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Attempts, Failures, Trails and Errors. Notes on an exhibition of failed prototypes and rejected projects.

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Abstract: In this paper, we present the history, the concept and the results of "Attempts, Failures, Trials and Errors" exhibition project which was first presented in the frame of Piksel Festival in Bergen, Norway (November 2017) and later on at "Salonul de Proiecte", Bucharest, Romania (February 2018). The project aimed to incite the e-textiles artists and designers to reflect upon the way they are engaging with their failures, as well as to the way in which they use these failures to better understand the context in which they are working and to continue to experiment. Our approach reverses the common R&D constructivist methods, by using deconstruction as a process of investigation in the field of wearable technologies and e-textiles. By questioning the ideas and the concepts of failure and success, the project puts an emphasis on art's capacity to be critical, while at the same time to poetically and self-ironically address contemporary challenges and concerns.

Keywords: E-textiles, attempts, failures, trails and errors, prototyping, publishing, technical development, institutional constraints.

1. Introduction

Within the realm of electronic and smart textiles, there have been promising technological investigations that never quite managed to reach their potential (in fashion, smart interiors,

wearable technologies, etc.). Despite these disappointments, industry, academia and the artists and designers continue to explore the possibilities of electronic and smart textiles. Rather than presenting "the next big thing", "Attempts, Failures, Trials and Errors" project sought to show the various stages of projects' developments by exploring forgotten attempts and perspectives, less successful paths, and less mediatized wearable technologies and e-textiles projects. In this respect, the aim of the project was double: to reveal some of the unknown history of the emergent field of electronic textiles and wearable technologies and, secondly, to advance a critical perspective related to the current ever-present innovation discourse in an era defined by "fast prototyping", "publish or perish" and "start-up competitions".

The advent of wearable and electronic and reactive textiles can be traced back to the 1950s, in the context of space research during the Cold War. The Soviet Space Dogs (Turkina, 2014), or the astronauts' suits are some of the first attempts to build up protective clothes for extreme, extra-terrestrial environments and to monitor the body's reactions. If the industrial development of electronic and reactive textiles let show their military origin (Berzowska, 2005), the development of cheap and affordable electronic devices made also possible to imagine electronic textiles as a medium for the democratization of digital technologies (Buechley & Perner-Wilson, 2012).

An interdisciplinary field, electronic textiles and wearable are the ground for a series of interdisciplinary clashes between textiles and electronics, between software and hardware, between open source and commercial platforms. These clashes produce inspiring work, but some encounters are also a source of frustration and irritation. Such issues, which we can call benchmarks, are rarely afforded a place in the spotlight. They result either from a lack of communication, either from divergent positions and visions, or from new disciplinary jurisdictions.

The "Attempts, Failures, Trials and Errors" project we are presenting here was in this sense an investigation, as was a test in itself. The present paper offers an insight into the challenges we encountered in setting up this project and puts in perspective some of the responses it received. Finally, the text discusses some of the learnings we have made along the process, many of them definitory for the design field in general.

2. General presentation of the project

2.1 Context of the project

The present project started following a series of exchanges between the two curators of the exhibition project. The initial idea was to work on a "Salon des refusés" inspired initiative that will gather together the less successful or rejected art and design e-textiles projects. The topic popped up after one of the curators was invited as mentor and judge for a series of startup competitions. After several such experiences and based also on her own frustrations with some aspects of the academic publishing system, a question started to make its way: What is the destiny of these less successful projects and what happens to all the energies put into such attempts to win startup competitions, to get financed or get published when the rates of success are less than 20%? There was a kind of intuition that the multiplication of all sort of competitions, from "Britain (read also Germany, USA, France, etc.) got Talent" to startup competitions, are actually a form of crisis, looking to cover some more systemic issues. If this would be the case, then looking to the "*différance-s*" (Derrida, 1988) within the emergent field of electronic and reactive textiles would help us reveal the difficulties we are encountering. In this sense, the project wanted to question our present "innovation obsolesce",

encouraging an ecological perspective which would take into consideration the whole cycle of conception, consumption, technology's ageing, and degradation.

2.2 First Attempt

A first proposal was submitted for funding to the Norwegian Cultural Fund by the end of 2016. At that point, the emphasis lied on the idea that by bringing to light rejected wearable and e-textiles devices, technically failed prototypes or commercial failures, we would be able to launch a debate related to present days' art, design, commercial and scientific practices.

After a first evaluation of the proposal, we were asked to refine our idea. We soon realized that there were still a series of open questions we had not addressed properly in the first version of the project. One of them was how exactly are we going to organize the exhibition? Should we search ourselves for failed projects or should we launch a call for non-working prototypes, failed projects, non-published papers, unsuccessful commercial enterprises? Obviously, we preferred the later approach. Contrary to the largest majority of calls, the aim of this call was not to launch a competition but to bring together works and situations we were not aware of.

Another question we needed to address was: how are we going to curate this exhibition? The act of curation implies a selection, and any selection needs categories and criteria of evaluation. Moreover, how should we present this "catalogues of failures", this collection of failed works, unsuccessful projects or rejected applications? How will we know in which way all the projects were failing in order to orchestrate them? What if the criteria we were about to choose would be too narrow and unaware of the context the authors were experiencing? Moreover, since we also wanted to cover the costs of shipping and those related to the organization of the exhibition, we were struggling with the idea that, in case of a high number of received proposals, we wouldn't be able to cover all the costs of the exhibition. We found ourselves trapped between conceptual and logistical imperatives. The solution we finally opted for was to publish all the proposals on the project's website and to invite only a limited number of projects which were possible to ship and to be physically exhibited. In the end, this solution proved to be quite challenging and a lot of very constructive polemics between the two initiators of the project emerged out of these constraints.

A refined version of our project was submitted to the Norwegian Art Council in the beginning of 2017. With the second version of the project we explicitly aimed to question the ideas and concept of "failure" and "success" as well as their dichotomy, and to use art's capacity to define a space of critical inquiry, where the present times' technology's challenges and concerns can be poetically and self-ironically addressed. In this second project, we proposed to collect attempts, failures, trials and errors in the field of e-textiles following an open call for trials and failed works, test-bench prototypes and samples, as well as for rejected scientific papers or short-life projects. Since we also wanted to understand the social, economic and legal issues of technological development of wearables and e-textiles, we specified that this "catalogue of failures" will be accompanied by the authors' reflective notes and description of the projects' afterlife. We also explained that our approach reverses the common R&D constructivist methods, by using deconstruction as a tool for critical inquiry in the field of wearable technologies and e-textiles. At the crossroad between artistic, anthropological, philosophical, scientific and technological inquiries, the project aimed to answer a less addressed aspect by R&D processes, that of the conditions of development, production and consumption of wearable technologies and e-textiles. Similar to reverse engineering methods (Eldad, 2005), our deconstructivist approach was aiming to allow us not only to figure out the technical short-cuts but also to discover the breaks that hinder e-textiles and wearables' developments. In line with the deconstructivist perspective in architecture (Wigley, 1993), we explained that we were not to

propose new innovations and new functionalities, but we were rather looking to present the phreatic layers of e-textiles and wearables fields and to open the discussion towards forgotten perspectives, closed paths and unexplored issues. Finally, we stated that we were interested not only in what has been done but also on the conditions in which the things have been done. Therefore, the "catalogue of failures" would help us better understand the complex socio-technical conditions in which all these developments took place, and, by doing so, we would be able to anchor the future developments into more solid grounds (Derrida, 1988). This second version of the project proved successful.

2.3 Second Attempt

There was a second attempt to find support for the project by submitting a proposal to the European WEAR Sustain project's call. WEAR Sustain project aimed to support the collaboration between artists and designers with technologists and engineers in order to develop product ideas that would be conscious of the ethical issues concerning the lack of privacy, and corporate ownership of personal data resulting from wearable devices, as well as the ethical issues around social, environmental, labour and supply chain concerns in the fashion and technology industries. As "product ideas" we proposed the exhibition project and the publication of the "catalogue of failures" along with critical investigations. The application was not successful, and the reasons listed by the evaluators were that:

" 1. Project is interesting but does not answer the call of this competition for innovative research and implementation. Improvement in some areas is always the mistakes and try, this is the way to reach the target.

2. Interesting idea and might be very useful tool. However quite broad and not really concentrating on e-textiles and wearables.

3. Could be inspiring however not sure if this will facilitate sustainability within the industry.

4. This is not a prototyping project... The idea is interesting, but the problem they are presenting is philosophical, and not technical.

5. Even though they are given scoring, I don't think this project should be going forward. Also, I think the budget is a bit off, since the money allocated for the wear-sustain seems a bit low? In the guidelines, innovation vouchers used are expected to be between 10k-15k eur."

We were aware that our proposal was not particularly a market product in the very strict sense of the word, but we were still surprised by some of the comments. The answers are of relevance for most R&D contexts (academic and business alike) which encourage empirical studies or statistical approaches as reliable forms of investigations. Still, when it comes to ethical concerns, they cannot be approached as technical problems and solved only through hands-on prototyping, statistical evaluations or common-sense interpretations. Notions such as ethical conduct, responsibility or equal rights need to be philosophically questioned. From this point of view, a competition that requests for "products" that would solve the ethical and sustainable issues resulting from the exploitation of our bodies' data or our labour relationships proves conceptual weaknesses (Floridi et al., 2018).

2.4 The call for non-working prototype and failed projects

Finally, the call for wearables and e-textiles trials and failed works, prototypes, samples and projects has been launched in July 2017. A dedicated project was set up and the application form consisted in a questionnaire through which the applicants were asked to describe the context of their project (art/design/academia/other), to offer details about their specific framework (Was the project designed for a specific call, exhibition or other defined frame? If yes, what kind?), to explain the motivation, to give a short description and to describe how the project failed, as well as the reason for it failed. The authors were also asked to present what they have learned from the experience, as well as what they would do differently from today's perspective. Last, but not least, we asked for details related to the afterlife of the projects and we requested the authors to evaluate how did the failure affect their work and their progress.

All the received applications were published on the project's website. The number of received applications was not exorbitant. Still, more than 20 projects were sufficient enough to compose an exhibition. In spite of the fact that the project has been mediatized in different networks and was personally sent to some of the very active artists and designers in the field of e-textiles, not all of them responded to the call. As we learned later, the reasons were various: fear to exhibit their own failures, lack of time, missed deadline, etc.

After the first presentation of the exhibition project in the frame of Piksel Festival, Bergen, Norway, a second exhibition took place at "Salonul de Proiecte" in Bucharest, Romania, between February – April 2018. On this occasion, we launched a second call for failed prototypes and rejected projects, which allowed those who failed the first deadline to join the project. All the presented works were accompanied by a note related to the story of the projects.

Figure 1. "Attempts, Failures, Trials and Errors" general exhibition view at Salonul de Proiecte, Bucharest, 2018. Photo credits: Stefan Sava.

3. Presentation of the Failed and Non-working Prototypes and Works

In the following lines, we are going to present some of the exhibited projects. All these presentations are written by their authors. Our intention is to give voice to this collective attempt to compose a less well-known face of electronic and reactive textiles.

3.1 Afroditi Psarra – FM Transmitter Wearable

The FM transmitter wearable was developed by interdisciplinary artist Afroditi Psarra in the context of the 2nd International Conference of Artists Scholars that took place on January 2018 in San Francisco, US. The concept behind the project was to create a wearable device capable of broadcasting over radio its surrounding sonic environment; and using the human body as an interface to translate and transmit its sensory experiences. The prototype explores rapid fabrication techniques to produce soft-circuits and specifically, it is comprised by Copper Polyester Taffeta fabric cut in a vinyl cutter and ironed on the garment using fusible adhesive. The circuit schematic was based on a simple long-range FM transmitter that uses two transistors and a series of other electronic components such as resistors, trimmers and capacitors, as well as a hand-winded inductor that defines the tuning frequency. Although the materials that were used for the prototype were deemed functional, the project failed to function as intended. This failure most probably consisted in

three technical issues: [a] The handmade coil does not have the desired inductance of 0.1uH, thus the transmission frequency is out of range. [b] The circuit includes a trimmer capacitor that has to be tuned using a non-conductive screwdriver. The conductive tip changes the tuning frequency. [c] Lack of appropriate grounding. The two first errors were caused by the lack of appropriate tools, such as a multimeter capable of measuring inductance, and a non-conductive screwdriver. The third error was the result of inexperience of the creator with the need for careful shielding and grounding of radio circuits.

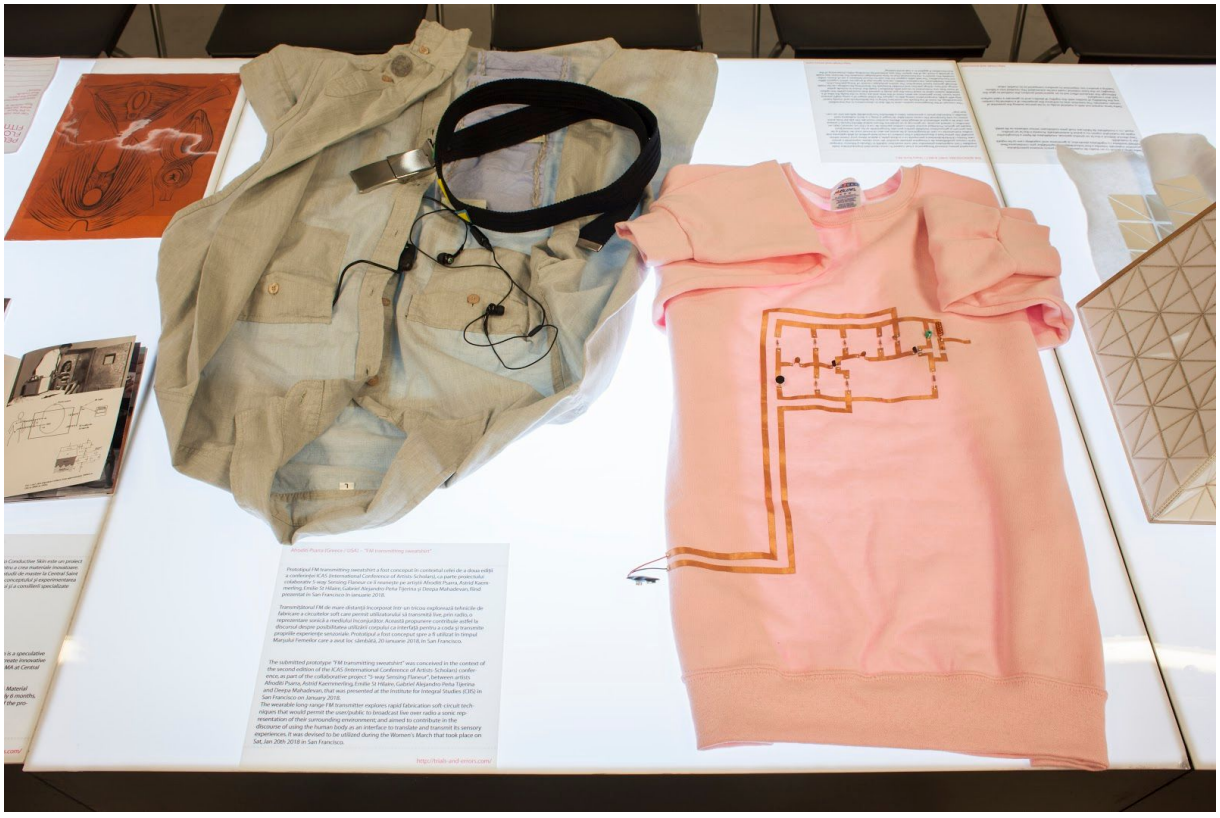

Figure 2. Afroditi Psarra - FM Transmitter Wearable, view from the exhibition, Salonul de Proiecte, Bucharest, 2018. Photo credits: Stefan Sava.

3.2 Kate Sicchio & Camille Baker – Hacking the Body 2.0

Hacking the Body 2.0 is a collaboration between Kate Sicchio and Camille Baker. Together we explore and create emerging wearable technologies through choreography and performance. We work with biosensing and haptic feedback and closely relate this to performers and their intimate data. Our failures in this project were technical, but in unexpected ways. Putting electronics on the body is difficult. Putting electronics on the moving body is even more difficult. Contemporary dancers are trained to find new and interesting ways to move, yet our technology is hard, unyielding and does not move with the body. Dancers were often breaking our prototypes by smashing batteries on the floor when rolling, popping solder joints when reaching, or shorting circuits when travelling across the space. Our failures were not really our but learning on the ways technology failed us and highlight where e-Textiles can be developed further in terms of interfacing with the body, and how

we might create new technologies that work for capturing data of the body while still considering ethics, privacy and sustainability.

3.3 Natacha Roussel – Group Interaction

My attempts to experiment on wearables were always seizing the limits of the technological possibilities, hence always flirting with what some people call failure, but for me they are part of an achievement. In this work I wanted to explore several very difficult technologies and concepts in live situations, such as: non location based, non-hierarchical digital positioning; using wearables to produce meaningful collective biofeedback, distributed network based group interaction in the city etc...
Since as an artist I am searching for things that sometimes does not exist, and also because the only way to challenge existing surveillance system, is to develop technologies in my own way along creative exigencies and in respect of the participant, therefore, I often develop my projects from scratch, and sometimes way above my possibilities. This was also the case for *Interac Wearing*, resulting in numerous unexpected results some glitches and interesting technical failures, however those were not the major point of failure of this project. I was more concerned by the difficulty to get the complexity of the relation to technology through, as I kept getting invited by technology enthusiasts who were interpreting e-Textiles as a panacea to bridge computer and human senses, and would assimilate any proposition to this framework, therefore we often got in very contradictory conversations, resulting in unexpected misunderstandings.

3.4 Renata Gaui – Fiber Optic Tail

This elbow patch is a speculative smart signalling system for female bike commuters in the urban space. The elbow patches have fringes with fibre optics, which are attached to a super bright LED that lights up and intensifies it brightness according to daylight. The fringes sweep if the biker is turning left or right. The project was done for a wearable technology class at ITP/NYU in which we were pushed to follow a very design-oriented methodology, thinking of ways to make the minimum viable version of the project. I was very optimistic regarding what I could achieve in one semester. This project taught me a lot about a single material exploration: figuring out how to weave / sew / knit different materials and seeing how bright the “tail” could be. It also got a second attempt in which I was able to optimize the circuit. During this process I learned a lot about mechanisms & fibre optics. The next step of this project would be to implement machine learning with user's data, to understand if the system finds patterns on how users behave and it can autonomously activate the turning signal, anticipating and making bikers commuting experience safe and seamless.

3.5 Annette Schmid & Veerle Pennock - Smell Fax – Olfactory Alternative Reality

SMELL FAX is a textile air pollution mask, extended by an odour copier and an odour printer. The speculative prototype investigates future uses of portable odour printers in textiles, reflecting the possible consequences of increased air pollution in megacities. Rapid urbanization has led to increased air pollution (World Health Organization, 2016) and to a decrease of natural, odour-forming green spaces, i.e. of parks, flowers, and trees, all over the world (Zhou & Wang, 2011).

At the same time, the existence of green spaces goes along with enhanced well-being. New research suggests that odours perceived during a stay can also improve our well-being without being on the spot (Herz, 2016). SMELL FAX addresses this problem by enabling users to extract site-specific odors from natural environments and reproduce them in artificial environments. The causes of failure were threefold. First, the development of the prototype was problematic due to time and budget constraints: Two design students developed SMELL FAX as a thought experiment within less than 14 days under a students' budget. Second, there were barriers in existing skills: In order to successfully build the prototype, an interdisciplinary collaboration of engineers, biologists, chemists, programmers, and biologists would have been required. Third, and most importantly, the success of the prototype depends on the technological progress of olfactory sensor and reproduction devices capable of sensing and reproducing site-specific odours (Obrist et al., 2014). Since such devices do not even exist in larger versions (most devices still work with ready-made aromas and the latest digital scent technology is still nascent), (Marks, 2010) we could not continue our work without the necessary smaller versions. Even if budget, time and technological constraints were solved, there would still be another challenge: Cultural constraints play an important role when it comes to the implementation of prototypes. In the Western world, face-covering masks are not yet well received. Therefore, while developing, one would have to promote adequate discourse and examine other usabilities of smell printers in e-textiles, i.e. less invasive ones like a scarf.

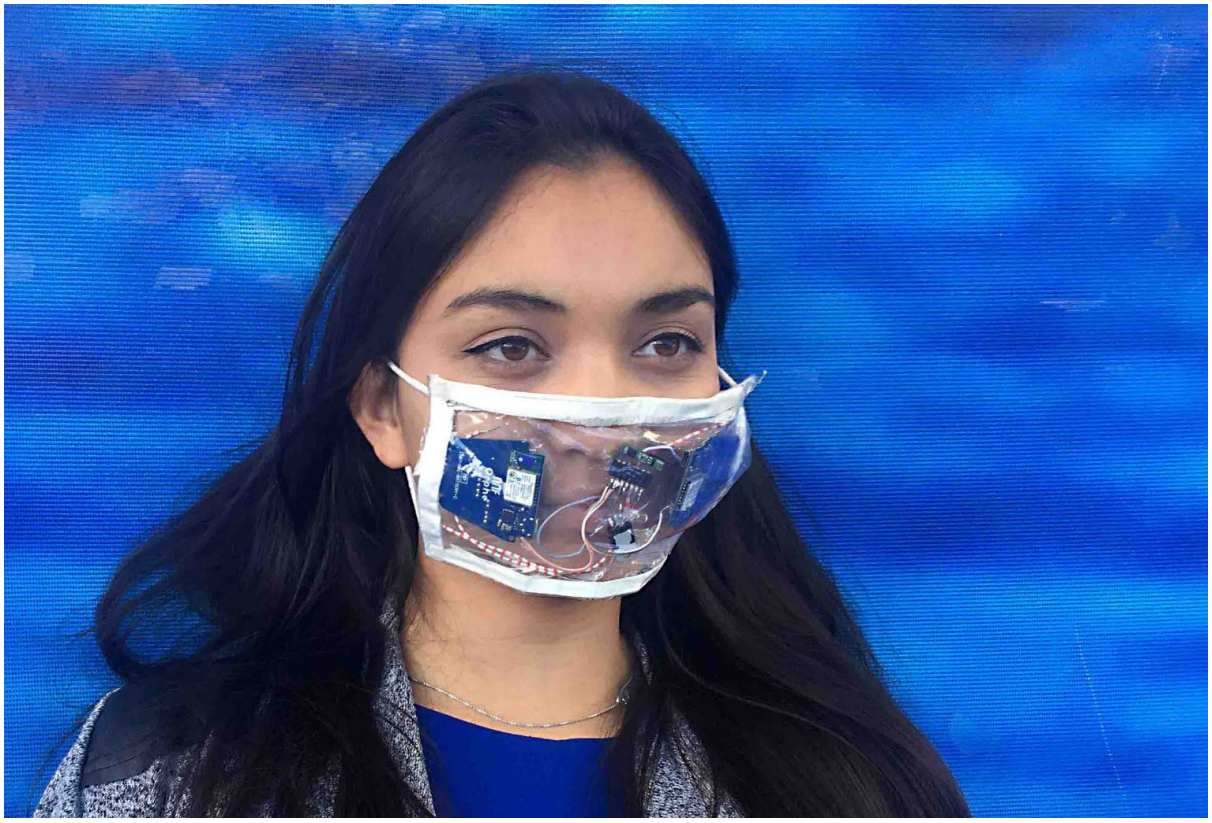

Figure 3. Annette Schmid & Veerle Pennock: „SMELL FAX", view of the prototype. Photo credits: Annette Schmid.

3.6 Giulia Tomasello - Bio Conductive Skin

Technology is getting closer and closer to our skin. Bio Conductive Skin explores the potential for augmenting living tissue with electronic components and conductive materials to create a new type of 'second-skin' interface. Aiming to blur the boundaries between what is human and what is technology and how can technology become more human? This project explores the possibilities of creating biomaterials and proposes alternative applications to our current technological interfaces. These components should feel part of nature and behave just like us. By exploring the notion of a technological second skin, the aim was to design biocompatible devices that mimic the symbiotic relationship we have with other microorganisms that we cannot live without. The action of nurturing biomaterials and domesticating biotechnology at home were two big challenges to face. The time that a living organism requires for growing is slow and unpredictable. Failures are just part of the process as you are not 100% in control of the material during its formation and final performance. Merging living organisms with electronics revealed the beauty of this experimental and fascinating union and the uncertainty of the future of technology embedded in human bodies.

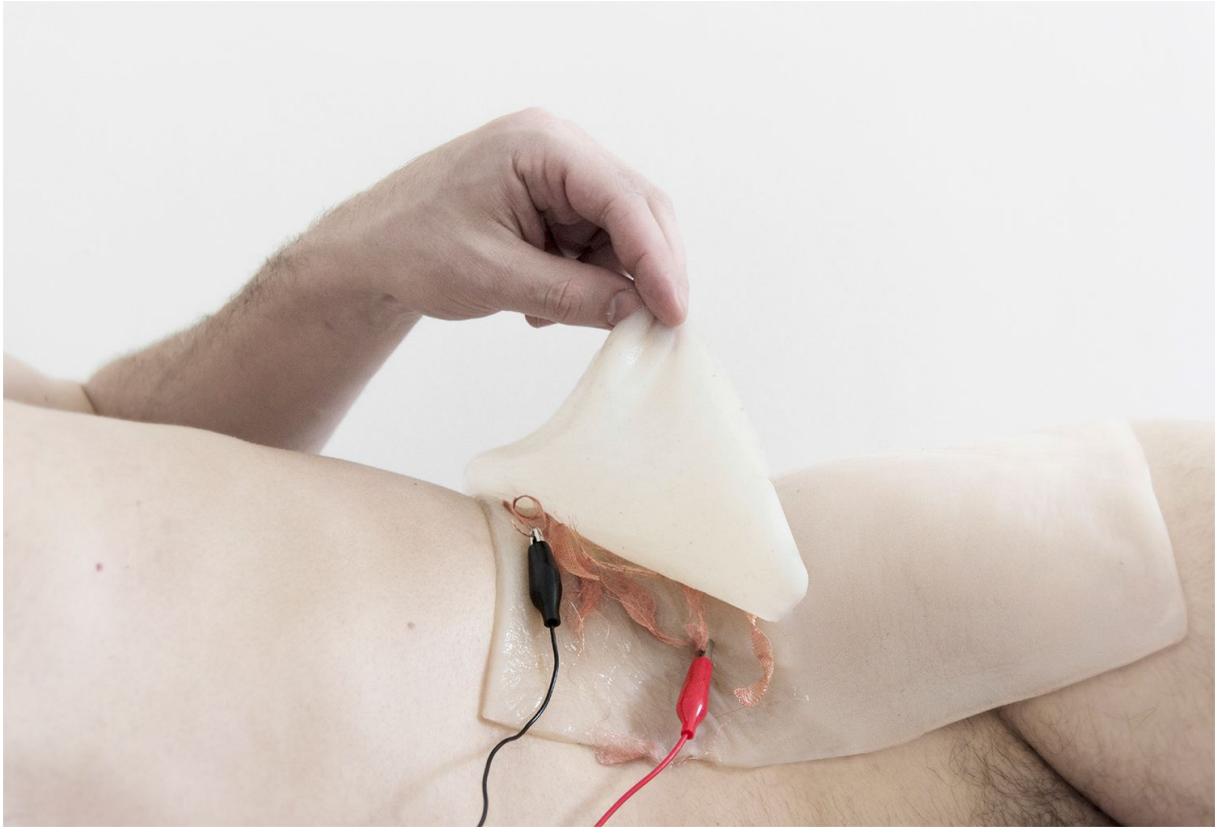

Figure 4. Giulia Tomasello: "Bio Conductive Skin". Photo credits: Giulia Tomasello.

3.7 Pauline Vierne - A failed hand exercising object from the research project DAAN (Design Ambient Adaptive Environments) at Design Research Lab, Berlin University of the Arts

The prototypes are a collection of sensor samples and shapes that were developed in the frame of an academic research consortium on «Ambient Assisted Living». As e-textile designers our interests, from the start of the research, focused greatly on material and interaction explorations. We got enthusiastic about industrially knitted stretch sensors and investigated silk-screen printing with thermochromic inks as ambient notification channel. Despite our practical knowledge the project failed from a lack of a conceptual background and unstable premises. Indeed, this object's identity was never properly defined and remained somewhere in between a therapeutic object, a musical instrument and a friendly technological pet... We understood that a design artefact cannot perform in any satisfying manner if it does not address a clear research question. After we had recognised it, the failure helped us to get back to a stronger methodological approach to pursue with the research.

Figure 5. Pauline Vierne - DAAN Project. Some of the prototypes composing the collection for the exhibition that display the different directions this object was taken to. On the left : embroidered capacitive sensor to be triggered from moving hands inside the shape ; in the middle : research on shapes for hand-exercising using piezo-resistive knitted sensors (on the right). Photo credits: Pauline Vierne and Sara Diaz-Rodriguez at Berlin University of the Arts.

3.8 Teresa Almeida - The Bitness Project v.01

The Bitness Project v.01 is a design toolkit that includes a series of artefacts designed for research. This research explored do-it-yourself (DIY) wearable e-textiles as a new creative set of materials and tangible medium to learn about human anatomy and physiology, specifically the intimate body in women. Whereas the design of e-textiles, as interactive materials that generate knowledge, has mainly focused on learning and teaching computation and engineering, e.g (Buechley and Perner-Wilson, 2012), the premise of this project was that e-textiles could enable embodied intimate learning experience. Moreover, technologies that engage and support body literacy and self-care are critical, and this design-led intervention evolved around a design toolkit to be included in hands-on research workshops. Within these settings, communities of women engaged in conversations that comprised topics of bodily taboo, while in practical contact with technology. If the starting point in the research was to explore how DIY e-textiles could promote embodied knowledge, then the workshops enabled discussion while seeing through public and private. All in all, the (working) e-textile prototype used during the study-workshop might have benefited from more robust

technical crafting. Nevertheless, as a research material, it helped consolidate the research in question and outline the next steps in the research programme (Almeida et al., 2016).

Figure 6. Teresa Almeida: "The Bitness Project V.01", view from the exhibition. Photo credits: Stefan Sava.

3.9 Beam - E-textiles swatch book exchange

Context: e-textile swatch - exchange, during the e-textile summer camp 2017. The exchange: 25 participants make 25 copies and coming together the copies are exchanged resulting in an example book of 25 different e-textile swatches. Project name "Inessential", author Beam (Bram van Waardenberg). Swatch working: given a conductive non-woven rectangle, from the sides the resistance can be measured. This gives two values and using an ATtiny85 the quadrant of touch can be identified. On a technical level this swatch worked. But to avoid making 25 pure copies, which i consider loss of time, I embroidered different words on the swatch from a text of Baudrillard about inessential differences in design - for example these embroidered words, which personalize, but don't contribute to the function (Baudrillard, 1984, p198). One of the words was "ultra-special". The participant who got the swatch with "ultra-special" was perceiving not only the swatch but was also pleased with the "ultra-special". The failure was in my opinion the fact that it was not perceived as humour that the words making up the text of Baudrillard were making a difference, making these words "essential" - in a striking contrast with his writing. The swatch was working on too many levels.

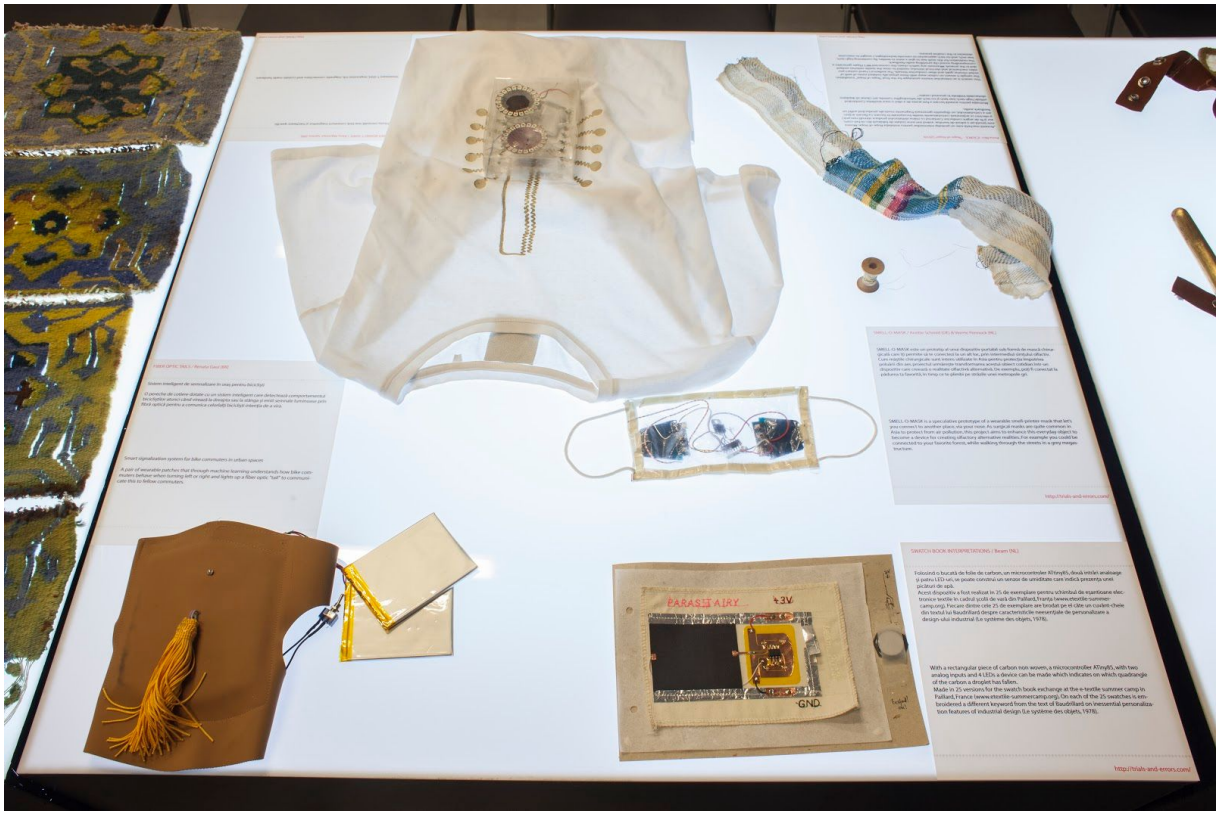

Figure 7. Beam (Bram van Waardenberg): "E-textiles swatch book exchange", view from the exhibition. Photo credits: Stefan Sava.

4. Discussions and conclusions

The present paper summarizes the trajectory and the results of "Attempts, Failures, Trials and Errors" project. Inspired by a deconstruction process (Derrida & Norris, 1988), the project aimed to bring into light the less visible aspects in the development of the field of electronic and reactive textiles. The approach cannot be exhaustive and the final results were marked by a series of limitations, like the tension we encounter between the conceptual and logistical aspects.

We should also acknowledge the reasons for which some of the practitioners were reluctant to exhibit, to make their failures public: fear of public acknowledgement, missed deadlines, logistical difficulties, etc. The choice the authors made in exhibiting their own failures is also significant. As some of the participants declared, this initiative allowed them to dive deeper into their project, to look at it from a critical point of view. Some of the authors noted that this reflective process allowed for new creative ideas and research paths to emerge.

As the accounts of some of the authors are testifying, there are different types of difficulties or failures that e-textile projects often meet. The translation of meaning from one platform to another (from textiles to electronics, from software to hardware), the acquisition of the required knowledge at work in this hybrid field of e-textiles (textiles, electronics and computing), the cost of projects'

development and the durability of flexible electronics are some of them. But there are also social and institutional issues which are not to be forgotten.

In spite of these limitations, the project launched a significant and fructiferous debate, not only on the field of wearable technologies and e-textiles, but also on the state of the art of the technological development as a whole. The interest that the project sparked was also made obvious through the invitation we received to present the project later on in Maribor, Slovenia, at the Kibla Portal in October 2018.

As Jacques Derrida previously stated in one of his interviews (Derrida & Norris, 1988), the deconstruction is a process, a process that creates the conditions of possibility to inscribe the terms of deconstruction in such a way as to open "to multiplicity, to heterogeneity, to these sharp and irreducible differences" (Derrida & Norris, 1988, p. 11). If not for something else, at least for multiplying the voices and the accounts related to electronic and reactive textiles, the project was deemed a success.

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