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"Whatever Works":
an Action-Centred Approach to Creation and Mediation in Designing Laptop Orchestra Performances

Introduction

Concordia Laptop Orchestra (CLOrk) is a large ensemble of laptop performers, which produces interdisciplinary and networked presentations within the framework of a course for advanced undergraduate electroacoustic (EA) students at Concordia University in Montreal. With artistic and educational purposes, the orchestra focuses on the creation of innovative improvisatory works and technologies, and frequently collaborates with ensembles and soloists of different backgrounds (EA, jazz, symphonic); dancers; video artists; and actors.

A prolific performance schedule, dynamic membership, varied collaboration types, and experimental technologies have nurtured a resilient, reflexive approach to creation and mediation, which we have descriptively named "whatever works" (WheW). Rather than systematising and repeating procedures, the realisation of every piece is undertaken as a distinct context with specialised concerns.[1] Building on the principles of action research, all of CLOrk's creative and educational considerations – including artistic goals and approaches, mediation strategies, the ensemble's structure, technological experiments, and students' roles, among others – are developed and evaluated democratically by the group through cycles of observation; problem identification; reflexive critique; and action design, implementation, and testing.

WheW is an action-centred approach that operates in multiple temporal levels: (a) the synchronous level, including real-time communications and actions during performances; (b) the short-term asynchronous level, relating to discussions, communications,

[1] See Eldad Tsabary, *Comprovisation for Laptop Orchestra* [Video], 2012, retrieved from https://www.youtube.com/watch?v=R2WeIMHE-L0, accessed November 26th, 2014.

and actions that take place during preparations to performances; and (c) the long-term asynchronous level, containing all discussions, communications, problem identification, and solution implementation and testing that occur without strict time constraints. While the first two levels support mostly operational needs, the role of the third level is primarily evolutionary.

In this article we introduce WheW and recount its implementation in four CLOrk performances. Following WheW's evolutionary path since the establishment of CLOrk in 2011, we begin with two early examples of its implementation on the synchronous and short-term asynchronous levels. The creative processes in these examples – *Concerto* for t-stick and two laptop orchestras (2011) and *Creation* for orchestra and laptop orchestra (2013) – began with producing text scores and unfolded through discussions regarding performance aids and synchronous communication. In two later performances – *MusicAcoustica* (2013) and *Dancing with Laptops* (2014) – the creative process became more sophisticated and with longer-term implications through the incorporation of an action research approach. Action research is a form of democratic inquiry first proposed by Kurt Lewin,[2] which is organised in cycles of action, observation, critical reflection, and transformation.

Each of WheW's temporal levels demands a different degree of urgency in problem identification and solution. However, we propose that in addition to being practical in the synchronous and short-term asynchronous levels, collaborative speedy solutions to emerging problems at all temporal levels can also accelerate the orchestra's long-term evolution by offering frequent opportunities for natural selection in the creative process. Understanding CLOrk's *raison d'être* – its research purpose – can assist in contextualizing WheW and its "need for speed".

Research Purpose

CLOrk's initially defined goals were strongly inspired by action research purposes, which are typically context-based and relate to «the perceptions of practitioners within particular, local practice contexts».[3] They bear a «double burden» of both action

[2] Cf. Kurt Lewin, *Action Research and Minority Problems*, «Journal of Social Issues», II, 4 (1946), pp. 34-46.

[3] Chris Argyris - Donald Schon, *Participatory Action Research and Action Science Compared: A Commentary*, «American Behavioral Scientist», XXXII, 5 (1989), pp. 612-623: 613.

(transformation of practice) and research (understanding practice).[4] They are centred on learning a «complexly formed, ecologically organised relations of lived experience».[5] CLOrk's initial research purposes were thus defined as:

1. expanding the ensemble's creative output;
2. exploring new performance modes and related technologies;
3. enriching the skillset of CLOrk's members (primarily listening, improvising, collaborating, technological and technical skills);
4. improving the efficiency and effectiveness of the creation process; and
5. improving and developing a better understanding of CLOrk's evolutionary process and all its components.

The speed and temporal flexibility allowed by WheW can serve these purposes well in the context of the short-duration memberships of CLOrk's students (typically one or two semesters).

Early Implementation of "Whatever Works"

The operational structure of creation and mediation that was utilised in CLOrk's first performance (*Durées*, January 2011)[6] was the most recurring operational structure through CLOrk's first three years. It involved a process in which musical ideas were reduced to parametric essences, listed sequentially in text scores, and then represented in quick-access scores of various types. These performances were typically conducted using Soundpainting – a «live composing sign language [...] for musicians, dancers, actors, poets, and visual artists working in the medium of structured improvisation».[7] Implementing this operational structure across varied interdisciplinary settings required adjusting its components to satisfy the needs and restrictions of the specific contexts. Some of these adjustments were set by a single composer, while others were determined collaboratively, giving birth to

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[4] Kathryn Herr - Gary Anderson, *The Action Research Dissertation: A Guide for Students and Faculty*, Thousand Oaks – London – New Delhi, Sage Publications, 2005, p. 5.

[5] Terrance Carson - Dennis Sumara, *Action Research as a Living Practice*, New York, P. Lang, 1997, p. xxi.

[6] A telematic performance by CLOrk with the New Music Ensemble Laptop Orchestra (NuMuLO), directed by Laurie Radford (Calgary), Scott Smallwood and Mark Hannesson (Edmonton) at the NetTets concert, Jan. 29th, 2011, organised by Syneme Lab. A video of this performance is available online at https://www.youtube.com/watch?v=sgyNF3fzhpM, accessed November 26th, 2014.

[7] Walter Thompson, *Soundpainting: The Art of Live Composition*, New York, Walter Thompson, 2006, p. 2.

an early form of WheW, which was restricted primarily to the short-term asynchronous and synchronous temporal levels. Such adjustments are exemplified here in two collaborative pieces: (a) *Concerto* for t-stick and two laptop orchestras (2011), performed by CLOrk (Eldad Tsabary, dir.), Cybernetic Orchestra (David Ogborn, dir.), and t-stick soloist D. Andrew Stewart on March 25th, 2011 at the D. B. Clarke Theatre in Montreal;[8] and (b) *Creation* for symphonic and laptop orchestras (2013), performed by CLOrk (Tsabary, dir.) and Orchestre symphonique de l'Isle (OSI, Cristian Gort, dir./conductor) on March 23rd, 2013 at the Oscar Peterson Concert Hall in Montreal.[9]

Short-Term Asynchronous Communication

During preparations for these performances, the orchestra directors, performers, and soloists created and communicated ideas primarily through e-mail discussions. Though both pieces were initiated by Tsabary in a text-score format, all stakeholders contributed to the process of devising creative approaches, identifying problems, and finding solutions in a layered manner, which resulted in performances that had ambiguous ownerships – they were co-composed to varying immeasurable extents by all involved.

Text-Score

Both pieces were first conceived as sequences of composed steps, which were communicated textually in a list format – a text-score. This score was created through a process in which abstract musical ideas were reduced into their parametric essences, including instructions regarding logistics, timing, improvisation and restriction, processes, and various sonic features (spectrum, texture, shape). Table 1 lists the essential parameters included in the text-scores of *Concerto* and *Creation*.

[8] See Video excerpt 1, https://www.youtube.com/watch?v=opdkt392Kto, accessed November 26th, 2014.

[9] See Video excerpt 2, https://www.youtube.com/watch?v=sIlD3UGsOcM, accessed November 26th, 2014.

Category	**Parameter**	***Concerto***	***Creation***
Logistics	Instrumentation	x	x
	Sectional organisation of orchestra	x	x
Timing	Steps: Who plays what and when?	x	x
	Structural sections		x
	Duration		x
	Cues		x
Restrictions	Solo	x	x
	Background/Foreground	x	x
	Interaction	x	x
	Degree of freedom	x	x
	Specific pcs		x
	Intervals		x
	Optional pcs		x
Processes	Dynamics	x	x
	Density/Rate	x	x
	Accumulation/Decumulation	x	x
	Glissandi		x
	Pauses		x
	Tempo changes		x
	Repeats		x
Texture, Spectrum, and Shape	Metric/Non-metric	x	x
	Timbre		x
	Register		x
	Stochastic clouds		x
	Pointillist texture		x
	Tremolo		x
	Drone	x	x
	Harmonic pads		x
	Clusters		x
	Heterophony		x
	Synthesis parameters		x
	Envelope		x
	Expression marks and articulation		x
	Antiphony	x	

Table 1: Essential Parameters in the Text Scores of *Concerto* and *Creation*

The text-score of *Creation* (19 mins) was much more detailed and restrictive than that of *Concerto* (12 mins). While the latter was made of 13 steps that included general instructions, such as «The Cybernetics enter to accompany Andrew (metric rhythm?)» (*Concerto*, Step 3), the former was made of 39 steps with specific instructions, such as, «In the breaks between clusters, laptops respond with very high-pitched, breathy long tones» (*Creation*, Step 26). In *Concerto* the restrictions were very general, for the most part describing who played, when, and at what dramatic intensity. *Creation*'s score was much more explicit, often calling for specific timbres, notes, and trajectories. This increased

specificity (and reduced freedom) in *Creation* was driven primarily by a WheW decision: since the collaborators in *Concerto* were disciplinarily compatible – all comfortable in live EA and improvisation – the performers' shared schemata and technical skills permitted the performance to succeed despite – or perhaps by means of – the allowed creative freedom. Contrarily, the two orchestras performing *Creation* were disciplinarily incompatible – CLOrk consisting of electroacoustic instruments, improvisatory, and striving for innovation and experimentation, and OSI being a traditional symphonic orchestra that rarely improvises or plays post-Stravinsky music.[10] *Creation*'s musical concepts were mostly alien to OSI performers and they were uncomfortable improvising with them, or as OSI's conductor noted, «if we give these parts nobody will play».[11]

Performance Aids

The narrative, textual information in the text-scores was very useful for communicating the compositional details to the performers while they learned the pieces, but was not able to provide a sufficiently quick access to information during performances. In every performance, therefore, a suitable type of quick-access score was created to «refer to while playing or [...] practicing».[12] After receiving the text-score of *Concerto*, Stewart translated it into a block-based representation of the piece's structure and components (see Figure 1), which allowed the conductor and performers to remain connected to the progress of the piece with occasional glances. While Stewart included timing information in the block-score, the team eventually decided that timing would be better decided and communicated synchronously through conduction, because «during the performance, we will know best when is the right time to move to the next section».[13]

[10] Cf. Cristian Gort, personal communications, Feb. 12th, 2013.

[11] Cristian Gort, personal communications, Feb. 5th, 2013.

[12] Andrew Stewart, personal communications, March 16th, 2011.

[13] Eldad Tsabary, personal communications with Andrew Stewart and David Ogborn, March 16th, 2011.

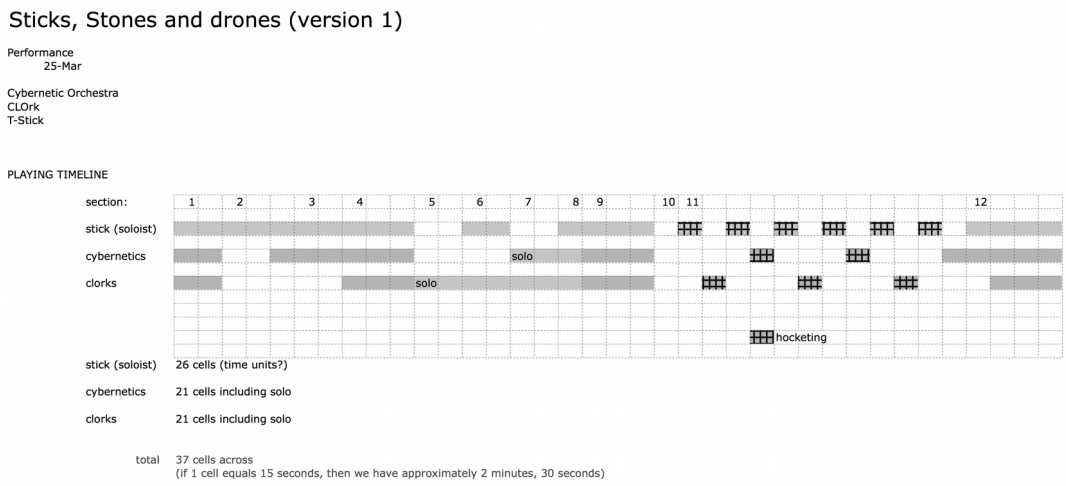

Fig. 1: Block score of *Concerto* for t-stick and two laptop orchestras

Due to the traditional nature of OSI, Gort requested that *Creation*'s text-score be translated into a conventional-looking score with staves and musical notes. Doing so communicated contemporary (primarily stochastic and textural) musical ideas that were alien to the orchestra members through a mediative device that was familiar to them. To Gort's request, this score also included notation of the laptop orchestra parts with gestural symbols. Being comfortable with flexible mediation techniques, CLOrk's members preferred to follow a written list of reduced keywords that represented their assigned parts while following Soundpainting conduction – "whatever works".

Synchronous Communication

Soundpainting conduction was used to propel CLOrk in both performances and maintain their artistic effectiveness and balance, communicating who was to play, what was to be played, how, and when – the four elementary components of Soundpainting syntax.[14] In *Creation*, it was decided that the symphonic orchestra conductor would determine the overall pace during the performance and announce it by raising a numbered cardboard sign. The laptop orchestra followed accordingly in real-time. This choice was based on the greater adjustability of the laptop orchestra due to its improvisational nature and use of Soundpainting. To borrow a metaphor from nautical laws, it was decided that «the most manoeuvrable vessel gives way».[15]

[14] Cf. W. Thompson, *Soundpainting*, cit.

[15] See http://www.boatinglicense.com, accessed November 26th, 2014.

Action Research

While planning and realising early CLOrk performances, we handled problems and challenges as they emerged, discussing them among the orchestra members and collaborators, intuiting potential solutions and developing tools, techniques, and documents to allow completion of the specific goals of the performances at hand. Ownerships of many solutions and tools were ambiguous because the methods we developed were comprised of layers of ideas and developments generously shared by multiple people. The process of problem identification and solution was often democratic and focused on forward motion with whatever the group considered "working", one problem at a time. Every solution was tested, reflected upon, and modified as needed until its eventual implementation in the performances.

Though initially intuitive and freewheeling, the participatory nature of CLOrk's creation process and the cyclical nature of its problem identification and solution resonated with the principles of action research – a form of democratic inquiry first proposed by Lewin which is arranged in «a spiral of steps each of which is composed of a circle of planning, action, and fact-finding about the result of the action».[16] Consequently, this fact-finding «influences or steers [further] action».[17] Action research involves group members as co-researchers to improve and better-understand an ongoing group process.[18] The involvement of the group in studying itself in a reflexive manner is essential for the effectiveness of the study, or as Lewin noted, «research in group dynamics is, as a rule, group research. It requires the cooperation of persons who steer group life and who record and measure various aspects of group life».[19] Incorporating research and creation in the context of CLOrk into an action research framework added method and rigorousness in short- and long-term decision-making. The cyclical, democratic, reflexive, and action-centred nature of action research inspired further collaboration and flexibility and extended the effect of the WheW approach to all aspects of CLOrk: creation, performance, innovation, technology, education, and evolution, among others.

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[16] K. Lewin, *Action Research and Minority Problems*, cit., p. 38.

[17] Kurt Lewin, *Frontiers in Group Dynamics: Concept, Method and Reality in Social Science; Social Equilibria and Social Change*, «Human Relations», I, 1 (1947), pp. 5-41: 13.

[18] Cf. Peter Reason - William Torbert, *The Action Turn: Toward a Transformational Social Science*, «Concepts and Transformation», VI, 1 (2006), pp. 1-37.

[19] Kurt Lewin, *Frontiers in Group Dynamics: II. Channels of Group Life; Social Planning and Action Research*, «Human Relations», I, 2 (1947), pp. 143-153: 153.

Performances as Action Cycles

With three years of performance repertoire and a better-defined research framework the process of inquiry became more structured and rigorously documented. Every performance was treated as a cycle of study that included the following stages:

1. a *planning meeting*, in which all the orchestra members and collaborators discussed an upcoming performance, its premises, its "knowns" and "unknowns", possible pieces to perform, technological and logistical necessities, role assignments, and timeline;

2. a *realisation process*, in which all the stakeholders acted within their assigned roles to realise the performance and communicate with each other to address emerging needs and problems;

3. a *performance*, where all the plans and actions come to fruition; and

4. a *post-mortem* data collection, including questionnaires and group discussion.

The discussions, questionnaires, and e-mail communications provided an open-ended, multi-layered data collection process for further in-depth study of the emerging issues and possible transformation. However, during the semester in which CLOrk is given as a course, performances take place approximately every 2-3 weeks, not allowing sufficient time for comprehensive data analysis. Instead, problem identification and resolution must occur rapidly, relying on the discretionary contributions of orchestra members, and using their collective experiences and intuitions. This "need for speed" will be discussed later in this article. When time allowed – when the CLOrk course was finished, or when performances occurred outside the CLOrk semester – the following two additional steps were completed:

5. an in-depth fact-finding, in which data from all communications, questionnaires, and (recorded and transcribed) discussions are coded, categorised, and analysed for emerging trends, problems, challenges, and effective/ineffective solutions; and

6. *critical reflection* – a collaborative reflexive analysis of data generated in the fact-finding step, which is used to determine the value of action[20] and hypothesise causes and effects.[21] Critical reflection has been considered «one of the salient features of action research».[22]

Performance at "MusicAcoustica" (Beijing)

CLOrk's telematic collaboration with the McMaster Cybernetic Orchestra, hosted by Professor Ken Fields at the Central Conservatory of Music in Beijing as part of *MusicAcoustica* Festival (October 23rd, 2013),[23] exemplified a complete cycle of study. This performance premiered an experimental telemetronomic collaboration between CLOrk and McMaster's Cybernetic Orchestra, in which two laptop ensembles were synchronised metronomically over the Internet, overcoming latency.

In a planning meeting (Step 1) six weeks before the event, 21 CLOrk members received information about the premise of the performance, and discussed potential approaches to creation, communication, and organisation. The group suggested and assigned the following roles: 6 composers, 5 performers, 3 audio team members, 3 network team members, 3 video team members, and an event manager.

The realisation process (Step 2) developed in the following six weeks, and included e-mail communications among the team heads and Cybernetic Orchestra director, and preparations by all participants. During this time, unforeseen challenges arose, resulting in significant adjustments to the inceptive organisational structure. The composers invited the attendance and input of the performers at their meetings, and the designated event manager withdrew from the project. Participant roles became less clearly delineated; the composers determined a highly improvisatory framework in which they functioned as section leaders – each section would provide a certain type of texture (transient, drones, vocal samples, etc.). This structure dispersed the organisational tasks previously delegated to the event manager and allowed the orchestra to move forward quickly and effectively.

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[20] Cf. Sue Curtis - Helen Bryce - Carla Treloar, *Action Research*, in *Qualitative Health Psychology: Theories and Methods*, ed. by Michael Murray and Kerry Chamberlain, Thousand Oaks – London – New Delhi, Sage Publications, 1999, pp. 202-217.

[21] Cf. Daniel Selener, *Participatory Action Research and Social Change*, Ithaca (NY), Cornell Participatory Action Research Network, Cornell University, 1997.

[22] Ortrun Zuber-Skerritt, *Action Leadership: Towards a Participatory Paradigm*, New York, Springer, 2011, p. 116.

[23] See Video excerpt 3, https://www.youtube.com/watch?v=tS7e3Dc4anY, accessed November 26th, 2014.

Section leaders met with their groups of two to three performers in the week leading up to the performance to co-ordinate audio content and signal flow. Each section generated its own flexible plan, aimed to provide coherence within the larger group as well as spontaneity for each performer. The composers also decided to provide a custom-made software step sequencer that could synchronise audio events throughout the orchestra, a master filter, and live text instructions sent from one composer to the whole orchestra. Composers who were not appointed section leaders presided over these aspects, taking responsibility for developing the software, workshopping it with the orchestra, and planning orchestra-wide rehearsals.

During the performance (Step 3), section leaders performed with their groups, contributing audio content or signal processing; one composer decided upon and sent text instructions through a local network in order to synchronise orchestra-wide actions such as crescendos or silences. Sections were seated together and verbal communication emerged spontaneously as a communicative device within these groups. When some performers experienced technical problems and were unable to receive text instructions, section members relayed them aloud, preserving the concinnity of the orchestra.

The *post-mortem* data collection (Step 4) included a group discussion and an anonymous questionnaire. The discussion was focused on the collaborative nature of the performance and the decision-making processes. The questionnaire included the following questions:

1. What was your role in the performance?
2. What would you change the next time around?
3. What have you learned/taken away from the experience?

Analysis

The fact-finding stage (Step 5) consisted of preliminary data analysis that provided content for critical reflection. Data in action research are «contextually embedded and interpreted»,[24] and are mostly (though not exclusively) qualitative.[25] According to Ernest Stringer, action research data analysis is typically focused on (a) epiphanies and (b) codes

[24] Paul Coughlan - David Coghlan, *Action Research for Operations Management*, «International Journal of Operations & Production Management», XXII, 2 (2002), pp. 220-240: 223.

and categories.[26] In this instance, we parsed – incident-by-incident – all the qualitative data from questionnaire responses and group-discussion, coded these incidents into compressed tense-neutral (gerunds) statements that focused on the comments' essential actions or processes, and categorised them by emerging topics.[27] The more rigorous data collection and analysis allowed investigating emerging issues with more specificity and detail. A summary of our findings follows.

The questionnaire responses exposed several problems. In reply to Question 2, 6 students (4 performers, a composer, and a communications coordinator) were displeased with the lack of leadership and effective communication. Among the 14 respondents, 5 (2 composers, 2 performers, and a network technician) also felt that the multiplicity of composers was problematic, unnecessary, and unhelpful for the creative flow. The overly technological (rather than artistic) compositional focus and the resulting creative restrictions were criticised by 3 performers and a composer. The emerging learning benefits expressed by students in response to Question 3 pointed primarily towards collaborative and technological knowledge acquisition.[28]

The *post-mortem* discussion occurred after we received feedback from the questionnaires and addressed emerging issues. In analysis of the students' comments, collaboration, decision-making and imbalance emerged as the main categories. Students discussed and compared "participation" and "collaboration" — the latter representing a greater «degree of choice, control, and agency».[29] Several students attributed their degree of collaboration to their perceived role in the decision-making process. Some students agreed that one could be simultaneously a participant in the larger context and a collaborator in a smaller subset group. As one student explained, he acted as a participant by following others' choices in

[25] Cf. William Leonard, *Using Research on Teaching to Improve Student Learning*, in *Handbook of College Science Teaching*, ed. by Joel Mintzes and William Leonard, Arlington (VA), NSTA Press, 2006, pp. 395-402; Robert Wright, *Grounded Leadership: An Action Research Study*, Doctoral dissertation, Fielding Graduate University (Santa Barbara, CA), 2008, retrieved from ProQuest Dissertations & Theses (UMI Number: 3350594), 2009.

[26] Cf. Ernest Stringer, *Action Research in Education*, Upper Saddle River (NJ), Pearson, 2004.

[27] Cf. Kathy Charmaz, *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*, Thousand Oaks – London – New Delhi, Sage Publications, 2006.

[28] Cf. Eldad Tsabary, *Music Education Through Innovation: The Concordia Laptop Orchestra as a Model for Transformational Education*, in *Proceedings of the 8th International Technology, Education and Development Conference (INTED2014)*, ed. by Luis Gómez Chova, Agustin López Martínez and Ignacio Candel Torres, Valencia, IATED Academy, 2014, pp. 657-664.

[29] Dave Beech, *Include Me Out*, «Art Monthly», CCCXV (2008), pp. 1-4: 3.

the larger compositional structure but noted, «I felt like a collaborator, at least in our group [...because...] I was actually making [decisions regarding] sound structures that I wanted».

Comments categorised as relating to imbalance dealt with problems in the collaborative process. Students described examples where one person constantly opposed decisions by others, as one student reflected, «it seems like in every group there is this resistance. Like, if you see how political stuff goes, there is always gonna [*sic*] be somebody that will say no». Another student commented that sometimes «the most vocal or dominant voice wins», therefore causing an imbalance in the collaborative process, disengaging some of the quieter collaborators. Some students noted a reduced personal accountability during *MusicAcoustica* due to the large group, where «responsibility kind of started to get passed around», or as another student explained, «the size of the collaboration was too big, cuz [*sic*] accountability starts, gets diluted, it's too wide».

Critical Reflection

In action research, data gathering and analysis (fact finding) is followed by a process of critical reflection (Step 6), in which researchers aim at gaining «a clearer understanding of what is happening and how it is happening for each stakeholder in relation to the problem or issue being investigated».[30] This process strongly depends on place, time, and situation, and on preliminary data analysis, and can therefore take various shapes. It is (a) reflexive – acknowledging of biases, interpretations, assumptions; (b) dialectical – in recognition of the limitations of shared language; and (c) collaborative.[31] Taking place in a group context, critical reflection involves the practitioner as a co-learner – not an expert[32] – and generates knowledge from a multiplicity of viewpoints, whether shared or contradictory. To increase the study's *catalytic validity* – or its ability to transform[33] – the reflection process must be open-minded, not based on predesigned analytical patterns. An example of critical reflection regarding *MusicAcoustica* is given below.

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[30] Ernest Stringer, *Action Research*, Thousand Oaks – London – New Delhi, Sage Publications, 2007, p. 238.

[31] Cf. Richard Winter, *Action-Research and the Nature of Social Inquiry: Professional Innovation and Educational Work*, Aldershot, Gower Publishing Company, 1987.

[32] Cf. Wendell French - Cecil Bell, *Organization Development: Behavioral Science Interventions for Organization Improvement*, Englewood Cliffs (NJ), Prentice Hall, 1995; Yoland Wadsworth, *The Mirror, the Magnifying Glass, the Compass and the Map: Facilitating Participatory Action Research*, in *Handbook of Action Research: Participative Inquiry and Practice*, ed. by Peter Reason and Hilary Bradbury, Thousand Oaks – London – New Delhi, Sage Publications, 2008, pp. 420-432.

[33] Cf. John Elliott, *Action Research for Educational Change*, Buckingham, Open University Press, 1991.

In one instance, we wanted to address the complaints that recurred in the *post-mortem* questionnaires regarding the overly technological (rather than artistic) compositional focus and the resulting creative restrictions. Instead of composing music in the form of scores or instructions, the co-composers designed instruments in PD and Max/MSP that would manifest their musical ideas through their sound and process boundaries. We were aware that initially each composer had planned to direct one structural section or time slot of the overall work. Later, the composers considered delegating compositional functions instead. We also knew that they were in regular contact with CLOrk's telematic collaborator – the Cybernetic Orchestra. We wondered if their inceptive approaches had collapsed due to their incompatibility with the highly improvisatory, live-coding practice of the Cybernetic Orchestra. To evaluate whether this speculation was true, we invited the lead co-composer to critique its accuracy. He responded that «the request for a more improvisatory performance from [the] Cybernetics led to more focus on instrument and performance ideas, like the grouping of performer-composer groups with individual live processing identity, and the local conductor message system», therefore validating our speculation. The collaborative critical reflection therefore established a likely assumption with which we could design transformational actions.

Action Design

Choosing a transformational action is strategic in nature. Should we address the symptom by avoiding technological design in CLOrk's following performance? Should we choose our collaborators differently? Would utilising a single composer solve the problem? And furthermore, how can we tell whether an action works? In the context of this research, a working action is one that brings us closer towards our research purposes. We may therefore ask whether the action helps to expand the ensemble's creative output, whether it promotes new performance modes and technologies, whether it helps to enrich the skillset of CLOrk's members, whether it improves the efficiency and effectiveness of the creative process, and whether it helps develop a better understanding of CLOrk's evolution. Like all other aspects of action research, answering these questions and choosing a course of action affects the group members and is therefore decided by the group.

The next CLOrk performance involved a new group of students who were mostly inexperienced in laptop orchestra performance. We were concerned that an experimental approach to action design would pose too many demands from these new students. We

therefore chose to take a simple action that addressed the symptoms described above through a method familiar to us from previous CLOrk performances: employing a single Soundpainting composer, avoiding a technological focus, and subdividing the orchestra into subsets. This action did not work very well in the context of the next performance – a collaboration with improvising dancers. In retrospect, this action was also unsupportive of some of the research purposes – primarily the expansion of the orchestra's creative output and exploration of innovative approaches to performance and technology. We explain this with further detail in the next section.

The Need for Speed

The field of research/creation within digital electroacoustic ensembles evolves rapidly,[34] and encompasses many shared practices (e.g. new interface design, networked music, live coding, interdisciplinary performance) across five continents.[35] Due to its experimental nature and dependence on technological developments,[36] laptop orchestra practice is typically driven towards innovation and could be considered as a form of «art science [...] an emergent field [...in which...] practice runs ahead of theory».[37] Researchers constantly experiment with new aesthetics, technologies, mediation techniques, and performance modes.

In the context of CLOrk, this dynamic approach is further emphasised as a pedagogical strategy. Students are exposed to diverse and frequent performance experiences and related challenges within a single semester. Time constraints do not facilitate thorough fact-finding and critical reflection; rather, performers identify problems and decide on solutions intuitively and in democratic consultation with other stakeholders.

Action research involves transforming an ongoing process – metaphorically «designing the plane while flying it»,[38] and therefore demands attention to speed in the

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[34] Cf. Stephen Beck - Chris Branton, *LELA: Laptop Ensemble Library & Archive*, in *Proceedings of the 1st Symposium on Laptop Ensembles & Orchestras*, Baton Rouge, Louisiana State University, 2012, pp. 27-30. Retrievable here: https://ccrma.stanford.edu/~ruviaro/texts/SLEO_2012_Proceedings.pdf. Accessed December 1st, 2014.

[35] See Jamie Woollard - Eldad Tsabary, *Laptop Ensembles Worldwide* [Data file], 2014, retrieved from https://docs.google.com/spreadsheet/pub?key=0An34utRW_3N6dDBpSlNzY0hNUGNvbFZ1MzIzVlBGUWc&gid=0, accessed November 27th, 2014.

[36] Cf. Scott Smallwood [et al.], *Composing for Laptop Orchestra*, «Computer Music Journal», XXXII, 1 (2008), pp. 9-25.

[37] Andrew Barry - Georgina Born - Gisa Weszkalnys, *Logics of Interdisciplinarity*, «Economy and Society», XXXVII, 1 (2008), pp. 20-49: 38.

[38] K. Herr - G. Anderson, *The Action Research Dissertation*, cit., p. 71.

decision making process. Tentative assertions are commonly drawn based on observation and «intuition regarding the influence of actions on performance».[39] This feature is not a compromise in any way. In our experience, decisions made in the immediate circumstances of a rehearsal or performance have yielded results that were more effective and appropriate than those produced from assiduous data-analysis and critical reflection on issues from previous performances. For example, in planning *Dancing with Laptops* – a collaboration with Le Collab'Art de Steph B contemporary dance group (January 30th, 2014)[40] – we incorporated actions to address the main problems that had emerged from *MusicAcoustica*. To address the performers' emerging dissatisfaction with the composers' overly technological focus, the lack of compositional coherence, ineffective communication, and unsatisfactory leadership, we used a single composer in *Dancing with Laptops*, arranged the orchestra into four functional subsets, and used Soundpainting conduction. While these solutions worked very well to overcome these problems when CLOrk rehearsed alone, they did not produce an effective dialog with the dancers. CLOrk's predefined role structure restricted its ability to respond spontaneously to the improvised dance. In group discussion during rehearsals, the lead dancer Stephanie Bernard noted that improvisation with the orchestra «was extremely tiring» and several CLOrk members described the orchestra's sound as «too busy», «too varied», and «super dense». Following suggestions by ensemble members, it was agreed that «if you have a drone, keep it low»; «if you are going to make a sound then there should be a reason for it, and be looking up [at the dancers]»; and that «the dancers [would] be like conductors [...] driving the sound rather than following it». Using these strategies was successful in generating a better sense of dialog among the dancers and laptop performers.

Considering that in this instance the most effective performance decisions have been made in speedy, intuitive manners, the question arises as of what benefits long-term asynchronous thorough fact-finding and critical reflection provide. One answer is that rigorous data analysis and critical reflection can unearth deeper assumptions and presuppositions,[41] which can «lead to some fundamental change in perspective».[42] Therefore, while speedy, intuitive decisions help to propel creation efficiently, critical thinking supports

[39] Richard Sagor, *The Action Research Guidebook: A Four-Step Process for Educators and School Teams*, Thousand Oaks (CA), Corwin Press, 2005, p. 148.

[40] See Video excerpt 4, https://www.youtube.com/watch?v=zc3GRtoBZOU, accessed November 26th, 2014.

[41] Cf. Jack Mezirow, *Fostering Critical Reflection in Adulthood: A Guide to Transformative and Emancipatory Learning*, San Francisco, Jossey-Bass Publishers, 1990.

[42] Patricia Cranton, *Professional Development as Transformative Learning: New Perspectives for Teachers of Adults*, San Francisco, Jossey-Bass Publishers, 1996, pp. 79-80.

transformation. In this case, the failure of the long-term asynchronous action design to provide an effective solution in a different context drove our perceptual transformation. It exposed the limitations of out-of-context knowledge and emphasised the benefits of flexibility and collaborative intuition in the creative process. It also brought us to witness a working example of non-hierarchical improvisation, which we believed to be a problematic model due to the challenges in the *MusicAcoustica* performance. Additionally, engaging in critical reflection in a democratic deliberation format trains the group members in reflexive thinking skills,[43] which support sharing of information and views,[44] as well as flexibility.[45] In our experience, these skills also foster speediness in problem identification and solution in the synchronous and short-term asynchronous stages of creation.

Conclusion

WheW has propelled CLOrk's evolution through a process of creation and inquiry. Based on the principles of action research, WheW was built through cycles of problem identification, reflection, solution, and testing, but with a particular emphasis on temporal multiplicity and flexibility. It was used synchronously to address emergent issues during performances and asynchronously for considerations uncovered during the planning and realisation stages of a performance. Additionally, WheW was employed in a longer-term asynchronous manner to unearth deeper assumptions and provoke fundamental transformations of CLOrk's evolutionary process and our perception thereof.

WheW thrived on emerging challenges and advanced the process under study through action. The democratic involvement of orchestra members and collaborators permeated the creative process and facilitated meaningful learning. The agility and resiliency afforded by the WheW approach make it pertinent within the meteoric field of digital electroacoustic ensemble practice.

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[43] Cf. Wendelin Reich, *Deliberative Democracy in the Classroom: A Sociological View*, «Educational Theory», LVII, 2 (2007), pp. 187-197.

[44] Cf. Martin Hoegl - Hans Gemuenden, *Teamwork Quality and the Success of Innovative Projects: A Theoretical Concept and Empirical Evidence*, «Organization Science», XII, 4 (2001), pp. 435-449.

[45] Cf. John Caldwell, *Production Culture: Industrial Reflexivity and Critical Practice in Film and Television*, Durham, Duke University Press, 2008.