'anni di musica elettronica all'Università di Padova. Il Centro di sonologia computazionale*. Palermo and Padova, Italy: CIMS/CLEUP.

Faia, C. (2014). *Collaborative computer music composition and the emergence of the computer music designer*. Unpublished PhD thesis. London, UK: College of Business, Arts and Social Sciences, Brunel University.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lympouridis, E. (2012). *Design strategies for whole body interactive performance systems*. Unpublished PhD thesis. Edinburgh, UK: College of Humanities and Social Sciences, Edinburgh College of Arts, The University of Edinburgh.

Manning, P. (2013). *Electronic and computer music* (4th ed.). New York: Oxford University Press.

Menger, P.-M. (1989). *Les laboratoires de la création musicale. Acteurs, organisations et politique de la recherche musicale*. Paris, France: La Documentation Française.

Menger, P.-M. (2005). *Les intermittents du spectacle. Sociologie d'une exception*. Paris, France: Éditions de l'école des hautes études en sciences sociales.

Nelson, A. J. (2015). *The sound of innovation: Stanford and the computer music revolution*. Cambridge, MA: The MIT Press.

Pearce, D. S. (2014). *An emerging profession: The Higher Education Philanthropy Workforce. A report to HEFCE by More Partnership and Richmond Associates*. London/Bristol and Dundee, UK: Higher Education Funding Council for England and More Partnership.

Plessas, P., & Boutard, G. (2015). Transmission et interprétation de l'instrument électronique composé. *Proceedings Journées d'Informatique Musicale* (Montréal, 7–9 May 2015). Retrieved from jim2015.oicrm.org/actes/JIM15_Plessas_P_et_al.pdf

Poletti, M., Mays, T., & Faia, C. (2002). Assistant musical ou producteur? Esquisse d'un nouveau métier. *Proceedings Journées d'Informatique Musicale* (Marseille, 29–31 May 2002), 241–246. Retrieved from http://jim.afim-asso.org/jim2002/articles/L29_Mays.pdf

Pras, A., & Guastavino, C. (2011). The role of music producers and sound engineers in the current recording context, as perceived by young professionals. *Musicae Scientiae*, *15*, 73–95.

Risset, J.-C. (2014). A la recherche du temps réel – Pierre Boulez et la fondation de l'Ircam. Jean-Claude Risset in interview with Gabriel Leroux and Frank Madlener. *L'étincelle. Journal de la Création à L'ircam*, *12*, 12–15.

Sabatini, J. P., Daniels, M., Ginsburg, L., Limeul, K., Russell, M., & Stites, R. (2000). *Teacher perspectives on the Adult Education Profession: National survey findings about an emerging profession* (Report No. NCAL-TR00–02, 2000–10–26). SRI International, Menlo Park, CA: National Center on Adult Literacy Philadelphia, PA. Retrieved from eric.ed.gov/?id=ED446230

Szendy, P. (1996). *Lire l'Ircam*. Paris, France: IRCAM.

Vidolin, A. (1997). Musical interpretation and signal processing. In C. Roads, S. Pope, A. Piccialli, & G. De Poli (Eds.), *Musical signal processing* (pp. 439–459). Lisse, The Netherlands: Swets & Zeitlinger.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge, UK: Cambridge University Press.

Zattra, L. (2013). Les origines du nom de RIM (Réalisateur en Informatique Musicale). *Proceedings Journées d'Informatique Musicale* (Paris, 13–15 May 2013, pp. 113–120). Retrieved from www.mshparisnord.fr/JIM2013/actes/jim2013_14.pdf

Zattra, L. (2014a). A colloquio con Roberto Fabbriciani. *Rassegna Musicale Curci*, 3, LXVII – September 2014, 45–51. Milan, Italy: Curci.

Zattra, L. (2014b). Interdisciplinarità, collaborazione, didattica e diffusione a Torino (1963), Firenze (1964) e Padova (1965). In A. Valle & S. Bassanese (Eds.), *Enore Zaffiri. Saggi e materiali* (pp. 124–148). Venezia, Italy: IUAV; AIMI, Associazione Informatica Musicale Italiana.

Zattra, L. (2015). Collaboration in computer music. An analysis of the role played by musical assistants obtained through semi-structured interviews. *TCPM – Tracking the Creative Process in Music* (Paris, 8–9 October 2015). Oral presentation.

Zattra, L. (forthcoming 2016). Collaborating on composition: The role of the musical assistant at IRCAM, CCRMA and CSC. In F. Sallis, L. Zattra, & I. Burleigh (Eds.), *Live-electronic music: Composition, performance and study*. London, UK: Routledge.

Appendix: The questionnaire

1st Part: Personal profile

1- Please indicate your age (9-year windows)

2- How many years in total have you worked as a Musical Assistant during your lifetime?

3- During which period? (9-year windows)

4- How many projects (works, installations, multimedia projects, etc.) have you participated in (regardless of the degree of engagement in the activity)? [You may add a comment if you wish]

5- Currently In-Progress Projects. [You may add a comment]

6- How many artists/composers/sound artists/etc. have you worked with? [You may add a comment]

7- How many artists have you established a privileged collaboration with (> 1 project)? [You may add a comment]

8- How many projects (works, installations, multimedia projects, etc.) have you participated in with these privileged artists/composers/sound artists/etc. (world première)? (With the 1st composer/artist → + 6 projects / 5 projects – 4 projects / 3 projects / 2 projects; With the 2nd composer/artist, etc.)

8.2 Additional comment to the previous answer [Optional]

2nd Part: The CMD—his/her identity and tasks

9- How did you acquire your Musical Assistant training? a) School, master's degree (specific training); b) Internship, workshop; c) Skill and "know how" received from another Musical Assistant; d) Other

10- Salary scheme with which you have worked more often (multiple answers are possible): a) Temporary contract, full time; b) Temporary contract, part time; c) Open-ended contract, full time; d) Open-ended contract, part time; e) Internships; f) "Intermittent du spectacle" [in

France]; g) Voluntary unpaid work; h) Voluntary unpaid service assigned within another contract; i) Other

11- Did your role involve sound diffusion (in concert)? (Never–Rarely–Half the time–Frequently–Always–Other)

12- Has your name been mentioned in the press, programme notes, etc.? (Never–Rarely–Half the time–Frequently–Always–Other)

13- Places where your name has been mentioned: a) Programme notes; b) Published score; c) Unpublished score; d) Articles in the press.

13.1 And also: Scientific papers where you have been sole author (please indicate the approximate quantity)

13.2 Scientific contributions where you have been the paper's lead author (approximate quantity)

13.3 Scientific contributions to which you have contributed (co-author) (approximate quantity)

13.4 Scientific papers for which you did not contribute to the writing (approximate quantity)

13.5 Other

14.1 Did the composers/artists you have collaborated with have computer skills? First composer: Very high level – Medium – Quite poor – None – No answer / Second composer…→ Fifth composer

14.2 Please leave any additional comments regarding this answer.

15- How do you evaluate your contribution to software development during your Musical Assistant activity? (multiple answers are possible). a) Trigger, research project developer; b) Contributor to research project; c) Implementer, user of extant research results; d) Disseminator of scientific results to the composer (mediator); e) Other

16- How do you evaluate your contribution to scientific research during your Musical Assistant activity? (multiple answers are possible). a) Trigger, research project developer; b) Contributor to research project; c) Implementer, user of other research extant results; d) Disseminator of scientific results to the composer (mediator); e) User who deflects results; f) Other

17- Please evaluate your contribution to artistic invention (scale from 1: less important – to 5: very important): a) A way of translating the author's ideas; b) A way of inspiring musical ideas; c) A way of executing another author's desires; d) Artistic consultant involved in the practical running of the project (e.g., contact with musicians, scheduling, organization, rehearsals, etc.); e) Co-composer in one portion or another; f) Producer of sound materials; g) Other

17.2 Please leave any additional comments regarding this answer

18- During (or right after) the production of an artistic project/work, did you supply your work with documents? (Never–Rarely–Half the time–Frequently–Always–Other)

19- Documentation of the project consisted of (multiple answers are possible): a) Paper material; b) Digital material; c) Audio material; d) Video material; e) Other

20- About paper material (Multiple answers are possible – Please indicate the storage place when possible: "Other" field): a) Genetic documentation with sketches and working documents; b) Technical operations manual c) Research report d) Computer music papers e) Other

21- Content of the digital documentation and storage place (Please indicate: e.g., Patches, annotations within the software, program sources, PDF, word, etc. – Storage place: e.g., personal disk, library, production service, Sidney database, etc.)

22- Content of the audio documentation (Please indicate the content and the storage place)

23- Content of the video documentation (Please indicate the content and the storage place)

24 Please evaluate the following statements (from 1: not important at all – 5: very important):

24.1 "The Musical Assistant job can be taught in a formal education programme"

24.2 "The Musical Assistant job is characterized by oral transmission"

24.3 "The Musical Assistant should be recognized as a professional association"

24.4 "The Musical Assistant activity is a temporary job one should consider before choosing another (artistic, academic, etc.) career"

24.5 "The Musical Assistant role in an artistic production should be acknowledged by copyright legislation"

24.6 "Any tools/applications/etc. created by the Musical Assistant should be protected/patented/marketed"

24.7 "The Musical Assistant must give computer courses for composers"

25- Did your collaboration with composer(s)/artist(s) ever experience a crisis? (Never – Rarely – Half the time – Frequently – Always – Other)

26- If so, could you explain the reason? (only if you wish to answer)

27- Do/did you carry out a parallel activity while being a Musical Assistant? Instrumentalist/ Vocalist / Composer / Plastic art / Sound artist / Engineer / Researcher / Other

28- If points a, b, c, d have been ticked: how many works/artistic projects/etc. did you complete over the period?

29- If points a, b, c, d have been ticked: Did you have a Musical Assistant in your turn?

30- What is your profession, if you are not a musical assistant anymore? (only if you wish to answer)

3rd Part: Documentation, Archiving, Porting

31- If some of your applications have been diffused in a larger manner, please specify in which way: Transfer of royalties to an editor (ex. Software) / IRCAM forum / Free diffusion papers and research results / Free software / Other

32- About updating applications, tools, etc.: did/do you manage to improve this aspect? For every artistic projects/works / For some artistic projects/works / Only when the artistic projects/work has been re-presented / Other

33- How many works/artistic projects have been re-presented (especially with different/updated technology)? All of them / Most of them / A few of them / None / I do not know

34- Have you been contacted for the work(s) to be re-presented? Yes / No / Other

35- Did you get personally involved in the work(s) updating? Completely / Partially / Not at all / Other

Please feel free to answer the following questions:

1: Please add any additional questions, comments, concerns and/or suggestions you may wish to share with me about the survey.

2: Do you think any aspects have been omitted from this survey?