

FeLT-The Futures of Living Technologies

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*FeLT- The Futures of Living Technologies is a research project, but also an initiative to build an environment for interdisciplinary research and education of national and international significance with a strong innovative and reflexive profile. The term **Living Technologies** points to an investigation of existing and future technologies where computers and robots incorporate functions of living and biological systems. We see this in an ecological and societal context where education, research and innovation are interlinked. The research involves student projects, project residencies by guest artists and researchers and activities open to students and colleagues as well as research by project members. Through collaboration between artists, researchers in ICT, humanities and creative concept developments, innovative methods and processes are explored and reflected on.*

Artistic Research, Interdisciplinarity, Transdisciplinarity, Living Technologies.

1. INTRODUCTION

FeLT-The Futures of Living Technologies is a research initiative comprised of people of diverse backgrounds from arts, science and the humanities, all colleagues from the Faculty of Technology, Art and Design at OsloMet - Oslo Metropolitan University. We started meeting informally from personal curiosity and interest in the autumn of 2017. A common interest in Living Technologies, became the starting point of a research process. In FeLT. We define Living Technologies as the relations that occur between human beings, other living organisms, living environments and machines. relations on the edge of how we experience aliveness today, in other words how we sense life in the environment, in other beings and ourselves in an existence being constantly enhanced by technology. We recognized unrealized institutional possibilities in a faculty where technology, art and design are separate institutes, research groups, courses and professional traditions. The motivation stemming from the institutional perspectives has gained importance through our first phases of building the project, as we have seen the potential in further developing transdisciplinary education, research and innovation.

Bridging the gaps between some of the possibilities, namely working with student projects and research proposals, as well as workshops and activities to engage colleagues, we are now funded by the faculty of Technology Art and Design at OsloMet as a strategic project for two years. FeLT aims to create projects that will result in external funding and eventually influence education and research in our institution. So far, FeLT is one of five partners in a Creative Europe project Green

Revisited: Encountering Emerging Naturecultures (GREEN), starting in 2020 led by RIXC Center for New Media Culture in Riga, Latvia.

Initially, we formed a work group of colleagues, and started out involving students in our work, at first as research assistants and later by co-advising on thesis work and practical applications. Based on this, we will look at how we will frame the FeLT project for future developments and collaborations and reflect on what characterizes our experiences so far.

2. PROJECT PERSPECTIVES

Influenced by climate crises and rapid changes in work life due to digitalization, education is challenged to look at possibilities for the future. These are some of the many reasons and motivations to seek collaborations across disciplinary boundaries, beyond personal curiosity and institutional possibilities. Recently at a seminar in Oslo Metropolitan University on the theme of future work life (Oslo Kommune 2019), a panel of student representatives emphasized transdisciplinary understanding, methodological experimentation and practical application as essential in education today. In future work life, creative solutions and critical thinking might be the most needed qualities. The daily activities in academic course work is not necessarily answering these prospective requirements. The focus on producing study points and degrees effectively, governs the curricular choices and the ensuing teaching and evaluation methods. Since digital technologies such as AI (Artificial Intelligence) in all probability will change work life and society at an escalating pace through the next decades, this will

also influence how knowledge is perceived and constructed. Technological developments are not always followed by subsequent cultural developments to ensure the best use of technology or a deeper understanding of the social and relational consequences. Cultural anthropologist Mariella Combi notes that the introduction of new technologies has led to changes which required readjustment, or new articulations, of relations between the various fields of knowledge and the daily life of both the individual and the community (Combi 2016 p.3). Considering these perspectives, interdisciplinary and transdisciplinary approaches might be necessary means to contend with complex cultural readjustments. **Interdisciplinary research** can be based upon a conceptual model that links or integrates theoretical frameworks from different disciplines, uses study design and methodology that is not limited to any one field, and requires the use of perspectives and skills of the involved disciplines throughout multiple phases of the research process. **Transdisciplinary research** can be defined as research efforts conducted by researchers from different disciplines working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem. (Aboelela et al 2007). The FeLT-project aims at the transdisciplinary after this definition, but will also be positioned within the interdisciplinary in many instances.

The means by which artistic research could contribute to societal and epistemological shifts, will be further discussed through this paper in the context of the FeLT overall perspective: How can we conduct transdisciplinary research to meet challenges and discover possibilities in the interrelations and intersections that occur between human beings, living environments and machines? This overarching perspective is admittedly both ambiguous and driven by fantasy and speculation. Accordingly, it can stimulate different views, ideas and interests from the level of scientific or practical experimentation and application as well as reflexive and thought-provoking concepts of living technologies, relations on the edge of how we experience aliveness today. This might evoke a sense of the uncanny and a fear of being dominated by the machine, but also reveals a world of possibilities of becoming, creation of new forms and behaviors. Could we develop aliveness and create a more balanced existence? Can we enhance our senses and communication to become beings that are more adapt at co-existence? Concretely, we are interested in existing and future technologies where computers and robots incorporate functions of living and biological systems or interact with living organisms. As

indicated, we see this in a broader ecological and societal context.

Contemporary artistic responses to AI range from dystopian predictions of totalitarian control and surveillance through utopian, playful sci-fi scenarios of cybernetic enhancements of our beings, to robotics, sensors and 3d printing. In particular, the AI developments of neural networks opens new possibilities, fears and ethical dilemmas. Neural networks can be described as interconnected layers of processing work units, modelled on the neurons of the human brain. According to the writer and curator Jens Hauser, options of choosing between previously non-existent ways of acting and decision-making always also imply an obligation to take the consequences and implications of such issues into account, as well as taking responsibility for the decisions made (Silvestrin 2018). By combining science, practical application, artistic subversion and speculation with humanistic reflection, we aim at developing artistic research and education for the future.

The FeLT project is structured in accordance with research models derived from EU/EEA calls by work group member professor Boel Christensen-Scheel, encompassing research, education and innovation with practice, process and methods as driving forces (Figure 1). Results are both artistic presentations, research communication and other dissemination along with educational formats and research proposals.

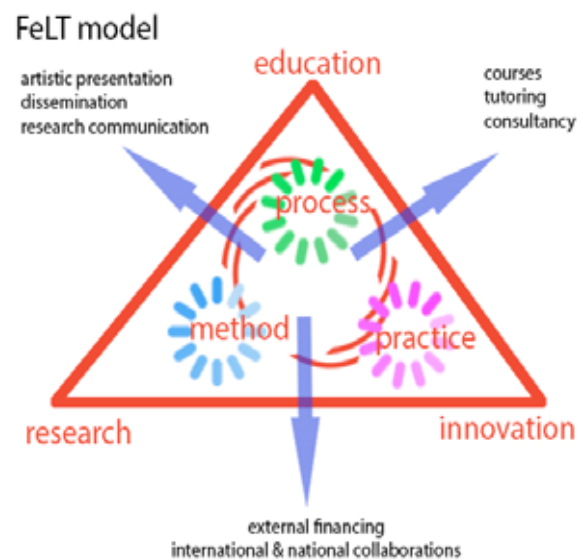


Figure 1: FeLT working model.

3. EDUCATION AND STUDENT WORK

The educational part of the FeLT project was the practical beginning of the project. This has evolved

from an initial student workshop, via a two year period of student projects inspiring conference presentations, through to the development of Haakon Haraldsen Roen's MA thesis presented below. As a first project, two students from the arts department, Stephanie Hoebeke and Haakon Haraldsen Roen, were engaged by the FeLT group. The students were engaged as research assistants to investigate and come up with their interpretations of research work from the ICT department. Their work was followed by advisors from both art and ICT departments. ICT-student Benjamin Bocquillon assisted by helping with technological work in this first phase. Some results are shown briefly here, based on posters produced for the opening of the AI-lab at OsloMet. The visualization in this project by Stephanie Hoebeke is evolved from a mathematical formula and algorithm developed by Henrik Lieng, Christian Richardt and Neil S. Dodgson (2012) at the University of Cambridge in the United Kingdom in the paper *Random Discrete Colour Sampling*.

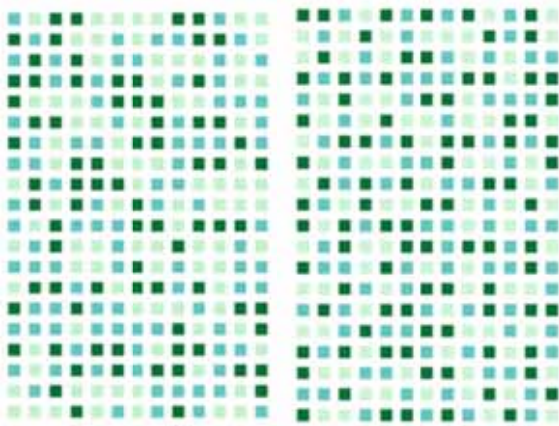


Figure 2a and 2b: Stephanie Hoebeke: *Random Discrete Colour Sampling*

By using principles of gestalt psychology, the formula and algorithm aims to produce perceived randomness in a visual manner. By using pseudo-random placement of colours, there will often be clusters of the same colour, and horizontal, vertical and diagonal rows of the same colour. We humans perceive this as not random (Figure 2a). The human brain is programmed to see patterns and will often find them even if it is not intentionally there. The purpose of the algorithm and formula is to avoid regular patterns, collections of the same colour, and horizontal, vertical and diagonal rows of the same colour (Figure 2b) (Lieng, Richardt & Dodgson, 2012).

Another project by the students was inspired by the pheromone-based communication found in social insects such as bees and ants (Figure 3). Thymio robots were placed on a heat sensitive surface that changes colour based on their movements. The

robots interact both among themselves and with the environment, and thus produce a continuously evolving pattern that emerges solely based on their movement, or lack thereof. This project is presented as a short video performance (Roan et al 2018).

This also inspired the MA thesis in Visual and Performing Arts: Art in Society 2019 by Haakon Haraldsen Roen. Titled *Gathering of the Hive: Investigating the clustering behaviour of honeybees through art and swarm robotics*. (Figure 4) The thesis was presented as an artistic presentation and an extensive, contextualizing academic text.

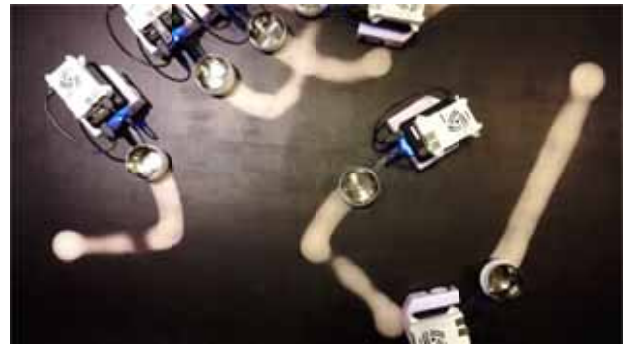


Figure 3: *Pheromone Thymio Robots*.

The Master project explored an algorithm inspired by the clustering behaviour of young honeybees. It was applied to a small 'swarm' of thymio robots. This formed a site of investigation on how social mechanisms observed in nature can be interpreted, adapted and illuminated, using strategies at the intersection of art and ICT. The focal point of this project, however - was not a technical development of Artificial Life, but rather to use this concrete, collaborative project as a kind of placeholder or entrance point towards a discussion of the nature of cross-disciplinary collaboration in-and-between art and artificial life. (Roan et al. 2019).

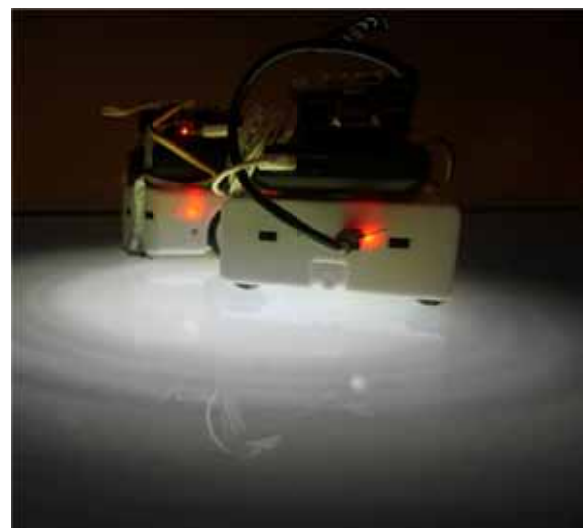


Figure 4: *Two thymios clustering at the center of a pulsating, radial light gradient, back-projection on a sheet of plexiglass.*

Included in the thesis work were interviews and reflections on the collaborations involved in the project, both advisors on the project (the authors of this paper) and the research assistant Vako Varankian who worked on the programming of the robots. Roen found many interesting aspects of the collaborations in his analysis. Differences in professional language, methods and expected outcomes are mentioned by both ITC and art participants, but both parties express openness and sees research values in the collaboration, as well as wider communication impacts, namely public research dissemination. From the perspectives of the advisors of the project, we experienced a process of learning different educational cultures as well as having a possibility to learn more about references from other fields and share interest in research and artworks that will influence the FeLT project further.

4. METHODS

As the student works showed, collaborations contribute value for both parties through exchange over time, even if one perspective (art or technology) may be the driver of the process. Rather than using art and design as a mere representation of technology or technology as a tool used by artists, a transdisciplinary development of joint methodology allows ICT and art researchers to reflect and speculate together. In this sense, totally futuristic (even non-scientific) scenarios may be used, or very negative or positive views of technology becomes accessible for further examination through art. This creates a broader base for reflection to understand more of the key ethical and human aspects that plays into the future of living technologies. Within FeLT, functions of living systems such as intelligence, evolution, reasoning and learning provides a framework of state-of-the-art scientific research that are opened to artistic questioning, re-formulation, interpretation and response. Similarly, engagement with technology as artistic materials and in artistic processes can further and stimulate discursive and performative processes that can be accessed and shared across different research environments. Resulting artworks or representational artefacts might be valuable in themselves and in dissemination. However, at this early stage, a main focus is developing innovative methods and processes that furthers transdisciplinary and artistic research contributions to reflection on possible future scenarios.

It is widely agreed that there are no longer specific media that can qualify something as art, consequently there are no prescribed methods. For instance, oil paint painted onto canvas is no longer privileged as medium and method. Even so, there are traditions, contexts and exploratory procedures

that can be sourced from art history or from the repertoire of other practices and disciplines. This was shown by Rosalind Krauss in her discussion of the meaning of artistic media in her essay *A Voyage on the North Sea* (Krauss 2000), which launched the influential concept of post-media. Inspired by this, artistic methods can be thought of in a parallel manner: the method may be invented by the artist while referencing artistic practices, research paradigms and other theoretical and professional perspectives.

Artistic methods carries meaning and add layers to the work in the production, interpretation and reception of art in new ways. This also points to the qualities that art historian Dorothea von Hantelman calls a specific kind of meaning production, which she describes as art's reality-producing dimension. Rather than seeing this as a representation of reality, "a specific methodological orientation goes along with the performative, creating a different perspective on what produces meaning in an artwork" (Hantelman 2010, p18), a pointer to method as constituting meaning. By looking at artistic research from this perspective, the artwork can be open to influences that will assist transdisciplinary processes. In accordance with post-media thoughts, different art practices carry certain traditions as part of their tools of expression rather than being defined by a medium. Through mapping interests and various backgrounds, we identified the following four artistic sensibilities or qualities as frameworks for artistic research: **materiality, sensory experience, performative practice and construction of narratives**, as well as intersections and different versions of these. This was done in an earlier artistic research project, *Oslofjord Ecologies*. (Oslofjord Ecologies 2019)

Of course there are countless ways of framing and conceptualizing artistic methods and sensibilities. Rather than suggesting a fixed model, our aspiration here is to enable artistic research processes and methods towards sharing, communication and development. Through asking ourselves the unanswerable question **what can art do?**, we reached a common metaphor: let us set the table and invite others to sit down with us. Through research residencies and further collaborations with artists and others, we hope to expand these shared sensibilities and quality mappings further. To exemplify what this might entail, we will look more closely at four quality mappings as they were understood in our group below.

4.1. Materiality

Materiality is crucial to the relationship between humans and the external world. It adds physicality and tactility to the interaction with the surroundings,

and establishes a physical relationship between subject and object. As such it offers tools for experiencing, being and thinking in the world with and through the body. It is also often important as necessary interface with technology. Material-based art practices have become more prevalent within the contemporary art scene in recent years. This is not so much due to their tradition of functionality. Instead there is a new emphasis on contextual aspects that relates to experimentation, conceptualization and narrative elements – what can be described as materialized narrations in which the act of crafting represents ideas of time and labour. A different view on materiality, often coined as New Materialism is emerging across arts, humanities and social sciences. This **turn to matter** (Fox and Alldred 2018) is conceptually not developed within our group so far, but is one example of where we might expand our mapping, especially connected to ecological thinking.

4.2. Sensory experience

Sensory experience is again frequently discussed in contemporary art theory and often actualized in relation to ecology and human experience of nature, after being less prevalent and maybe overshadowed by a conceptual turn since the 1960ties. The two philosophers Gernot Böhme and Jaques Ranciere relates the sensory to political functions in today's society. Ranciere sees the distribution of the sensible as a common denominator to the fields of art and politics. According to him, a redistribution of the sensible is in itself political, the unheard can be heard and hierarchies subverted (Ranciere, 2006). This direct connection between the original meaning of aesthetics (aestesis - the senses) and the function of art, is treated differently by the German philosopher Gernot Böhme. He calls for an expansion and renewal of the philosophy of aesthetics to entail the sensory realm at large, to be able to attend to human environments whether it encompasses nature or urban architecture, design and advertisement (Böhme, 2008). A renewed interest in sensory experience can be seen as a complement to the interest in audience participation and a rethinking of the sensory as including more than visuality and sound. This is evident in diverse examples of art works such as *Riverbed* by Olafur Eliasson from 2014 that transported a natural Icelandic landscape into the Louisiana Museum or *Eureka/Blindhotland*, sculptural installation by Cildo Meireles that plays on the physical experience of weight and size. The audience is invited to lift shiny balls from the floor. Two balls of the same size might have very different weight. This creates a bodily shift in perception that makes a surprising impact on senses other than the visual and

underscores the relations between bodies and environment.

4.3. Performative practice

Rather than addressing performance art as such, performative practice is an approach in which we consider elements from the perspective of how they are acted out and have an effect in the world. In actor-network theory, all events occurring within the social and natural worlds are considered to be continuously generated effects of the webs of relations that they are located within. Instead of asking why something happens, actor-network theory asks how it occurs, and study how occurrences arrange themselves. The performative addresses how the materials of the world (social, technical, documentary, natural, human, animal) get themselves done and on how they go on shifting and relating themselves in the processes that enact realities and knowledge (Law, 2008). From this perspective, performative practice is not only a typically human behaviour, expressing and reflecting the intentions of humans, but also collaborative relationships between heterogeneous elements such as organisms, objects and sites. The performative is also prominent in bio-art and techno-ecological genres where processes in living material are displayed or made visible or audible as they happen in time. The direct experience of responses from plants as found in Maria Castellano's work (Maria Castellano, 2019) has a different impact from work that represents and illustrates these processes.

4.4. Construction of narratives

Construction of narratives entails practices of assembling and appropriating material keeping in mind psychologist Jerome Bruner's thoughts of the narrative as an instrument of the mind to construct reality (Bruner, 1999). Documentation of various phenomena and historical documents might be archived and collected as a basis for constructing new narratives. As the art historian Charles Merewether suggests: "the archive, as distinct from a collection or library, constitutes a repository or ordered system of documents and records, both verbal and visual, that is the foundation from which history is written." (Merewether, 2006, p. 10) The critic and writer Hal Foster (2004, p. 5) underlines the constructed in the archive as a productive element in his analysis of art based on archival material in this way: "[I]t not only draws on informal archives but produces them as well, and does so in a way that underscores the nature of all archival materials as found yet constructed, factual yet fictive, public yet private." (Foster, 2004, p. 5) In our

context, historical and cultural documents may be sources of information as well as material for artistic appropriation and storytelling.

To be able to see these four artistic qualities and their intersections as functions in different contexts, we layered them with the genealogy of the site-specific offered by art historian Miwon Kwon's seminal book *One Place after Another* (2002). This creates a repertoire of possibilities to reflect on artworks, documentation and methods in relation to different situations and its inherent characteristics. Kwon suggests three instances of the site-specific. The first is the *phenomenological*, which is concerned with the physical and sensual properties, as found in e.g. Robert Smithson's work. Secondly, the *social or institutional* can be found in works that decode different sites and interests involved in the work of art, namely institutional critique, as found in works by Hans Haacke, Mierle Lederman Ukeles and others. The *discursive*, which she poses as the third category, is linked to the present and to the two other categories in terms of how the relationship of the art work to the actuality of a location (as site) and the social conditions of the institutional frame (as site) are both subordinate to a *discursively* determined site that is delineated as a field of knowledge, intellectual exchange, or cultural debate. This may be created by the artwork itself or be a potential of the site. (Kwon, 2002).

To sum up: Artistic research is characterized by methods invented by the artist while referencing artistic practices, research paradigms, other aesthetic, theoretical and professional perspectives. The method carries meaning and contributes new layers of interpretation and reception of art as well as facilitating production in new ways. By allowing for inherent or possible production of meaning in the context of a site, artistic methods are open to interpretations. It might be that the methodological flexibility and inherent transdisciplinary openness are among the components artists can bring to the common metaphorical table. Participants from other fields of knowledge and the public can join in from their own perspectives within an artistic frame.

5. EMERGING RESEARCH FIELDS

What we are trying to achieve in the FeLT-project is of course not our invention. We find many examples of transdisciplinary research within art and technology internationally. A range of quite established research communities arrange conferences and publish journals. In the Norwegian context however, the transdisciplinary involving artistic research seem to be of interest mainly to self-organized artists such as the PNEK (PNEK 2019), a network of artist's initiatives. In academic

institutions and art education, we find less activity aiming at such practices. In the following, we will look at three possible research field

5.1. Artistic Research

The Norwegian Artistic Research Programme (NARP), is a funding body for artistic research within Norwegian academic institutions. NARP also provides research training for artistic research fellows from all major art educations, and consequently has a strong influence on how artistic research is understood nationally. In 2018 new regulations for a PhD in artistic research was issued. This enabled the main art educations to start their own PhD programmes. As a result, the artistic third cycle is strengthened, but universities with art educations embedded in traditional university structures are less able to launch transdisciplinary programs that include art. There is an ongoing discussion in the academic and artistic communities about what artistic research implies. Even so, there is a consensus that the artistic practice is at the core of the projects that are supported, and the emphasis is on artistic results. Reflections on process, methods and context are mandatory, but there is no formal requirements for a thesis. The artist's own experience and insights are highlighted as being of importance, rather than outside perspectives. (DIKU 2019). In the FeLT project, we will propose transdisciplinary projects within this framework. The evaluation criteria promote a view on art that privileges results of a high international standard, while productive and innovative processes are not promoted as clearly. The high international standard is unexplained. It might mean everything from success in the international art markets to what international art communities might assess as valuable. This means our project proposals will enter a discussion of what quality might mean in artistic research in a contemporary context where the transdisciplinary might not be seen as a quality.

5.2. Artificial Life

As an example of a multidisciplinary research field, Artificial Life aims at building artificial systems, which incorporate properties of living systems. Artists and engineers have created a wide variety of life-like artefacts. This type of results often raise critical questions on what life is, what intelligent is, what type of effects may such artificial living systems and technologies have on our society? Artificial life systems are typically based on the local interactions of many components that create an emerging complex structure through self-organization. Artificial Life offers a rich mode of enquiry that incorporates the four qualities described above. In particular, materiality is often explored in Artificial Life art through the production

of physical systems and autonomous artefacts that are able to interact among themselves and with the environment through sensory feedbacks. The sensory experience is often explored in a bidirectional fashion where the environment and audience sense the system's behavior and responds. The system is therefore changing through such continuous interactions. Artificial Life allows the investigation of the hybrid interactions between living beings and non-living. The VIDA Artificial Life Art competition's online archives represents a range of examples of art works within the field of Artificial Life (Fundacion Telefonica 2015). The multidisciplinary nature of artificial life provides one possible and specialized platform for the combination of research methods at the intersection of art and technology, as it is targeted in the FELT project.

5.3. Humanities and Living Technologies

FeLT also has the ambition to engage in reflections on technology through competences from Art in Society research group and collaborations in earlier projects, such as the Creative Europe project Renewable Futures (RIXC.org 2016) and the Nordplus collaboration Hybrid Labs. Hybrid Labs was described as follows: Innovative Maker Trends in Art & Design Practices: Art in Society, Heritage Narratives and Hybrid Laboratories (Maker Trends) was a collaborative effort to bring together art and design, education and heritage communities to develop practices that lead to development of new hybrid work forms. (Aalto University 2018). The need for perspectives from art- and performance theory in the transdisciplinary field of Living Technologies is much discussed and will probably become more developed in the future.

6. CLOSING REMARKS AND FURTHER WORK

At this stage, curiosity, learning and inventiveness are more important traits and motivations for FeLT than envisioning concrete results. To develop further, we will turn to production of applied projects and artistic practices through artist's residencies, workshops and symposia. Building knowledge and reflection through networks that also share and facilitate artistic practice seem crucial to the transdisciplinary model of FeLT. However, we recognize that also institutional needs and possibilities are important to drive the work further, adding strategic views to professional interest. Lack of resources such as a suitable PhD-program, financing for research fellows and PhD-students and lacking research infrastructure are serious impediments to further developments. We suggest that if academic structures would become more adapted to artistic research needs, it would also mean preparing for a more innovative and dynamic

institutional life with a closer integration of education, research and innovation.

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