SUPPORTING GROUP EMOTIONS AWARENESS THROUGH TECHNOLOGY

AN EXPLORATION OF THE AFFECTIVE INTERACTIONAL APPROACH FOR GROUPS OF MULTIPLE USERS

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“Man is such a strange creature that one can never enumerate all his good points, and the more we look into him the more new characteristics we discover and the description of them would be endless.”

*Nevsky Prospekt,*
Nikolai Gogol (1835)
The aim of this research is to speculate on the opportunity to create deeper human interactions for which technological means supporting the expression and the understanding of group emotions are explored. I tried to do this by connecting the Affective Interactional Approach (Höök, 2013) to studies about group emotions. The theoretical framework of this research is presented together with a brief account of the evolution of design for affect.

The methodology used in the design process and in the evaluation used for the outcomes are delineated and tailored for this specific research, in which a central focus is given to users and their opinions. Following, the research process is divided into three stages/experiments: I first produced some Cultural Probes, then distributed them in an office and carried out an interview; after this I developed a prototype for collective emotional awareness and I tested it through a workshop attended by Interaction Design students. The last experiment consisted of a second prototype for collective emotional awareness which gave me the opportunity to explore what kind of technology is best suited for collecting and representing group emotions. This last prototype (Processing + Kinect based) was tested in a student collective and the results of a following interview were used to evaluate it.

I conclude my dissertation proposing future scenarios for the explored designs and then with a presentation of the knowledge contributions produced.
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03. INTRODUCTION

This research is a follow up of my previous thesis: *CITY MOOD, How does your city feel?* (Fabrizi 2014) where I tried to explore the opportunity to develop a system to understand the emotional connections and triggers citizens experience in different areas of the city. The final aim of the study was to develop an instrument to evaluate how a city could and should be developed in order to make it a better place for those who inhabit it. A year later, I am still interested in the main focus of my previous research: how to detect and represent the emotional state of a collectivity and give to everyone involved in it some instrument to understand what is emotionally going on around them.

My research foundation is based on the so called Affective Interactional Approach (Höök, 2013), and aims to place itself inside this research field. The Affective Interactional Approach is a design and research field born around the first half of the previous decade, branching out from Affective Computing (Picard, 1997). The novelty of the Affective Interactional Approach lies in the new way it sees and considers emotions: as a cultural and dynamic phenomenon that gets shaped by interaction and self assessment (Boehner et al 2005); this view is very different from the one previously proposed by the Affective Computing researchers, where emotions are seen as discrete episodes, complementary to cognitive events (ibid.) and therefore fully computable and transferable.

Based on this premises, my research aims to study emotions as a collectively experienced phenomenon and represent this phenomenon to portrait a community to trigger self reflection and mutual recognition in between this group of people.

On a cultural and political side, my research blooms from an active critical reflection on our economic system. One of Capitalism’s major downfall is the dehumanization of the relation between individuals; peoples are considered and see each other merely as an appendix to the machine or the bureaucratic organization (Fromm, 1956).

My aim is to reflect on the opportunity to recreate a space for a deep human interaction enhancing already existing (but underestimated) human abilities: the expressions and the understandings of emotions. Evolution theorists have interpreted the ability to express emotions (Laughing, crying, smiling, frowning, etc.) as a primordial way to communicate with other humans; the ability to express emotions has been selected by evolution because it strengthened the relation between humans as a group (Darwin, C. 1872). The ability to express discomfort and the ability to be receptive to it may have helped humans to reach for help and receive it and therefore survive though a “collective strength” (Morris, W. 1967). Nowadays, we live in contexts that are very different from the one where we developed our social behaviour. The tribe, our big cities, are inhabited by millions of people and we are losing this ability to emotionally communicate between each other, which means we may have lost the ability to ask for help as well as to know when someone needs help from us (Morris, W. 2002).

The aim of this research is therefore to explore how technology could become a means to trigger a renewed attention between individuals through the displaying of emotions expressed by groups of people that spend a lot of time together, but that did not necessarily develop a sense for the emotional state of their peers and of the group itself.
04. RESEARCH FOCUS AND KNOWLEDGE CONTRIBUTIONS

As already mentioned, I am going to focus on consistent groups of people, these groups of people are going to be: employees in an office, a group of master students and friends living together in a collective house. Those choices are made on the assumption that the interactions for each of these groups happens mostly in the same places: the office, the University, the apartment. It is possible to guess a scale in the amount of confidence shared between the people that constitute each of those groups, where the office is the place where less confidence can be found between the components of the group (and where they didn’t decide upon the other components), while the collective is probably the one of highest confidence between the inhabitants who actively chose to live together.

As a first step in my research I will try to prove the opportunity of the research itself; therefore I will try to understand if and how a consistent group of people consider the “emotional heat” around them. My first research question, related to this and answered through the first part of my design process carried in the previously mentioned office, is:

- Is there a space of co-constructed emotions for a consistent group of people? What kind of space?

As previously stated, I am basing my view on emotion on the Affective Interactional Approach (Höök, 2013), which refuses to handle emotions as something that can be represented through numbers or data. On this account my objective in this study and possible knowledge contribution would be to develop an instrument capable to embody group emotions, in order to leave open the opportunity for the people involved to verbalize and discuss the meaning of this representation; this way, I think I would respect the definition of emotion as a dynamic phenomenon that gets shaped by interaction and self-assessment (Boehner et al 2005). This statement is followed by the second and the third research questions I aim to answer, which will be explored in the second and third steps of the design process. The two questions are:

- Is it possible that a system inspired by the Affective Interactional Approach theories (Höök, K. et al, 2008) can be meaningful for a consistent group of users rather than for a single person?
- What does it mean to design for a group based emotional experience available for group based reflection?

The last research question I will try to tackle, is directly connected to the ones exposed before, but it has a more practical and designerly approach and is related to the understanding end explorations of technologies that could be able to support the user’s emotional experiences, therefore:

- What kind of technology could be used for a system supporting collective emotional awareness?

While answering to this questions is going to be the main knowledge contribution I am going to produce, there are other outcomes that could be considered as important: those are the methodologies used– the reflections and proposal for different uses of the technologies, the sketches I produced that represent an highly designerly approach to research.

There is another aspect that I would like to discuss in this chapter, and is related to what my knowledge contribution won’t be; in the development of a theory about how research through design produces
knowledge, one of the current visions in the academic discourse has identified so called *intermediate levels* of knowledge (Löwgren, 2013), abstractions driven from design artefacts, meant to capture the core lesson taught from the artefact itself and therefore meant to be easily communicated, appropriate, and further developed by the research community (Ståhl, Löwgren, & Höök, 2014); many kinds of intermediate levels will be discussed in the next chapter and are going to be used for the development and evaluation of my design. With this premise about the contributions of research through design in mind, I want to clarify how this master thesis research is not meant, both because of time and practical constrains, to produce any intermediate level knowledge, since such a level of abstraction would need a maturity in the design process and development I don't aim to reach on this occasion. However, with this research, I aim to build the *designerly foundations* for future development and future explorations and inquiries of what is it to design for supporting the understanding of group emotions.
05. THEORETICAL FRAMEWORK

ACCOUNT ON THE INTERDISCIPLINARITY OF THE RESEARCH

It can't be denied that this research is born as an interdisciplinary research, where Interaction Design, the study of emotions under a psychological and philosophical perspective and the study of social contests and social behaviours all have a great influence and together structure the research, the design and the final contributions. Nevertheless, it is important for me to remind the reader that this is a Masters thesis research in Interaction Design and that the writer's background is in Design and Architecture; while I would consider it essential for a further exploration of the themes discussed here, I didn't have the opportunity, for this research, to have an extensive collaboration with any professionals in any of the other field mentioned.

WHAT ARE EMOTIONS?

For example, a more extensive research in this hybrid field would probably have required a personal and highly detailed description of the term “emotion”. Also some parting of emotions from moods and from sensations would be necessary; as previously stated, my research is not meant to be an exhaustive work and I wouldn't dare, at this point, to enter such a convoluted road without the company of someone more prepared than me. For defining “what are emotions?” I will use the definition Klaus Scherer, Professor of Psychology and director of the Swiss Centre for Affective Sciences in Geneva;

“In the framework of the component process model, emotion is defined as an episode of interrelated, synchronized changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism” (Scherer, 1987, 2001, 2005).

EMOTIONS AS A GROUP EXPERIENCE

A fundamental theme of this research is the concept of emotions as a group experience. This is an important and highly discussed theme in psychology, social science and behavioural sciences. This thesis could actually benefit very much from a deeper understanding of this theme from all points of view that are available in research today. Here, I am going to give a brief description of it, leaving the deepening of this theme to the next researchers or to the curiosity of the reader.

Group emotions refer to an emotional state that is shared and created inside a group of people. It is seen as an emotional entity that is influenced from top down, by each individual's emotional state, while at the same time influences individuals from bottom up (Gibson, D. and Barsade, S. 1998). Studies about group emotions revealed their correlation with how “functional” and therefore safe the group is. Here are four statements that define group level emotions:

• Group-level emotions are distinct from the same person's individual-level emotions.
• Group-level emotions depend on the person's level of group identification.
• Group-level emotions are socially shared within a group.
• Group-level emotions contribute to motivating and regulating intragroup and intergroup attitudes and behaviour. (Smith, E. et al 2007)
Another theme that I am going to briefly explore is “Human behaviour” and “Body Language”. For example, I am going to support some of the choices I made for designing my second Prototype using the work of Desmond Morris (2002), an English broadly recognized zoologist, ethologist and popular author in human sociobiology. The choice of using his work, of which I have been a follower for a while, is based on the great abilities Morris has in communicating very complex concepts with a simple and understandable language. I must add that my work is also highly inspired and directed by his exceptional status of a researcher that loves and admires the subjects of his study, human beings.

“[…] to understand the significance of another man’s actions is to gain an insight on his problems; to see what lies behind his conduct is perhaps to forgive it, where previously one would have attacked it.” (Ibid.)

The idea of including emotions in the realm of design and computing is fairly new. Since its first official appearance back in 1997 (Picard, R.) this field not only has become an important field of study and research, but has been branching out in different directions, giving rise to heated discussions between supporters of different positions (Hook, K. and Picard, R., 2013). I will try, in the next pages, to give a short account of the different branches of the field concentrating my attention in what has been the main inspiration and theoretical support for my research.

Affective computing is a specific branch in the field of Human Computer Interactions and it explores the influence that emotions have in the users’ experience of the interaction. This research was born within a new approach, started in the ‘90s, to the study of emotion. In this revaluation, emotions began to be considered as components of humans’ rational behaviour (Höök, 2013).

In 1997, Rosalind Picard wrote the first definition and comprehensive study about Affective Computing. She is also the founder of the Affective Computing Research Group at the MIT Media Lab. To explain what Affective Computing is today, it is worth reading the description on the official web page of the Affective Computing Research Group, directed by Rosalind Picard, at the MIT Media Lab:

“Affective Computing is computing that relates to, arises from, or deliberately influences emotion or other affective phenomena. Emotion is fundamental to human experience, influencing cognition, perception, and everyday tasks such as learning, communication, and even rational decision-making. However, technologists have largely ignored emotion and created an often frustrating experience for people, in part because affect has been misunderstood and hard to measure. Our research develops new technologies and theories that advance basic understanding of affect and its role in human experience. We aim to restore a proper balance between emotion and cognition in the design of technologies for addressing human needs.” (Picard et al, n. d.)

After almost twenty years since the first steps of the field, different approaches and interpretations of what it means to consider Affection as a component of Computing flourished. New questions arose, considering the nature of emotions, the opportunity and possibility to store emotions as data, what are the contributions that those new knowledges and reflections could bring in conceiving and developing a design.
**INTERACTIONAL APPROACH**

In 2005, Boehner together with Dourish, DePaula and Sengers presented a paper to the decennial Critical Computing Conference held in Aarhus, Denmark called: *Affect: from information to Interaction* (Boehner et al., 2005). This paper is one of the theoretical grounds on which Kristina Höök and her colleagues built much of their research though design for the development of what they call the *AFFECTIVE INTERACTIONAL APPROACH* (Höök, 2013).

In their paper, Boehner et al. point out how the “traditional” approach to Affective Computing (Picard, 1997) basically sees emotions as discrete episodes, complementary to cognitive events, and therefore approachable with the same information processing model of cognition; following this model, emotions are seen as fully representable units experienced internally and transferable between individuals and through machines.

In contrast, the Interactional Approach sees emotions as a cultural and dynamic phenomenon that gets shaped by interaction and self assessment and it is culturally created and experienced (Boehner et al., 2007). This new view changes the value of emotions in the design of interactive artefacts: before designers were expecting to design to help computers to understand our emotions, now the aim is to support users in the understanding, the interpreting and the experiencing of their own emotions (Boehner et al, 2005). This new value given to emotions could shape as well the methodologies used to evaluate design; this comes from the fact that, in this approach, affective systems are not designed to decode and transmit a location on a pre-ordered scale of emotional data, but imagined to support the user in her own understanding and emotional meaning-making (Boehner et al., 2007). This way a successful system is not the one that gets the “right data”, but the one that lets the user experience and reflect upon its own emotions; therefore the user is the ultimate judge and evaluator of the design.

Boehner et al (2005, 2007) not only describe a new approach to Affective Computing, but also present a set of design principles to influence and support both researchers and designers:

- The interactional approach recognizes affect as a social and cultural product;
- The interactional approach relies on and supports interpretive flexibility;
- The interactional approach avoids trying to formalize the unformalizable;
- The interactional approach supports an expanded range of communication acts;
- The interactional approach focuses on people using systems to experience and understand emotions.

It should be noted how those are structured, yet still flexible instruments that influence and shape future designs. Designers are given a number of aims and ethical insights that are not meant to restrict the field of imaginable future artefacts, but are offered as a generative opportunity for new visions of the future and a compass used to “make the right choice” (Zimmerman et al, 2007).

In a further exploration of the concepts and design means of the Interactional Approach, *How emotion is made and measured* (Boehner et al, 2007), Boehner and colleagues reconsider the utility of the behavioural, empirical and physiological measure developed by the Affective Computing research community, but only once assured that those instruments are used to support the users’ understanding and experiencing of their own emotions and not as straightforward thermometer of the “truth”.

**AFFECTIVE INTERACTIONAL APPROACH AND THE “SWEDISH SCHOOL”**

Following the Interactional Approach, but pushing it forward to a higher practical and designerly manner is a “Swedish school” (author’s definition) of researchers, mostly represented by Kristina Höök, Petra
Sundström and Anna Ståhl, but supported by many other researchers. This “Swedish school” builds on Boehner and colleagues’ theories and conceptualizations, but enriches them using as fundamentals pivots of their research design processes, users involvement and experimentation with technologies. Therefore, the steps further made in the research are not only made though a theoretical speculation; on the contrary, the theoretical approach is constantly enriched and directed by a reflection in the action of designing (Schön, D. 1983) as well as in the act of user-proofing each prototype. This work is also constantly developed with the intent of producing a strong and communicable ground for the designers/researchers to come.

In her Phd thesis, Anna Ståhl describes how the need for a new approach to the design of emotional experience was born while in the practical act of design processes:

“In our work, we quickly came to realize that when designing for emotional experience, it was, for many reasons, important to provide an alternative to the idea that human emotion can be isolated, automatically recognized by the system, and used to make the system automatically adapt – as that kind of framing excluded a whole range of applications we saw as possible and desirable. Step-by-step, we formulated a program we called Interactional Empowerment, which tried to capture this alternative view on design for emotion: allowing users to be expressive, to reflect and to leave the meaning making to users. “ (Ståhl, A., 2014)

**Interactional Empowerment**

The Interactional Empowerment, as an aspect of the Affective Interactional research, treats the user as the necessary end and always active participant of the whole interaction. While in this approach to design the final end is still to make the experience of the emotion available for understanding and reflections (like in the Interactional Approach), another added value is the power given to the user on how to treat their own data: they decide what to unfold, what to share with others and what to keep for themselves since they are the only ones that have the key to interpret their own data (Höök, K. et al, 2008). Another aspect is a refusal of a dualistic divisions of human experiences (eg: intellectual and emotional experience are seen as one), also emotions cannot be separated from the social context in which they are generated and experienced. To this follows the centrality given to the human body, the place where the emotion happens and that culture and social experiences make complete (Ibid.):

“ In our view the integration of bodily, cognitive and social/cultural interactions into a design is key when dealing with design for emotional interaction “ (Ibid.)

**Design examples**

The Interactional Empowerment is built on the reflection upon practical aspects of the research, the process and the final designs and user testing, therefore it is important to provide the reader with some examples to go further in the description of this approach to Affective Interaction.

**Affective Diary**

Affective Diary (Ståhl & Höök, 2008) was developed with the idea to design a system that could support people’s understanding and experiencing of their own emotions. This design is meant to engage users in the embodied process of their emotions, where the concept of cultural body is central to this experience. The system is composed of a mobile phone with camera, an armband and tablet pc. The mobile phone is used to keep traces of the sms sent and received and collects all the pictures taken. The armband detects
both the arousal level of the wearer, through a galvanic sensor, and the amount of movement, though an accelerometer; these data are sent to the phone through wireless network. At the end of each day the phone needs to be connected to the tablet pc, which will display all the data in a non-straight forward way; on the space of a timeline arousal together with movements are displayed as ambiguous shapes that needs the user’s interpretation to obtain a final meaning (Ibid.).

“The aim was to provide users with material working as a bridge to the embodied emotional experience.” (Höök, K. et al, 2008)

AFFECTIVE HEALTH
Driving on the experience of the Affective Diary system, “Affective Health” is a similar kind of system: it measures user’s movement and arousal level and does it through sensors attached to their body. Of course this is a more sophisticated system with some essential difference: a more engaging and understandable visualization of the data, the fact that the data is displayed on the mobile phone and therefore are more accessible, and the fact that the data is shown in real time. Another important feature is that a large amount of data (hours/day/week/month) can be checked out at the same time while the visualization remains consistent (Höök, K. 2009; Ståhl et al, 2011).

DESIGN ELEMENTS
Höök and colleagues, through the experimenting of designs, design processes and user testing, developed what they called Design Elements (Höök, K. et al, 2008); those design elements are an intermediate level of knowledge (Löwgren, 2013). On a scale from theoretical to practical (Picture n.1), those Design Elements would be placed in the middle, between Boehner and colleagues’ (2005, 2007) set of Design Principles they were based and structured upon (the theoretical components) and the actual design and design processes they were abstracted from (Höök, K. et al, 2008).

The decision to share those inspirational patterns (Löwgren, 2007) is about sharing knowledge together with the rest of the design research community, releasing the instruments for further research and a design repertoire for future products. The Design Elements resulting from this abstraction are:

• The Affective Loop,
• The Evocative Balance,
• Open Surfaces.

![Picture n.1]
I will now try to briefly describe those Design Elements for the design of the Affective Interaction.

**AFFECTIVE LOOP**

In the Affective Loop what is taken in consideration is the strict relation between what the user does and how the system reacts to this (Höök, K. et al, 2008; Höök K. 2009); what makes the loop work is the seamless interaction: the user expresses her emotions though a bodily interaction with the system, the system reacts to this, the user is then affected by the system and can interact more with it, becoming every time more involved with the system and deepening her interpretation and understanding of how it works. In the Affective Loop the idea is that the system is creating a space for emotional reflection, without interfering with the user, who can decide how, when and if getting involved with the system:

“The system is only staging the scene for the activity.” (Höök, K. et al, 2008)

**EVCATIWE BALANCE**

Evocative Balance (Höök, K. et al, 2008; Ståhl, et al, 2014) is another element of user's empowerment. The systems previously described make use of biometric data, but those data, rather than being presented as raw information, are elaborated and represented in a manner that leaves the keys of their interpretation to the user.

“Affective interaction has the experiential quality of evocative balance if the user finds the data to be familiar, recollecting lived experience, and at the same time suggestive and open for fruitful interpretation.” (Ståhl, et al, 2014)

The concept of Evocative Balance builds on a reflection upon Ambiguity as a design tool that can be used by the designer to raise topics and proposing point of view and involving the user in meaning making, instead of dictating answers (Gaver, W. et al, 2003).

“[...] the artefact or situation sets the scene for meaning-making, but doesn't prescribe the result.” (Ibid.)

It is important to note that the noun of this Design Element is “Balance”, which underlines the long process needed to find the right equilibrium to communicate a sense to the user without impose a too strong perspective.

**OPEN FAMILIAR SURFACES**

The idea of Open Familiar Surfaces is an extension of the concept of “appropriation” that is when users adopt technology in a way that goes beyond the original intention of the designer (Höök, K. 2006); for example, to give a funny name to a WiFi connection in order to communicate with one's neighbours is an appropriation. In the case of Open Familiar Surface the appropriation is encouraged by the designer and is a further step in the direction of empowering the user and give them an instrument for expressing themselves. For example, in both Affective Diary and Affective Health the user can sketch, write and leave notes on the representation provided by the system. The term “familiar” can be defined as the attempt of the designer to support the interaction of the user with the system; therefore the images and feedbacks that the system is sharing must be of a kind that the user is able to interpret and make sense of (Evocative Balance) (Höök, K. 2006; Höök, K. et al, 2008).
TIME
While it is not considered a design element in any of the literature, Time is a key concept to be taken in account in the designing of instrument for Affective Interaction. Affective Loop, Evocative Balance and Open Familiar Surfaces need time to become effective and meaningful; the user needs to mature over time her understanding of the feedback given from the system, and this understanding gets deepened when different moments of the interaction can be confronted and understood to develop further the user’s reflections and meaning making of her own long-term behaviour.

CONCLUSIONS
In this chapter I presented the theoretical framework that is going to influence and structure my research. Together with the themes I mentioned and that may need further study in future research, I presented the current state of the research theory related to affect and emotion. In this presentation I gave particular attention to the so-called Interactional Approach, that treats design for emotion as a way to make people more aware of how they feel rather than designing for machine that can detect emotions better. In particular I described the Interactional Empowerment approach, a research through design conducted by what I called a “Swedish school”. This research, given its strongly practical approach, is going to be the strongest compass in my design and process choices.
In this chapter I will describe the methodological approach I will use in this thesis; as previously mentioned my research is strongly based on the so-called Affective Interactional Approach, therefore the themes I am researching, the kind of outcomes I am expecting, and the methodology I’ve decided to use are strongly influenced by this specific approach to the design for emotions. Nonetheless because of personal design opinions, physical and time constraints and specificity of the research, the methodology used has been designed specifically for this research and it developed together with the research itself. As previously stated, the novelty of the Affective Interactional Approach lies in the new way it sees and considers emotions: as a cultural and dynamic phenomenon that gets shaped by interaction and self-assessment (Boehner et al 2005, 2007); this view is very different from the one previously proposed by the Affective Computing research (Picard, R. 1997) where emotions are seen as discrete episodes, complementary to cognitive events (Boehner et al 2005, 2007) and therefore fully computable and transferable. This original understanding and conceptualization of what emotions are has a strong impact on what it is to design for emotions: as a designer affected by this view my aim is not to find a solution to develop a technological system able to quantify and distil the “right emotions”, on the contrary, my designerly aim is to develop a technology that can support humans in the understanding and experiencing of their emotions (Boehner et al 2005, 2007).

It is understandable, given this perspective on emotions, the consequent design aim and a personal design background, how my methodological choice is far from the positivist traditional HCI methodology; in the developing of my research I am therefore going to keep myself very far from looking for scientific validations, formalizations or protocols (Gaver, 2012). Also, to answer to my research questions and to be true to my personal design approach, the development and testing of a design prototype is essential part of the knowledge production process I intend to contribute with (Ståhl, Löwgren, & Höök, 2014). Research though design (Zimmerman et al., 2007) has gained a lot of attention and received many validations as of late, while the field of interaction design has obtained more and more autonomy from HCI’s influences.

As opposite to the traditional HCI approach I am going to use a multi-grounded design approach (Ståhl, 2014) with the aim to structure my work as a fusion of different research instruments such as:

- Theories (described in the previous chapter) such as:
  - Design theories and previous design researches;
  - Experiential qualities and design aims;
  - Design elements,
  - Group psychology theories;
  - Researches and theories about body language.

- Previous design experiments and examples;
- Artistic influences;

All this materials and theories are going to inform, influence and structure my design openings and sketches (which I consider part of my knowledge contribution). My approach is the one of a research
through design and therefore it aims for a practical creation, this means that the sketches and design openings need to go through an evaluation of the material and technical knowledge I have available before being translated into design artefacts. Each of those design artefacts or prototypes, then, gets tested in the wild (in real situation outside the laboratory). User testing is meant to further develop the prototypes, understanding the drawbacks and potential. They are a base for further steps in the research since they influence the previous phases (Picture n.2). All of those elements, theories, influences, sketches, prototypes, user testing and evaluations are, in the end, not only the method I am using, but also my knowledge contribution and the structure that evaluates this contribution.

**EVALUATING DESIGN FOR EMOTIONS**

I previously discussed the choice of a detachment from HCI approaches in the direction of a more strong designerly and experiential one. With this decision comes other reflections, such as the need to think about how to evaluate the validity of the design and of the knowledge contribution I am going to develop.

At the time writing, the question of an evolution of the evaluation (Kaye and Sengers, 2007) is still an ongoing and sensitive discussion, that follows closely the development of new methods and new approaches. Since the first steps of the Affective Interactional Approach, questions about how to evaluate system built under its umbrella arose; in the passage from Affective Computing (Picard, 1997) to the Affective Interactional Approach (Boehner et al, 2005), the meaning itself of what it means to design a successful system for emotions has completely shifted and together with it the evaluating instrument needs to find a new shape (Boehner et al, 2008).

"Evaluation depends on measurement, on comparison, and, principally, on expectation. One can evaluate only with respect to a goal. When we look at emotion as a product of culturally situated encounters between people and settings of action, measurement and comparison become problematic, but most particularly our notion of expectation begins to fail us." (Ibid.)
If the evaluation instruments comes before what we want to design for, the emotion, a misconception and an impoverishment of the value and complexity of emotions is created. Anyhow, Boehner and colleagues (2008) leave the speculation upon how to broaden and change the concept of evaluation to future studies. I will then take the responsibility for myself to try to define the evaluation criteria I think my work should be measured up to; those criteria all come from previous researches in the field of the Affective Interactional Approach or are taken from previous works that were inspiring to the field.

To evaluate and steer the design and knowledge contributions I intend to develop with my research work, I will aim to certain qualities; of these qualities, the first I consider is that the result of my process and the process itself “must be criticizable” (Löwgren, 2007). I will try to stick to this expectation, revealing as much of my process and motivating each decision I am going to take during it. Together with it, I will try to give all the accounts of user testing and of user feedback on the systems I will develop (Gaver, 2006). If other colleagues or researches will find those descriptions sufficient and transparent enough and they will be able to “identify and criticize every step” (Löwgren, 2007) my work will have been measured up to the first evaluating criteria I set for it.

In pondering how to evaluate my knowledge contribution I would consider as well Ståhl and Höök’s (2008) views on the value of unboxing the theoretical and designerly process; those are: exposing the design process can be a validator of the design process itself when it reveals its seamless debate with the chosen design qualities. The second aspect that should be considered, when revealing the design process, is the practical knowledge that is being shared with the design and researchers community that can be inspirational in yet unknown ways (Ibid.).

If I consider more closely the evaluation of the systems as design knowledge rather than this written support, the question I need to overcome (and that many and others have tried to overcome before me) is the developing of:

“[..] evaluation methodologies suitable to systems that are experiential and conceptual rather than functional” (Sengers et al., 2002).

In their historical account of the evaluation of HCI systems Kaye and Sengers (2007) consider systems that have an experiential purpose rather than a task driven one; for those experiential systems users become evaluators of the system and the unit of their evaluation is:

“How to express oneself. How to be seen or not.” (Ibid.)

The year before Kaye and Sengers’ s historical account, Sengers and Gaver (2006), discuss the evaluation of ambiguous system and conclude that when systems are designed to “support a space of interpretations around a topic” (Ibid.) the flourishing of interpretations evaluates the system and therefore users interpretations are more than just part of the evaluation. This means that as a ultimate instrument of evaluation of my contribution I will give voice to users, their opinions and all the different interpretations they will come up to during the workshops and user testing. This will be done through interviews, group discussions and questionnaires.
In the next pages I am going to describe the design process that is the core structure of my research. Through three different experiments I am going to explore how consistent groups of people relate to the emotions of their own group. Two of the experiments feature prototypes that are used to develop a way to represent emotions as a group experience and to speculate about it with together with two different groups of users.

The first of the experiments happen in the office of an hospital, where I asked some of the employee to collaborate with me thorough the use of Cultural Probes (Gaver, 1999). The second experiment was brought forward in an Interaction Design Master Class and will concern the use of the first prototype for collective emotional awareness I developed. The third experiment happen in a collective; here I used a second prototype developed with a different technology, but build following the outcomes of the previous one.

**CULTURAL PROBES**

**FIRST EXPERIMENT**

The first phase of my research was conducted together with employees of an office of the Hospital in Malmö; it made sense for the beginning of my research to seek collaborators in a workplace since I was looking for confirmations that my research proposal, and later on my knowledge contributions, could be “relevant” (Löwgren, 2007). Through a workplace is not a situation that would be commonly considered for emotional interactions, it is still a place where people spend a lot of time together without actually deciding with whom they spend this time with. A workplace is inhabited by a consistent, but not spontaneous, group of people; it made sense to me that, if even this somewhat odd and productive focused situation would have revealed itself as a place where group emotions are present, then many other more spontaneous situations of togetherness could be as well considered as place for studying group emotions as well.

I decided to make my first steps in my design research through the use of Cultural Probes (Gaver, 1999), this for two main reasons: on one hand it aligns my research within the design process of previous researches in the field of the Affective Interational Approach (Ståhl and Höök, 2008), on the other hand I considered it as way to answer to the first of my research questions:

- Is there a space of co-constructed emotions for a consistent group of people? What kind of space?

**DESIGNING THE CULTURAL PROBES**

In designing the tasks to present to the users through the Cultural Probes, I made use of Tulli Mattelmäki’s PHD research (2006) Design Probes; in her research she delineates what could be the reasons for a designer to decide to use the Cultural Probes instrument, and how to design the Cultural Probes in a way that could support this aim. Specifically, I made use of a series of themes Mattelmäki presents to the designer in order to make up their mind about the reasons, the preconceptions and the expectations they have about the Cultural Probes and the expected results (Mattelmäki, 2006). Here is an account of how Mattelmäki’s guidelines helped me in the delineation of the design of the Cultural Probes I used for my research.
Considering the aim of the study (Mattelmäki, 2006).
Mattelmäki suggests to the designer to develop the Cultural Probes with clear goals in mind. Here are listed the aims I set when designing the Cultural Probes:

- Enhance attention around emotions and shared emotions in the participants/users.
- Understanding if there is a space for emotions in the workplace and what kind of space it is.
- Obtaining representation of emotions made through different physical/representatives means.
- Inspiring me for the next phases of my research (Gaver, 1999) (Ståhl and Höök, 2008).

Preliminary mapping:
Write down your views and preconceptions of the subject (Mattelmäki, 2006).
This is meant for the designer to understand what she is expecting to find through the Cultural Probes. In particular this is going to be useful when making sense of results and interviews to separate new findings from expected ones.

- I am expecting that they find the observation of group emotions as something new, some of them may not understand the task or find it “silly”.
- The language (participants’ mother tongue is Swedish) may be a big obstacle.
- It may be difficult for them to collaborate in representing and discussing group emotions.
- Some of them may feel very awkward with crafting, they may not like it or just stopping at drawing happy/sad faces to represent emotional states.

What are the issues you are interested in (Mattelmäki, 2006)?

- Understanding how much the participants are aware of emotions and group emotions.
- Understand how they would represent emotions.
- Understand how they connect certain shapes, colour and materials with emotions.

What are the properties of the various tasks and what is their purpose (Mattelmäki, 2006)?

- The first exercise is a self reflective exercise: the participant is asked to reflect about her personal feelings and to represent them.
- The second exercise is about the empathic understanding of the others: the participant is asked to reflect on others emotive status, and to represent them from a personal point of view.
- The third exercise asks the participant to reflect on the relations between colours, shapes and emotions.
- The fourth and final exercise is again based on the representation of emotion with a focus on the constant floating nature of emotions.

What do you want to learn and probe (Mattelmäki, 2006)?
Together with the research questions, I want to answer some “sub-questions” that could help me to clarify what understanding I hope to derive from the usage of the probes:

- How normal is it to consider emotions in a work place?
- How deep is the participants’ understanding of others emotions?
- What is a “common” representation of emotions?
The designing of the Cultural Probes was supported and shaped by this preliminary reflections and based on them I prepared six Cultural Probes to distribute to six different people working in the Hospital's Office. Each of the packages (Picture n.3) contained: a presentation letter, a booklet containing the instructions to the exercises (they can both be found in the Appendix to the research), a diary, where the participant were asked to sketch and draw. Together with those paper based instruments, each participant could have found in its package: some coloured pens and pencils, glue, coloured papers, coloured cloth, coloured dough (Picture n.4). Two of the Cultural Probes package had some “special items” such a cross stitch set and a knitting doll. Cultural Probes generally ask for pictures, diary entries and sketches (Gaver, 1999)(Mattelmäki, 2006) and some of the item I included is not very common, but I figured out that to give different expressive materials would have been a way to tickle participants’ imagination, and give many different ways to express and represent emotions.

RESULTS FROM THE CULTURAL PROBES AND INTERVIEWS

I distributed the six Cultural Probes to six different people working in the Hospital's office, unfortunately I couldn't choose my collaborators, but I had to rely on the choice made by my main contact and office's business Developer, Bitte Zetterman.

Ten days after I handed the Cultural Probes I went back to the Hospital office to get them back. Out of six packages I got back five since one of the participant had left her work at the office; of this five Cultural Probes one came back almost intact since one of the persons that received it decided not to participate further in the research. I couldn't ask to this ex-participant why he decided to leave the experiment, but I would conclude that he found the exercise silly and not worth of his time or maybe he just forgot about it. After getting back the Cultural Probes I studied them for few days and then I asked to the people participating to meet me for an informal interview. While one of the participants was immediately available, the others didn’t reply to the several solicitations I sent them, which means that by the end I had to rely mostly on my own interpretation of their works.

INTERVIEW WITH USER NUMBER ONE

User number one, a woman around 45 years of age, was the only one to be available for taking part to the final interview. In Picture n.5 and Picture n.6 it is possible to see what she produced to answer to the questions posed by the Cultural Probes.

The interview pivoted around three main themes: I wanted to understand how the general experience of working with the Cultural Probe was, I asked for an explanation of the material produced for each of the exercises, I tried to find out if the exercises changed something in the user's perspective about emotions
and their value in the workplace.

**Discussion about the Cultural Probes experience:**
A the beginning of the interview, the user commented the need to read the Cultural Probes’ instruction more thoroughly than it would have done with another text, this was not due to the language barriers (Her mother tongue is Swedish, while the instructions were written in English), but more related to the requests made for each exercise. She also described how the way she judged the exercise changed while working and reflecting on them; she declared that, when she approached the first exercise:

“It felt a bit silly.” After that my brain started to realize, and then my fantasy and I got more experience and the 3rd was pure fun!”

She also discussed how her own way of representing emotions got more complex: while in the beginning she only used smilies, while keeping on working on the Cultural Probes she tried to use more descriptive representations and then more ambiguous and sophisticated ways of communicating her own emotions (Picture n.5, A).

**Explanation of the delivered material (choice of)**
The cross stitch work (Picture n.5, B), representing a traffic light and a road and related to the first exercise (represent the emotions you have been experiencing during the whole day)

“There is a road (Some work you need to be done with), sometimes you have to wait and you want to go forward with something, but there is a stop. The whole day is not a green light, but all the different things.”

The exercise n.3 required to reflect about specific colour of the clay in the package, find out what are the personal emotional connotation related to the colour and representing them with the clay. This exercise was delivered though photographs (Picture n.6), the clay was moulded to represent a mouth in differ-

![Picture n.5](image1)
![Picture n.6](image2)
ent positions, from down to neutral, upward and very up. Explaining this exercise gave the opportunity to the user to explain me what for her was the value of a smile in her working context:

“[…] if I just smiles a little bit, it effects my co-workers. […] Not to fake. But I know that is kind of important to show that you are OK. Like with my dogs, it is important to be positive, if you smile you get a smile back. It is an easy way to make it nice to come to work. Good morning, and a smile. The smile triggers a smile.”

The last exercise asked users to represent a whole week of emotions using any of the materials found in the package. User number one decided to work with some green fabric that was supplied upon which she sketched and added other materials (Picture n.5, C). Here she used, together with a few smilies, some highly communicative means such as the “dark cloud” and the onomatopoeic "zzzzzzzzz"; on top of all, the most interesting choice, I think, is the green paper glued on the green fabric:

“[…] sometimes you feel ‘invisible’.”

Did the exercises change the user's perspective about emotions in the workplace?
To answer to this question I will only refer to the user’s words:

“It started a kind of process, try not to get so irritated about things you can’t change. It just bothers me and it only affects me, it’s me that gets tired of things that I can’t change.”

“I can’t take my troubles to work, it effects everyone in the work place. I need to treat my patient with a smile, I think a lot in this way. I can’t bring my problems and troubles in the group. It effects everyone if someone is negative.”

User number four
As previously mentioned, user number one was the only one to accept to meet me for an interview about her work. The absence of an interview with the other three users makes my interpretations of them very personal and somehow unreliable. Nonetheless, I considered the material shared by user number four (a man around 35 years of age) as extremely communicative, creative and noteworthy. I am therefore presenting here what he produced because I believe it shows an original and mature approach to the theme of emotions and describes a highly creative and sensitive personality. Anyhow, in this paragraph, I am matching the pictures only with a description trying to avoid any interpretations.

Picture n.7 shows the material created for the first exercise (represent the emotions you have been experiencing during the whole day). The image contains the 7 cardboard tiles, four of them are highly modified (and again highly communicative) using mostly materials not coming from the Cultural probes package, such as a glued AAA battery and the hospital official user’s...
stamp (where the user erased his name). Another of the tiles has been modified to represent something like a necklace and a fifth one has been pierced with a coloured pen.

In Picture n.8 it is possible to see a green cloth of fabric transformed through well positioned cut, a pink paper stripe and some pen marks (all material found in the Cultural Probes Package); the result of this transformation seems to be a mask with a happy face. I personally don't know to which of the exercises this manufacture is connected.

![Picture n.8](image)

**Conclusions**

The outcomes of the Cultural Probes have been various and interesting. In particular, through the use of the Cultural Probes I tried to answer to a certain number of questions, such as:

- How normal is it to consider emotions in a work place?
- How deep is the participants’ understanding of others’ emotions?

It appears to me that emotions have their importance in a work place, in particular, it seems like the ability of being aware of one's emotions and the effect it could have on others has a main role. The interview with user number one specifically revealed this:

“We had, a year ago, a co-worker that wasn't pleased with the work, she was trying to get a new job. Everyday she was lips down, frowning back, bad talking. That effected the whole group. One person effected the whole group. Everybody got low, because, listening to someone that is nagging, it effects you!”
What came out through the interview seems to be a kind of “shared emotional responsibilities” between people working together in the office. It is not bad itself to feel down, but it is not fair to the other colleagues to show it all the time. Breaks need to be moments of relaxation and laughter and not an opportunity to cast an heavy shadow on the others. Indeed, there are moments for complaining or sharing sadder moments, but it takes a personal involvement between those who talk and those who listen and an appropriate place.

“[…] we have a lot of laughter here. We have a lot of fun. It is a nice place to work and we try to help each others a lot. We try to come up and sit together for lunch and breakfast and we have a lot of fun together. Of course, sometimes I need to talk to someone, I do it with my friends behind the closed doors of my office.”

Therefore, trying to answer to one of my “main” research questions:

• Is there a space of co-constructed emotions for a consistent group of people? What kind of space?

Emotions are definitely important for a group of people working together and it is quite evident that the group seems to be prone to be easily influenced even by only one of its components and so much that this is remembered after a long time. There are, then, co-constructed emotions. It seems to me that a group that shares such a long time together and that has been sorted out by chance (as in most of the offices and work places) spontaneously and almost unconsciously decides to “emotionally collaborate” in order to co-construct a light and pleasant environment for everyone. When user number one described it, it almost felt like it was not only polite to do so, but a responsible duty she was eager to bring on.

Another question I was eager to investigate was:

• What is a “common” representation of emotions?

It was surprising to me to find out how creative some of the participant had been and how many different and complex ways have been used to represent emotional states. I would consider this as a proof of how sophisticated the understanding of emotions is, even for people who are not interested in those studies in the first place. The interview, as well as the absence of interviews, made it clear how unrealistic it is to interpret emotions as a straightforward set of data and information, on the contrary the interpretation of what is represented needs to be unveiled by who created the representation itself and seems to acquire value and meaning though a dialogue.

EXPERIMENTING WITH TECHNOLOGY AND THE EVOCATIVE BALANCE FOR MULTIPLE USERS, FIRST PROTOTYPE

SECOND EXPERIMENT

In the next paragraphs I am going to describe the ideation, the development and the user testing of my first Prototype for collective emotional meaning making. This prototype was developed in a very short time and before I got the Cultural Probes back and therefore it didn't take in account any of the insight coming from them.

DESIGN OF THE FIRST PROTOTYPE FOR COLLECTIVE EMOTIONAL AWARENESS

This first prototype was developed to answer to the second and the third research questions:
• Is it possible that a system inspired by the Affective Interactional Approach theories (Höök, K. et al, 2008) can be meaningful for a consistent group of users rather than for a single person?
• What does it mean to design to make a group based emotional experience available for group based reflection?

In the designing of this first experimental system I tried to keep in mind the lessons learned though the study of previous systems designed on the track of the Interactional Approach, such as Affective Diary (Ståhl & Höök, 2008) and Affective Health (Ståhl, Höök, & Kosmack, 2011) and to use this abstracted repertoire of inspirational patterns (Höök et al, 2008; Löwgren, 2007) as core concepts to scaffold the autonomous development of my own design.

I have been trying to construct this first prototype around three concepts I’ve already described and examined; those concepts are taken either from the Affective Interactional approach theories or abstracted from previously developed designs.

The three concepts used for this first prototype are:

• Affect is a social and cultural product (Boehner et al, 2005) as well as an embodied and bodily product (Höök, et al, 2008);
• Leaving the interpretation to the user (Boehner et al, 2005);
• The system should be designed in a way that stimulate reflection on and awareness of affect (Boehner et al, 2005).

TECHNOLOGY

As suggested by Boehner and colleagues (2007) measurement systems developed for “traditional” Affective Computing designs can become powerful tools when designing for an interactional approach if the results are displaced in an ambiguous way that empowers users in their meaning making.

To develop the first prototype for “collective emotional awareness” I therefore used a “traditional” Affective Computing system, the Android App Moodies (Beyond Verbal, 2015), and tweaked its use from a system that senses and transmits emotions, to a technology meant to support humans in their understanding and experiencing of emotions (Boehner et al., 2007).

Beyond Verbal is a “traditional” physiological metric Affective Computing system in the sense that, even if created almost twenty years after the first official appearance of Affective Computing (Picard, 1997), it is strongly based on the idea that emotions are informations that can be detected and communicated between humans and machines without errors (Boehner et al., 2005). As a physiological metric system, Moodies Emotions Analytics treats emotions as a biological event that exists outside the user understanding and interpretation of her own feeling (Boehner et al., 2007).

Here is the description appearing on Moodies Emotions Analytics’ download page:

"Your mood in 20 seconds. Just press a button and talk.

Intrigued by emotions?

Want to know how sentiment look like?"
Curious to understand how you and your colleagues feel as you speak, right now?

*Moodies is providing the answer - all with a press of a button.*

*Based on 18 year of research into the science of emotions, Moodies analyses and presents the current emotional state of speakers in real time, as they speak. Based on Beyond Verbal’s award winning Emotions Analytics cloud-based engine, Moodies listens to vocal intonations to understand our emotions as we speak – because it’s not what we say, but HOW we say it."

(Beyond Verbal, 2015)

This description together with the screen-shots from the app (Picture n.9), show how strongly research and market relies nowadays on the idea of emotions as an objective, transferable and culturally universal information that don’t need the user (and feeler) intervention to be understandable (Boehner et al., 2005 and 2007). To make use of *Moodies* and transform its emotion discretizing features in to a system that supports users meaning making, I had to transfer the detected and static informations in to another system capable of transforming one-directional information into ambiguous, but consistent representation, whose meaning is not conveyed by the system itself, but needs to be created and elaborated by the users (Sengers, and Gaver, 2006). This choice could be considered very similar to what was done for designing other systems providing emotional cues, an example is the already mentioned Affective diary. The use of *Moodies* in my design was a way to use bodily experiences (the change of the tone and of the pace of speaking) without having needed to provide with GSR sensors and pedometers to all of the users; also it was in my interest to collect the information of the participants as a group and not as a sum of individuals. The strategy I used to transfer the information from *Moodies* to the collective emotional awareness prototype system was to use the manually activated “post to Twitter” feature on *Moodies*. Each tweet posted on my personal page was then decoded by a Processing (Reas and Fry, 2014) sketch. The Processing (Reas and Fry, 2014) sketch was written in such a way to react every time any emotional statement was posted though *Moodies*, different words were triggering different responses on the screen. The different responses triggered by each of the Twitter posts were circles, being circles one of the easiest

*Picture n.9*
shape to draw through Processing (Reas and Fry, 2014); each of the circles had a dimension, colour, pattern of movement and position based on the words posted by Moodies, for example: if the Twitter post contained a word like -anger- or -aggressiveness- then Processing (Reas and Fry, 2014) sketch reacted by creating a red static circle whose dimensions changed abruptly (Picture n.10); differently, a Twitter post containing the word -sadness- or -fear- provoked a blue circle moving slowly on the bottom of the screen. I tried with those different “qualities” of the drawn circles to capture what Ståhl, Löwgren, & Höök (2014) defined Evocative Balance: a representations consistent with the feeling represented, but still open to users’ interpretations.

**EXPERIMENT AND WORKSHOP**

This first Prototype for collective emotional meaning making was developed in a very short time and I decided to try out this experiment because I needed to understand if an approach like the one taken by Höök and colleagues for developing systems like Affective Diary (Ståhl & Höök, 2008) or Affective Health (Ståhl, Höök, & Kosmack, 2011) could be suitable for a group of users and not only for a single user; of course, given the complexity of the theory and the susceptibility of a theme as “emotions” I had to find a group of people sharing characteristic like:

- being able to understand difficult new concepts and being able to speculate over them in order to give meaningful feedback;
- being integrated in the group, feeling safe expressing opinions, having a consistent relation with the other people and with me.

A seminar, part of the Interaction Design Master course I was studying in, was a the right opportunity
to experiment my prototype; the seminar consisted of about 45 minutes for each student: 20 minutes of presentation of their research project, followed by a critique session based on comments by their fellow students, around 12 people, and teacher. I asked my colleagues their approval to use Moodies and to participate in my workshop, then I recorded five seminar sessions through the app and then posted on Twitter Moodies’ findings. Those sessions with critique were a time of copious emotions: each student presenting and defending her work, getting ready to receive approvals and oppositions; different people take the same situation in different ways, someone gets nervous, someone gets excited, someone is too tired, someone is all of those and even more.

At the end of the seminar session, six students participated in the workshop, four of them hold their presentation on that day, while the others had participated as opponent or just bystanders. The workshop consisted in showing my fellow students the visual result of the class’ emotional day, something similar to what appears in Picture n.10. I introduced the image telling my colleagues it was an “emotional representation” of how the day went by. I proposed them a two part workshop, in the first part of which I asked them to be users, to try to come up with an interpretation and to build up the meaning of the moving image together, without me actually giving them too many cues. In the second part of the workshop, I asked them to take a more designerly active part: I explained to them what the whole prototype was about, how it worked, I asked their opinions, and I accepted their suggestions. Here is the account of what happen during that session.

**Workshop, part one**

The first interpretation that came out during the workshop was about trying to find a spatial relation between the drawing and the room setting, the impression was that the users were figuratively trying to find some landmark, something to relate the moving image with.

*“Is this some kind of geo-localization? It looks somehow how the room is arranged.”*

Two users tried to build up a meaning over this first impression, they discussed how the blue circles represented the people present during the seminar, but not taking any active part in it, the red circles instead, were representing the student taking part in the discussion, while the pink ones represented the one presenting.

After a while the other participants started to take part in the discussion, they tried to build up a more metaphorical understanding of the moving image: someone proposed the circles may have been different ideas coming up during a brainstorming session; another participant tried to interpret the circles as different things happening during the seminar sessions, for her blue circles could have been questions or doubt, red circles critiques and purple circles were the constructive discussion, agreement or suggestions.

A this point the group started to analysing more in detail what was happening on the screen:

*“Some of them are very trapped and some go out. Because we have to be here, right? We cannot get up and leave when we are bored! Maybe there is something more abstract in the black ones, because they are allowed to leave.”*

And another user:

*“The back and blue don't change the size, there must be something...”*

Building up on this analysis the group started to look for a time wise value in the moving image:

*“Nothing really appears or disappears, things are present all time!”*
At this point of the conversation it seemed like there was a good flow in the meaning making: many ideas following each other, many laughter, but at the same time it seemed like they had not very much more to add. I decided to take advantage of the lull in the discussion and introduce the second part of the workshop.

**Workshop, part Two**

I introduced the second part of the workshop describing to my users and colleagues what was the theory I was working on, the technical aspects of my design and the reason for each figure on the moving image; my aim at this stage was to have some design critique to understand if it could make sense to make a system to support a group based emotional meaning making, but I was also looking for some suggestion on how to develop my prototype further.

After discussing together how each of the informations displaced could have been more evocative based on movement, colours and dimensions (and here the group was quite compact on describing what made and what didn't make sense on the moving image), the discussion took again a more general and meaningful approach.

“It would interesting compared with yesterday.”

And then again:

“This is like a loop, you are trying to summarize an entire day in a loop, the real time is more interesting: to make more sense of it either you see it happening or you can confront it with other days.”

At this point of the workshop it became clear that the whole moving image was somehow meaningless on its own, that without being related to time and without the opportunity to compare more than one day at the time is not really possible to understand the value of what is on the screen.

The group then started considering the application of this kind of system:

“It could even be used to see what was the mood during the morning, and in the evening, before lunch, after lunch.”

“Yes! It could help to understand when to take a break!”

“A flexible schedule at school, the teacher would know what to do.”

“I think it would make sense for an office as well.”

The uses they were foreseeing were of two main kind, an utilitarian one, like the one above, to fit a schedule on a group of people in order to keep working/studying when productivity is high and take break when productivity is going down; the second kind of use is more related to the group well being and therefore maybe more related to an aspect of mutual care within a group of people:

“It's about self reflection, about the group, you can learn something about what you are”
“It could be a way to understand what is going on, how to react.”

By the end of the workshop, the last point that was discussed was the value of anonymity and how this system could be used without giving away personal data:

“Making machine able to recognise emotions is not fine.”

“It can be scary.”

“This is a good way to visualize it because it is anonymous and shows the group as a whole, is way more neutral, you can grasp it fast as soon as you understand a pattern.”

This is the account of what happen during an half hour workshop, the conversation was smooth and in continuous evolution and the significance of the moving image was investigated by the group as a whole.

**Conclusions**

As repeatedly mentioned, the reason for this first prototype and workshop was principally connected to the need to understand if an instrument inspired to the Affective Interactional Approach theories and practices and meant to support collective emotional awareness could have any value for the group it was proposed to; at this point in my research I needed to find out if there was any propitious space for designing instruments meant to support emotional awareness in a consistent group of people; on this account I would say that the way the workshop happened, the manner the discussions were built together by the participants, how opinions were mutually supported and confronted, the shared embarrassment and collective laughs are all clues supporting the idea that collective emotions are a promising space for research as well as for that design.

This workshop was very fruitful as it gave me a lot of feedback and insight on how to design for what I already called collective emotional awareness. What I think was the greatest contribution was seeing how users were looking for some kind of -real world- frame while trying to make meaning of the moving image: the first attempt to interpret the collective drawing was relating it to the space we were into. After a while into the discussing of the moving images the users (and design students) started to seek a -temporal relation- in order to give meaning to the moving image; they suggested two ways to add this feature:

- Having the opportunity to compare different days and/or different times of the day;
- Having the opportunity to see the moving image change in front of their eyes to make sense of it.

Both these suggestions and specifically the second one are related to what Kristina Höök (2009) defined Affective Loop. As described in chapter four, an Affective Loop experience is based on a system that is influenced by the users but also influences them as it calls for users’ interaction and physical expressions for the meaning making to happen (ibid.). In Picture N.11 I represent how the collective emotional awareness system I designed (made of both the prototype and the workshop) worked; the fifth step, represented with a red arrow, is the missing link to create an Affective Loop inside this system; this added step would have been a way to close the “meaning making circle”, giving a more substantial flavour to the whole process.
The workshop also gave some insights on future applications of the system and the structure I proposed. The users I tested were seeing a purpose for having an instrument supporting self-reflections and the understanding of what is happening around them. As designers they also speculated on what kind of situations could benefit from a system supporting collective emotional awareness, for examples such as having flexible schedules in a school or a class, or offices, in order to find the best moment to take breaks. Another interesting aspect my colleagues and user testers reflected upon was the anonymity supported and embodied in the system, someone declared how scary it would be in a world where machines can read emotions and appreciated the way each user is blended inside the collective representation; this is very relevant to my research since it further strengthens Kristina Höök’s and colleagues reflection (Höök et al, 2008) on how:
“ [...] the interactional view, when translated into design, has some power in pre-
serving aspects of users’ privacy and autonomy in interaction.” (Ibid.)

Concluding, the combining of my first prototype for collective emotional awareness together with the workshop built around it, gave a lot of insights; first of all, I had a confirmation that a research in the direction of the Affective Interactional Approach and focusing on groups of people rather than on single users had reasons to exist and to be pursued. I also had many insights and suggestions on how to continue my research and how to design for it in future iterations; above all, the design of the next system should actively support an affective loop while still maintaining users anonymity and privacy.

EXPERIMENTING WITH TECHNOLOGY AND THE EVOCATIVE BALANCE FOR MULTIPLE USERS, SECOND PROTOTYPE

THIRD EXPERIMENT

Once I proved the potentiality of a research in the direction of the Affective Interactional Approach with a focus on designing for a consistent group of people, and once I developed an understanding of some of the features needed by a system meant to support emotional group awareness, my research took a new step forward. This new step forward, concretized by a second prototype, is both meant to keep on answering to the third research question and to the forth and last question:

- What does it mean to design to make a group-based emotional experience available for group-based reflection?
- What kind of technology could be used for a system supporting collective emotional awareness?

DESIGN OPENINGS

In my previously discussed prototype I used a number of principles inspired to the Affective Interactional Approach, I consider them still valid after user testing, and I decided to keep them for the next design I am going to develop; those principle were:

- Affect is a social and cultural product (Boehner et al, 2005) as well as an embodied and bodily product (Höök, et al, 2008);
- Leaving the interpretation to the user (Boehner et al, 2005);
- The system should be designed in a way that stimulate awareness of and reflect upon affect (Boehner et al, 2005).

To those principles, I followed before I added another one that I find very significant:

- The interactional approaches is non-reductionist (Höök et al, 2008);

This principle states the importance of the body in the experiencing of emotions and underlines the need to overcome the dualism body/mind/society; the intellectual experience can not be separated from the emotional experience as they exist and grow together and the social surrounding is experienced by and influences both of them (Ibid).

In the discussion of some of their design inspired to the Affective Interactional Approach Höök and her colleagues (2008), suggest a “design repertoire” abstracted from those designs (which I have already discussed in chapter n.5), a bridge between principles and the systems inspired to those principles. This
proposed design repertoire is composed by design elements to be included in the affective systems; I decided to include some of those elements in the design of my second prototype:

- Leaving the interpretation to the user through the pursue of ambiguity (Gaver et al., 2003) and evocative balance (Höök et al., 2008; Ståhl, Löwgren, & Höök, 2014);
- Designing open familiar surfaces that can be appropriated by users (Höök, 2006; Höök et al., 2008)
- Users need to be involved in affective loop experiences (Höök et al., 2008; Höök, 2009).

On the base of those design principles and design elements I presented, together with the reflections coming out of the first prototype's workshop I developed the design opening to base the development of my second prototype.

Picture n.12 represents and describes the design openings I set for my second prototype; the whole system is divided in five points:

- 1 - A group of users interacting between themselves; the interaction with the system should be automatic and not requiring special attention from the users.
- 2 - INPUT - a system that automatically captures and decodes the body inputs and emotional states.
- 3 - OUTPUT - the computed interactions and emotional states are represented in a ambiguous way, users need to build up together their own interpretation of what is represented (Gaver et al., 2003).
- 4 - HUMAN INPUT - users have the possibility to interact with the representation, and appropriate it though personalization (Höök, 2006).
- 5 - The interaction should be seamless, while the users try to interpret it they also keep on influencing it, closing the Affective Loop. (Höök et al., 2008; Höök, 2009).

**Reflections on the choice of the technology**

I am now going to describe the technologies I used to develop this new system, the different options I considered and the reasons for my final choices.

**Input**

Both the projects I previously presented, Affective Diary (Ståhl & Höök, 2008) and Affective Health (Ståhl, Höök, & Kosmack, 2011), rely mostly on the use of a body placed sensors, such as GSR sensor, Heartrate sensor, accelerometer and pedometer. All those sensors need to be worn by the user throughout the time of the interaction with the machine. The fact that I am interested in developing a group based system makes the use of those kind of sensors somewhat problematic both on an economical and on a practical level: I would need to provide many people with each of those sensors. It could be problematic on a conceptual level as well: in my personal idea, a consistent group of people is often related to the place where the togetherness happens, be it a school, an office, or a home; also the choice of a single place for the interaction to happen could be a way to create at least some initial frame on how to interpret the ambiguous output, while a constant change of venue would have a rather big impact on the ambiguity of
1. Group of people (users) interacting.

5. Users keep making sense of the system an close the Affective Loop.

2. INPUT
A system captures and computes the interactions and emotional states.

3. OUTPUT
The computed interaction is then represented in an ambiguous way leaving space for the users to interpret its meaning; the more the use interacts with the system the more she understands it.

4. HUMAN INPUT
The users can add something to the representation in order to personalize and appropriate it.
the outputs and their interpretation.

Another characteristic I have been looking for in my input technology is the ability to detect both individual and group data, since they both exist at the same time and influence each other creating the “group temperature” I am trying to detect and then to represent. Individual data I could be looking for are: face expressions, heart rate, body language and all those could be connected with group data such as: number of present people, distance between users, angular distance (the angle made by two user's shoulder, the smaller the angle the more the users are facing each other), amount of movement of the users.

Therefore, the input technology needed has to be place-based and able to capture information from a distance in order to include both individual data from each of the users and group data all in one take. The technology that seemed to be the best fitting for my prototype was the Kinect (Microsoft, 2012), a motion sensing input device created by Microsoft. The Kinect (Microsoft, 2012) is composed by a RGB camera, a depth sensor and a multi-array microphone, it provides full-body 3D motion capture, facial recognition and voice recognition capabilities. Using a fairly simple programming language, called Processing (Reas and Fry, 2014), I could have programmed the Kinect (Microsoft, 2012) to detect certain events: change in heart rate, particular facial expression or body postures, closeness between users, amount of sound, (etc…), I could also have used the microphone to interact with the previously used app Moodies.

In the actual development of my system I had to give up some of my expectations because of availability of instruments: I could only get a first version of a Kinect (Microsoft, 2012), less advanced than the new system, Kinect 2, and therefore less precise, able to detect only up to six users and not capable to detect heart rate and facial expressions. I also had to give up the use of Moodies since I didn't obtain the authorization to use the app's API (application programming interface) which I would have needed to incorporate the app in the system in a seamless way without having to go through the Twitter every time. I found on my path few other technical obstacles, for example, the wrapper (layer of code translating a library's existing interface into another compatible interface) I used to communicate through Processing (Reas and Fry, 2014) with the Kinect (Microsoft, 2012), called SimpleOpenNI (Rheiner, n.d.), didn't support some of the Kinect’s features such as the use of the Microphone.

The sketch in PICTURE N.13 shows the transit from the design opening to the choice of the input technology:

- The Kinect (Microsoft, 2012) used to detect presence, body language, closeness between users and amount of movement;
- The computer's microphone used to detect the volume and amount of noise.

OUTPUT

The output of the system needs to support, as previously described, two main characteristics:

- Information needs to be displaced in an ambiguous (Gaver et al., 2003) and evocative way (Höök et al, 2008; Ståhl, Löwgren, & Höök, 2014);
- Users need to be able to navigate, interact and appropriate the information (Höök, 2006; Höök et al, 2008).

In my research for an output technology that is able to support both those necessities I had to consider two different kind of outputs (PICTURE N.14): a tangible output or a digital output. To choose in which direction and with which design to proceed, I considered, together with the characteristics I wanted in my design, several other more practical elements such as: the cost of the materials, the time needed
INPUT
A SYSTEM THAT CAPTURES AND COMPUTES THE INTERACTION

I need a system that captures group and individual data such as:

- physical interaction,
- body language
- speaking / laughing / silence..
- movement,
- facial expression,
- heartrate,
- ......

A CAMERA WITH A DEPTH SENSOR

Meant to read body language, proximity between users, speed of movement, other...

A MICROPHONE

Meant to detect sound and its volume.

A KINECT

Picture n.13
to realize the design based on my programming skills and access to building facilities, the opportunity to adapt the design based on the workshops’ outcomes.

**Tangible output**

The first thing that should be considered is that a tangible output is the easiest instrument to interact with, which means that the appropriation (Höök, 2006; Höök et al, 2008) by the user is more accessible and varied, with a smaller design effort than it would be with a digitally designed output.

I considered several design opportunities in this direction such as using a printer and hack it to have a continuous flow of paper printed, I considered one of the several Arduino (Banzi et al., 2005) based drawing bot and automatic knitting machines. I think that all these ideas and proposals I couldn’t follow up with for technical and time reasons, are all valid and could be interesting to investigate in the future.

In picture n.15 it’s possible to see one of the prototype I designed and considered to build. This design was inspired by the large amount of designs of Arduino (Banzi et al., 2005) plotters that can be found on

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**OUTPUT**

**TANGIBLE REPRESENTATION**

**HUMAN INPUT**

**PERSONALIZATION AND APPROPRIATION OF THE OUTPUT**

There are two potential solutions I am considering for this design question:

1. The machine “prints out” a tangible output the users can easily interact with.
2. The output is digital, either represented on a screen or projected. The machine is equipped with several instrument that make it easy to navigate the representation and to distort/add information to it.
the web. This design consisted of an Arduino (Banzi et al., 2005) controlling two stepper motors on the top edge of a surface; the stepper motors are controlling a pen perpendicularly suspended to the surface, the motors move and the pens draws.

The idea behind this design was to make the whole plotter portable in order to have a fixed position for the laptop, the Arduino (Banzi et al., 2005), the Kinect (Microsoft, 2012), the pen and the papers. Each day would have been represented by a sheet of paper (A2 or A3 size), and users could have easily interacted with the paper output; I don't need to explain the thousand ways users could have interacted with a piece of paper, and different paper-day could have been placed one side by side with the other in order to have a continuous comparison and a continuous learning of the system.

While this system would have been very interesting to build and experiment with, I decided to postpone its realization for a further research conducted by myself or by someone else. The reasons is that this design would have been very complex to realize, somewhat expensive, and time consuming. Also a physical prototype often lacks of the malleability a digital design has when it comes to refine, add, or change its features, therefore the realization and development of this design would need a more mature status of the research behind it.

**Digital output**

A digital output is a fairly simple system to build, the physical material needed is a computer and codes can be easily shared between users, which means it is possible to find suggestions, tutorial and examples all around the web; it is also possible to ask for help to the several web based community whenever being stuck somewhere. At the same time, designing the active human interaction and appropriation in a
digital system can be very complex and time consuming, not only in the realization, but particularly in the understanding and supporting what users need for the interaction with the system to be seamless. I considered two ways to share a digital output with the users: through a screen or projecting the data on surfaces. The idea of using projections sounds very fascinating and malleable, it’s enough, as an example, to think about the opportunity of projection mapping on the walls of a room; projections, as a media, can be connected to the space where they are projected and this would enhance the relation between the prototype and the shared space the group of people would be using. Unfortunately, since I was building a prototype with the need to be moved around and tried out in different situations and places, I didn’t want to design it (yet) for a specific space. In the end I decided to develop a screen based output for my prototype, but I still think that it could be interesting, in the future, to explore how projections and projection mapping could be used as an output.

I made my final choice to develop a system based on a digital screen-based output following the speculations I described so far (that made me exclude the other directions), but also considering the opportunity coming along with designing a digital output. Once I choose the digital output as my design arena, I started considering what this would have to bring along:

• I could write the program for the digital output with the same environment as the one I would use for translating the Kinect (Microsoft, 2012) Input, Processing (Reas and Fry, 2014), simplifying many of the steps I would need to take.
• Using a digital output would make it possible for me to get more complex and evocative representations;
• The digital output would give me the chance to make many changes and corrections “on the fly”;
• Using a digital output would make the interaction with and appropriation of the instrument more complex to design and realize:
  • The output needs to be time-related, which means the output represented needs to be navigable;
  • Users may be enabled to add content to the representation using a camera or the microphone, there may be a button that let them take snapshot, short videos or short audio registrations;
  • I could connect a scanner to the system and then users could add other images;
  • Another possibility is to connect the screen to a graphic tablet so users could draw on the representation directly.

HYBRID OUTPUT
Another opportunity I considered is to have a digital output and at the same time to enable users to print out tangible representation and then interact with them. This is another interesting path I could not follow in the context of my master thesis, but that I would consider to propose for future research.

CONCLUSION ON THE CHOICE OF THE TECHNOLOGIES
Summarizing, the technology used for the second prototype part of my research are:
As input:
  • A Kinect (Microsoft, 2012), a sensor able to collect different data from a distance and to collect both individual and group data;
  • The computer’s built-in microphone, able to collect the amount of noise in a given space.
A pen tablet the user can use to write/sketch on the images appearing on the screen.

As output:

- A digital design appearing on a screen, this instrument is malleable, can be used to iterate several kinds of ambiguous representations, has a big supporting community that can be reached in the development.

As an added value, both input and output chosen can be programmed in the same language, Processing (Reas and Fry, 2014).

**DESCRIPTION OF THE DESIGN**

As described in the previous paragraph, the final design of the prototype is based on the use of a Kinect (Microsoft, 2012), of a microphone and of a drawing tablet as inputs and of digital representation on a screen as output.

I will now go through the functions performed by the code I designed in relation to each of these instruments; this description may sound somewhat technical, but I consider the technical aspect of my research essential to understand the relation between theory and technology that is the core of the design choices I took.

**DIGITAL REPRESENTATION**

The design I developed to represent the interactions of the users with the prototype aims to be seamless and to appear together with the interaction itself. I aimed to make this representation develop an Evocative Balance (Höök, K. et al, 2008; Ståhl, et al, 2014), to keep users engaged in the meaning making process. The development of a well balanced evocative representation would need its own research, therefore what I came up for this prototype has to be considered as the first step in the direction of a potentially much more complex system.

Here is the description of this first attempt:

Simple figures, circles, appear on a timeline every few seconds (a cycle) while the interaction is happening. The timeline keeps sliding in order to keep the newest cycle of circles at the centre of the screen, the timeline can be explored through a digital handle at any moment of the interaction. I chose to use circles to represent the interaction with the system because the circle is the most basic figure that can be drawn with the programming language Processing (Reas and Fry, 2014).

For each cycle, the number of circles, their dimension, the distance between them and their colours change based on what the microphone and the Kinect (Microsoft, 2012) are detecting (Picture N.16, 17, 18, 19).

**MICROPHONE**

The microphone is going to be used to detect sound in the room where the interaction happens; together with the presence of sound also its intensity is detected and influences the representation.

**KINECT**

The code used by the Kinect (Microsoft, 2012) was designed by me together with André Landwehr; it was developed based on the Processing (Reas and Fry, 2014) wrapper SimpleOpenNI (Rheiner, n.d.). The main difficulty we had to overcome in the writing of the code was to develop it in a way that any movement from each of the users could be detected seamlessly, avoiding to repeat a distinct chunk of code for each of the users; all over the Processing (Reas and Fry, 2014) and Kinect forums, there was no code available that could be controlled by more than one user at the time. Though many experiments we managed to develop a rather light code that makes it possible to modify and to easily add movements to detect and that are valid for all the number of users interacting with the Kinect (Microsoft, 2012).

The digital representation is influenced by the Kinect (Microsoft, 2012) based on:
• Individual data:
  • How much each one of the users is moving.
  • If the users are assuming an “open” or “closed” position (Morris, D. 2002);
• Group data:
  • The number of users present,
  • The distances between the users (Ibid.).

Another interaction I tried to add but that wasn't ready by the time of the user test is the:

• Angular position (Group data).

The “open/closed” position, detecting if the arms of the users are folded, the distance between users and the Angular positions (the angle made by two user’s shoulder, the smaller the angle the more the user’s are facing each other) are all behaviours decoded and described by Desmond Morris (2002) and are used to measure group emotions.

The Arm folding is defined by Morris (Ibid.) as an Auto-Contact Behaviour, one of many action performed by humans when they need some kind of comfort and protection that they don't seem to find in the environment around them; for example, it can be performed in stressful or tense situations. I chose this action because I consider it representative of how someone feels inside a group if they need to comfort themselves or not.

On the contrary, distance between users and angular distance represent the existence of a relationship between the two or more users and the amount of confidence they share and they want to show in each particular moment; those as well seemed important signs to understand the groups emotions.

In order to try to achieve a form of Evocative Balance (Höök, K. et al, 2008; Ståhl, et al, 2014) I tried to represent the interactions described above in a manner that could be “evocative” of the interaction itself. For example, the number of users present in front of the Kinect (Microsoft, 2012) influences the number of circles appearing for each cycle; at the same time, to avoid a too straightforward interpretation, the number of circles isn't exactly the number of users present, but preserves a certain randomness.

Further more, the volume of the noise detected by the microphone influences the opacity of the circles, while the colour of the circles is altered based on how open user’s arms are, going from cold colours when users have their arms crossed to warmer colours the more they open their arms. Distance between users will determine how distant the circles are between them, while the amount of movement will influence how much the circles are going to tremble or stay still (Picture n. 20). All these variations in the way the circles appear, as much as the choice of what it is that influences those variations, are meant to be experimental, an opportunity to start understanding what may or may not work for a system and are not to be considered as a final and polished choice

PEN TABLET
The pen tablet is meant to give the opportunity to further interact with the system, by drawing and leaving message on the digital design while it is being produced as well as while checking out older parts of the timeline (Open Familiar Surface (Höök, K. 2006; Höök, K. et al, 2008)).

All these interactions and representation were developed with the user testing in mind: they were designed to be quickly changed and modified in order to make comparisons between different proposal during the user testing.

USER TESTING
The prototype that came out of the design is a complex and quite new idea, the theory it was developed
one user

arms wide open (warmer colours)

huggung (cluster of circles)

Picture n.16

Picture n.17

Picture n.18

Picture n.19
The amount of noise influences the opacity's of the rings: the louder the sounds the more opaque the rings appear.

The dimensions and the number of the rings appearing is influenced by the number of users detected. More users means more and bigger rings.

The color of the rings changes with the way users hold their arms; a closed position results in cold colours, while an open position results in warm colours.

When users stay close the rings on the screen appear close as well. On the contrary, when the users stay apart the rings on the screen do the same.
on, the technology used and its final form aren’t really easy to grasp and to present to a new public. Those reasons made me decide to choose a setting that both me and my testers would have found comfortable. I decided to have the user testing in my own apartment, a collective I share with three friends of mine. The users that tested the prototype were the friends living together with me and another couple of friends that is often visiting us. In my opinion putting together people that are used to spending time together in the space was a reasonable choice for understanding the potential and downfall of the prototype. Even if I considered the confidence between the people chosen and the setting of it, the user testing was not easy to handle; in the beginning I briefly explained to the tester what the system was about and what it was meant to detect without giving too many details. Afterwards I asked to the testers to experiment with the instrument, play with it and try to find out how it worked, I avoided suggesting any particular approach. As they started playing with the system, what seemed to capture their interest in the beginning (or maybe what was the easiest to understand) was the relation between volume and opacity of the circles. This was also the first time the system was running with six people at once (I was participating to the test as well) which created a overload of information to decode for the code that started running very slowly; what was designed to become a seamless interaction suffered from a delay in the representation. Together with this delay in the representation, which made the system look quite cumbersome, also the number of circles appearing at each cycle was overwhelming and was not clear the connection with the number of people present in front of the Kinect (Microsoft, 2012). Given the effort we put to write a light code, the heaviness of the whole process can be mostly blamed on the use of a not too new or powerful laptop. Since the whole code was designed to be easily changed and perfected, I took advantage of a break in the user testing to correct the delay, slowing down the number of cycles per minute, and therefore lowering the amount of data that needed to be processed and represented. I also changed the rate of circles appearing for each user. I also decided to perfect the relation between the opening/closing of users’ arms and the change in the colour. After a new round of “blind” experiencing of the prototype, which was fun in the beginning, but seemed to start confusing the users, I decided to run a “tutorial” of the system; I asked to the testers to perform a certain number of activities: enter the Kinect (Microsoft, 2012) space one at the time, open their arms and then fold their arms, come closer to each other or go further away. After this, the user testing kept on going for a short while, the users kept on trying out the effect their interaction had on the system, commenting on the different phases of the user testing and looking though the timeline of the representation pointing out where they were seeing themselves and where they didn’t recognise their presence.

QUESTIONNAIRE
The day after the user testing, I asked the testers to answer to a questionnaire. I could have decided to interview them after the workshop, but I considered it would have been interesting to leave some privacy and some time to the users for them to give an evaluation of the prototype. I tried to inform the questions with what Sengers and Gaver (2006) have called “user’s levels of interpretation”; Sengers and Gaver propose that, while it is not necessary for a system to be interpreted in a straightforward way in order to consider it successful, it is important for the evaluation of the design to be able to understand how complex is the relation a user develop with a the said system. This relation is strongly connected to the way the user interprets the system. The first level of the of interpretation consists in the understanding of the interface. The second level of interpretations regards the influence the system may have on the user’s everyday life, understanding what it is meant for. At the third and highest level of interpretation the user can interpret the values and cultural meaning the system embody (Ibid).
Following this structure I divided the questionnaire in this matter:

- **First level of interpretation, about interfacing with the system:**
  - Did you understand how the system worked? What did you do to understand it? How long did it take and why?
  - Do you have suggestions to make the system more understandable?
- **Second level of interpretation, about experiencing the system:**
  - What do you think the system you user-tested was?
  - Did you feel represented by the system? When? How?
  - Do you think the group was represented? When? How?
- **Third level of interpretation.** The users did not have enough time to develop a deep interpretation of the system. Therefore, I decided to ask questions suggesting a reflection on the value of emotions shared in a group.
  - Do you ever consider the mood of the people around you? In which situations?
  - How much does the general mood around you influence how you feel?
  - How much do you think your mood influences the general mood of who is around you?

I am now going to give some example of the answers I received trying to analyse their meaning and how they could help me to go further in the development of my research. It is possible to read the answers in the Appendix to the research.

**QUESTION N.1** - Did you understand how the system worked? What did you do to understand it? How long did it take and why?-

From the answers I received it seems like it took a while for some of the users to make sense of how the system was working; also, it seems pretty clear that the changes made to the code during the time of the workshop helped to communicate better with the users. Also the improvised “tutorial” I conducted had an effect on how much the users made sense of the system:

“*The third game was the most clear and I think the key one to understand what the system is for - it was when you told us what we should do so then we could really observe the changing rings on the screen*”

Another interesting aspect seems to have been the “exploration” of the interface which may have seemed less threatening to another user, someone who is more acquainted with computers and interactive systems:

“So I tried to move and make sounds and see the reaction on the screen. After a while I discovered that there is a time delay between action and visualisation. Noise level and movement seemed to have effects on size of the rings and on how much they vibrate on the screen. Also when there were more people there were more rings. Also the interaction between people seem to have effect. What happens if we cuddle? Move together? stand up / sit down? Not sure if I found all inputs/outputs, but I also think that was not the point of the system. It was more to mirror/visualize the overall situation.”

**QUESTION N.2** - Do you have suggestion to make the system more understandable?-

All the users agreed that the time delay was challenging and some suggested a more responsive system.
They also suggested to try to use different colours and trying out different shapes. One of the tester suggested as well to design a built-in tutorial for starting to use the system.

**QUESTION N.3** - What do you think the system you user-tested was?
The users seem to be all agreeing on what the system was doing ("A group dynamics visualisation system", "visualisation of peoples behaviour"), but one of them made an interesting comment on this matter defining the system as "A constant flow that likes to be altered" and giving to it a sort of personification that may be in a future an interesting space of exploration.

**QUESTION N.4** - Did you feel represented by the system? When? How?
This question received very different answers, revealing different point of view and interpretation; for example, one user wrote:

"Not really. I don't know why, I guess it was hard to find "myself" among those hundreds of rings."

While another one had an answer somehow similar, but also implying a very different group perspective:

"Um, not really. I didn't see myself as an individual, but as part of a group."

A third user had an even more clear vision of his relation with the system:

"I felt personally represented when I could identify how I influenced the outcome on the screen. "See these wobbling rings? That was when I danced in front of the kinect!""

**QUESTION N.5** - Do you think the group was represented? When? How?
The two users that answered "no" in the previous question gave a clearly opposite answer to this one, together those two answers may reveal that the system is actually capable of portraying a group.

"Yes, by the "chaos" displayed by the system. It was clear that more people = more controlled "chaos"/circles"

"Yes, there were some moments that we were doing something all together and we saw this strong colours and bunch of rings. And also at the last game was so cool to see when we were hugging."

**QUESTION N.6** - Do you ever consider the mood of the people around you? In which situations?
Also here users seem to agree on the fact that, while the mood of important people around them is basically important, but it is not easy to consider it all of the time and something may slip their awareness:

"I consider most the mood of people I care about. Or those who are sending strong signals about there emotions. But I can be quite oblivious or insensitive, I have to admit."

**QUESTION N.7** - How much does the general mood around you influence how you feel?
Going deeper in to the relation between group mood and personal mood, user's confessed how they, at different degree, get influenced by the feelings around them and the action of the people they interact with:
“It effects me a lot. Somebody's bad mood and rudeness can destroy my best day....”

“That's hard to tell. If the whole group feels down, of course that has influence on you personally also.”

QUESTION N.8 - How much do you think your mood influences the general mood of who is around you? Interesting enough, users don't really have the feeling of how much influence their own mood has on the people around them:

“I am not sure it does, either. Probably when I am stressed/angry then this usually affect others.”

“I don't know, it depends how big the group is. If we're only 2, then a lot. At a party, not a lot.”

“No clue.”

CONCLUSIONS
This last prototype, together with the user testing and the questionnaire, was made to answer to the two last research questions I proposed earlier. I previously pointed out how time is essential for seeing the effect of Affective Systems, therefore I would argue that further and more extensive user testing should be done to better understand the potential of the system. Anyhow, I think that what has been done so far should be considered as a successful attempt to understand that the system I proposed is valid and could be further developed in a meaningful artefact to support the understanding and meaning making of emotional states in a consistent group of people. For example, the choice of the technologies, the Kinect (Microsoft, 2012) together with the microphone and the computer screen, have proven to be a good choice; those technologies not only supported the actualizing of the theories I proposed (using the Affective Approach for a collective experiencing of emotions), but also proved to be highly supportive as prototyping tools in the same area. A good prototype, in particular at the first stages of a design, needs to be highly flexible in order to be quickly moulded based on the needs arising though user testing. Together with the system I actually developed, I also speculated on the opportunity of using other different kinds of technologies and instruments; for example, I proposed other designs using analog outputs instead of digital ones and I think all of the opportunity I briefly explored are worth building and testing in different settings and with different users. This, I think, answers to the research question:

• What kind of technology could be used for a system supporting collective emotional awareness?

A better setting of the space for the detecting of the interaction may be something to consider as well, for example a bigger screen to show the results on and avoiding to the users the need to be too close to it while checking what's going on. Also, it may make sense to develop the design of a proper instrument to place the Kinect (Microsoft, 2012) on, for example, I think it would be much more effective if the instrument was placed on a higher level, maybe hanged on a wall.

I am now going to consider the last question that I proposed to lead my exploration:

• What does it mean to design a group based emotional experience available for group based
reflection? (Partly answered with the previous prototype as well.)

I think that a lot of insights have been gathered; for example, the use of social behaviours as a mean to trigger the representation of group emotions seems to be a fruitful direction and it needs to be explored more in depth.

Also, the user testing supported further the value of design principles as the Affective Loop (Höök, K. et al, 2008; Höök K. 2009), see how important it was to get rid of the delay, and the Evocative Balance (Höök, K. et al, 2008; Ståhl, et al, 2014), in fact many comments were made about the visualizations; as already mentioned, the representations and the graphics would need a research on their own, though I think that what was achieved so far has built a good space for further reflections and exploration, since the users seemed to grasp the main concepts behind the prototype.

I can’t add very much about the Open Familiar Surfaces principle (Höök, K. 2006; Höök, K. et al, 2008) since the pen tablet was not used during the user testing.

Something else that is worth reflecting upon is the introduction of a “tutorial” phase at the beginning of the experiencing of the prototype. This could be done together with a facilitator, as it already happened, with the support of text in the prototype, as one of the users suggested, or it could be achieved adding features to the prototype over time, so that the users can get accustomed to them. Still, I think that the opportunity of this learning phase needs further explorations.

It is very interesting how more than one of the testers answered the questions related to how much they considered themselves and the group represented by the system. It seemed, from their answers, that they could identify a “group representation” which was the main aim of the prototype and of the research; it also appeared to me that some of the testers were missing a feedback about their own presence and contribution to the whole group. This comment could be also supported by the answers given to another question: whether or not they consider their mood able to influence the mood of the people around them. The matter of what is the individual contribution among the group is actually interesting and it may be explored in further development of the research.

Concluding, while I think that the design I proposed is a good start for making a group-based emotional experience available for group reflection, there are still many aspects to take in consideration, being the graphics, the amount of “individuality” to be found among the representation of the group or the kind of social behaviour to use as a symptom of the group well being.
I do believe that the research I proposed and the final prototype I developed can be further explored and may find a space in the future of design. I could see the future usage of these instruments in different place and with different means: here I am proposing a few. The order these proposals appear matter: I started from the more specific ones (research, group therapy support) that seem to be an easier way for a new system to break the barriers of solely university research; I then moved to more “world related” systems, such as art galleries, that generally have a specific and maybe open minded public, and finally schools, offices and private apartments.

**SYSTEM TO RESEARCH GROUP BEHAVIOURS**
I could imagine that while the research on group behaviours could be very fruitful for a further development of the system previously proposed, I would also consider that the system itself could become a mean to understand group behaviours and it could be used for this purpose.

**SYSTEM TO SUPPORT GROUP THERAPY**
Quite similar to what I wrote before, while the development of the system could earn a lot from the support and wisdom of a trained psychologist, it may also be interesting to consider a similar system as a side instrument to be used during group therapy session. Of course such a system should be designed exactly for this purpose.

**ARTISTIC MEANS**
Given the great deal of technologies considered in this research, I think that it may be easy to speculate of all the ways the system I proposed could be developed in an artistic form to arise amusement among the public. Different new shapes and forms of the system could find place in an art gallery, a festival or in a public space and this could be a way to give the public an opportunity to speculate about the theme of group emotions and how we influenced them and are influenced by them.

**EVERYDAY MONITORING SYSTEM**
I carried out all the three of the experiments of this research in places where a very normal everyday life is lived and I consider those as the last, but not least situations, as the ones that could obtain the most through the use of the system I proposed. As it has been speculated during the workshop together with the Interaction Design Master students, places like school or workplaces could rely on a collective emotional awareness system to understand how to pace the workday and to keep awareness on the well being of the whole community. Also, from the Cultural Probes I gained some information about the value that shared emotions have in a workplace and the responsibilities shared by who is working together to keep a good, enjoyable general mood. In a workplace, an anonymous system for monitoring the general emotive state of the people working could be used to support the general emotional awareness and mutual understanding. I could also imagine a similar system to be used inside family houses, to keep an extra eye (not a controlling one) on what is going on with its components.

Of course, each of the scenarios I proposed would need a system tailored exactly for that situation and this concerns the technology used as much as the kind of input that are detected and the balance between the representation of the group versus the representation of the individual and the level of anonimity to connect with it.
I have here presented a study in the field of designing for emotions, in the specific I proposed a research based on the Affective Interactional Approach (Höök, K. et al, 2008) and extended the approach to a consistent group of people; doing this I also connected the existing research to other studies such as the psychology of group emotions, human behaviours and body language. This research aimed to answer to four questions through a design process structured in three distinct, but coherent experiments. Here are the four research questions I posed in starting this work:

- Is there a space of co-constructed emotions for a consistent group of people? What kind of space?
- Is it possible that a system inspired by the Affective Interactional Approach theories (Höök, K. et al, 2008) can be meaningful for a consistent group of users rather than for a single person?
- What does it mean to design to make a group-based emotional experience available for group based reflection?
- What kind of technology could be used for a system supporting collective emotional awareness?

The first experiment that I carried out had, as main goal, to provide evidence for the validity of the research and consisted in involving few employee of an office in the execution of the exercises part of Cultural Probe packages I prepared for this occasion. This first experiment was aimed to answer to the first research question:

- Is there a space of co-constructed emotions for a consistent group of people? What kind of space?

What came out of the Cultural Probes and the following interview is that the employee in the office taken in consideration seem to be aware of the importance of being conscious of their own emotion and feel responsible for how much of those emotions they carry out on their colleagues. What seems to exist is a responsible and sensible co-creation of the emotional well being of the group. This awareness of the need to collaborate to create a pleasurable emotional common space can definitely be considered as a validation of the existence and of the importance of co-constructed group emotions.

In addition to answering to the first research question and to validate the value of the research, this first experiment carried out other knowledge contributions that I would like to mention. First of all, I had a proof for a very complex understanding of emotions, at least from some of the participants to the Cultural Probes, to this I would connect as well a very sophisticated capacity to express and represent emotions. Both the reflecting about emotion and the representing of emotion somehow was shaken and further developed in the execution of the Cultural Probes’ exercises. This insight supports the Affective Interactional Approach understanding of what should it mean to design for emotions: users need to be able to express themselves and not only passively contribute with emotional information.

The second part of the design process I worked on consisted in the designing of a digital system which I called for collective emotional awareness, I tested out this prototype together with a group of students of an Interaction Design Master program. From this experiment I expected to gain insight to answer to the second and the third research questions (though the third question is going to be discussed also in the
• Is it possible that a system inspired by the Affective Interactional Approach theories (Höök, K. et al, 2008) can be meaningful for a consistent group of users rather than for a single person?
• What does it mean to design to make a group based emotional experience available for group based reflection?

The experiment proved that collective emotions are a promising space for the applying of the Affective Interactional Approach theories and design methods; the workshop I carried out to test the prototype was emotionally intense and emotions where shared between the participants: embarrassed laughs and some heated discussion are some proof of it. Through the workshop I learned that to design a system that supports reflection around a group's emotional experience, it is necessary to give the users some kind of real world frame; for example, at the beginning of the workshop the users were assuming that the representation was some kind of “geolocalization” and by the end of the workshop they discussed the opportunity of a more strict relation of the representation with the situation in real time. This frame is needed to help relating the representations showed to what has produced it, this insight can easily be related to the previously discussed Evocative Balance (Höök, K. et al, 2008; Ståhl, et al, 2014). As just mentioned, the design critiques the prototype received were suggesting in the specific a more direct connection of the representation with time. This relation should be of two kind: the representations of the emotional states should happen while the emotional state is happening, to support the users in connecting the two events. The second time related feature that should be taken into account is the opportunity to compare different days or moments of the interaction, in order to make a deeper sense out of the representation. Another important theme that was touched and that I think could be highly valuable for further researches is the anonymous status that is preserved though the prototype, this condition was considered as important and necessary by more than one of the participants to the workshop. All those insights not only helped me to direct the next steps of my research, but are also a valid knowledge contribution on their own.

The third experiment I conducted is derived by the conclusions made about the previous one. This last experiment was conducted to answer to the third and forth research questions:

• What does it mean to design to make a group based emotional experience available for group based reflection? (partly answered through the previous experiment)
• What kind of technology could be used for a system supporting collective emotional awareness?

For this experiment, I designed a new prototype; as mentioned, the design openings of this second prototype were inspired to the previous system I developed, the critiques it received, and the conclusion driven from all of it. The system that I decided to develop had to be able to use insight both from what I called Individual data (amount of movement, open/closed position, ...) and from what I called Group data (number of users, distance between users, ...).

After clarifying the design openings of the new prototype, I started a exploration of the different technologies available for the development of the prototype. I proposed different kind of outputs and inputs and described the opportunity to use each of them. The technologies I proposed by the end (a Kinect (Microsoft, 2012) and a microphone to be used as input and a computer screen used as output) revealed themselves to be suitable to support the theories proposed and make them available for a group of users. The instruments I used also proved themselves to be suitable as prototyping means, as they were malleable and easily modifiable during the user testing. These insight have to be considered more than
sufficient to answer to the last research question I had propose:

• What kind of technology could be used for a system supporting collective emotional awareness?

As previously mentioned, this last experiment was built as well to better answer to the third research question:

• What does it mean to design to make a group based emotional experience available for group based reflection? (Partly answered through the previous experiment)

With this last experiment I proposed to use human behaviours and different example of body languages (what I previously mentioned as Individual and Group data) as a mean to understand the emotional state in a group of people. This is a matter that could request a research on its own, but that seems to me to be potentially very prolific.

Thanks to the last prototype, I had the opportunity to experiment with some of the design principles I described several times in these pages, such as: the Affective Loop (Höök, K. et al, 2008; Höök K. 2009) and the Evocative Balance (Höök, K. et al, 2008; Ståhl, et al, 2014) and I found them both to be valid for group interaction as much as they are for the individual interactions happening in systems like Affective Diary (Ståhl & Höök, 2008) and Affective Health (Höök, K. 2009; Ståhl et al, 2011).

Another aspect to consider while designing to make a group based emotional experience available for group based reflection, is the opportunity to give users a way to make sense of the system, either through a tutorial or making the features of the system available one after the other in order to give time to the users to understand how the system works.

A last insight that needs further explorations is the relation between the single and the group represented. While from the previous workshop, I concluded that being anonymous is an added value to the system, the answers to the questionnaire about the last prototype cast a shadow upon this assumption. It may be important for the system to consider the contribution of each user in the group representation, but this may result in a loss of anonymity; probably the answer to this issue is that the right balance is not absolute, but is related to the place and the situation where the system is supposed to be used. This last insight concludes the answers to the research questions.

There are other knowledge contributions made through this research and that I think should be considered; there is a number of future scenario I proposed, that may be useful for the developing of further research about group emotions and their representation.

Also I contributed with several sketches and drawing that could be inspiring not only in their content, but as well in the way that content is transmitted. It seems to me that many design research projects only rely on text and not enough on the communicative power of sketches and drawings.

To conclude, with this research, the experiment, and the prototypes presented, I hope I contributed to create a new space for research and speculation that considers humans and their daily interactions as charged moments of emotional exchange and co-creation, and I hope this research together with the future ones are going to enrich human life and interactions.
Hello collaborator!

I am very thankful you decided to help me with my research and I hope you are going to enjoy working with me.

The research I am developing is about the presence and value of Emotions in working places; I would like to use your experiences and reflections to understand this theme better.

This that you have in your hands now is a Cultural Probe. A Cultural Probe is an instrument designers use to connect with their users and to understand which is the best way to design for them. If this sounds unclear now, I promise it will become more understandable in the development of the process. In the Cultural Probe package you will find small exercises concerning the understanding and representation of Emotions.

You can always contact me and ask me for more explanations at luisa.fabrizi@gmail.com. All your personal information are going to remain private. You can decide to leave the project whenever you want.

Thank you again for your help! I am looking forward to seeing your work and discuss it together.
Hello again collaborator,

In this booklet you will find information on how to use the Cultural Probes. The package you received is filled with tools, coloured pencils, textiles, dough (...) that you can use to complete the exercises. You are always welcome to make changes on what an exercise asks and to choose the tool you are more comfortable with.

You can decide to skip an exercise if you find it too demanding, unnecessary or too personal.

I wish you will enjoy the Cultural Probes,

Thank you for your precious help,

Luisa

Exercise n.1:

- How do you feel?

There are seven cardboard squares in the package you received, I would like you to represent the emotions you have been experiencing during a whole day by writing words, drawing and using different colours on these seven small cardboard squares; you can use the colours you have found in the package or any other thing you like.

* If you found a Cross Stitch kit in your Cultural Probe package, please, consider using it for this exercise.

Exercise n.2:

- Empathy-

Look around yourself and try to recognise the emotions that other people working around you feel; you can just be an observer or you can decide to ask them about it.

After you recognise those emotions, you can record them on the Diary and represent them in different ways:

• make a sketch,
• take a picture,
• write down what you saw,
• make a collage,
• ……

Here is some questions that could help you describe the Emotions you witnessed:

Now that you are done with all the exercises it’s time for me to get the Cultural Probes back. This is probably going to happen on the 4th of May, but I will keep in touch with you.

After I will have examined all the material, I am going to organize a meeting with you and the other participants and, based on the time on your disposal, I will organize some short interview or a workshop.

Please, send all the pictures you took at luisa.fabrizi@gmail.com, this is the same email to contact in case you have any further questions.

Thank you very much for your help,
I hope you enjoyed it!

Luisa

Exercise n.3:

- **Represent!** -

The next step is about understanding and producing representations of emotions.

There is some dough in the package, observe its colour, does it have any emotional connotation for you?

Could you model something out of the clay and represent the emotion(s) inspired by the colour?

Take pictures, please!

Exercise n.4:

- **Stream of emotions** -

It’s now time for the last exercise; I suggest for this last experiment to work in pair with someone else, you can choose someone who has a Cultural Probe package or a friend in the office.

What I ask you to do is to choose one or more of the materials you can find in the package and use them to represent a whole week of emotions in the office.

I ask you to work with someone else because discussing will help you find out what to represent and how to represent it.

* if you found a Knitting kit in your Cultural Probe package, please, consider using it for this exercise.
RESULTS, User n.1

A = Exercise n.4, B = Exercise n.1, C = Exercise n.1.

Exercise n.1

Exercise n.3

Here is a link to the audio of the interview I conducted together with user n.1:

User n.1, Interview
RESULTS, User n.2

Exercise n.1

negative
surprised
energetic
dissatisfied
\[ \text{Lots of love and thoughtfulness for colleagues} \]

Exercise n.4

HAPPINESS
WARMTH
SADNESS
RESULTS, User n.3

A = Exercise n.4, B = Exercise n.3, C = Exercise n.1.
RESULTS, User n.4

Unknown exercise

Exercise n.1
EXPERIMENTING WITH TECHNOLOGY AND THE EVOCATIVE BALANCE FOR MULTIPLE USERS, FIRST PROTOTYPE

Here is a link to the software of the prototype I developed:

Prototype n.1

Here is a link to a video showing the interaction between Moodies, Twitter and the Processing sketch:

Video

Here is a link to the audio of the workshop I conducted together with the Interaction Design Master students:

Workshop, prototype n.1
EXPERIMENTING WITH TECHNOLOGY AND THE EVOCATIVE BALANCE FOR MULTIPLE USERS, SECOND Prototype

Here is a link to the software of the prototype me and Andre Landwehr developed:

Prototype n.2

ANSWERS TO THE QUESTIONNAIRE

User n. 1

1 - Did you understand how the system worked? What did you do to understand it? How long did it take and why?
User n.1: “Yes. It was pretty obvious that a tool named “Kinect” would be related to motion. Less than a minute, for the above mentioned reasoned + we had the test with the dummy earlier.”

2 - Do you have suggestion to make the system more understandable?
User n.1: “More cause-effect when moving -> the last trial was more immediate to represent the movements on the screen --->really good”

3 - What do you think the system you user-tested was?
User n.1: “A constant flow that likes to be altered.”

4 - Did you feel represented by the system? When? How?
User n.1: “Most of the times yes but not always. When we opened-closed our arms at the most.”

5 - Do you think the group was represented? When? How?
User n.1: “Yes, by the “chaos” displayed by the system. It was clear that more people = more controlled “chaos”/circles.”

6 - Do you ever consider the mood of the people around you? In which situations?
User n.1: “When spring-summer come it’s clear that everybody is merrier. In the city, at work, at home. Because weather has a huge impact on a city-society that has everything else working sort of “very well”.”

7 - How much does the general mood around you influences how you feel?
User n.1: “It doesn’t. I am very not “moody” nor I am influenced if people around me are in good/bad mood.”

8 - How much do you think your mood influences the general mood of who is around you?
User n.1: “I am not sure it does, either. Probably when I am stressed/angry then this usually affect others.”
1 - Did you understand how the system worked? What did you do to understand it? How long did it take and why?
User n.2: “In general the system seemed to analyze voices or sound and movement of people and the number of people engaging with the system and to translate this information into abstract digital visualization. In the beginning it was hard to guess which inputs can be measured and to what detail. So I tried to move and make sounds and see the reaction on the screen. After a while I discovered that there is a time delay between action and visualization. Noise level and movement seemed to have effects on size of the rings and on how much they vibrate on the screen. Also when there were more people there were more rings. Also the interaction between people seem to have effect. What happens if we cuddle? Move together? stand up / sit down? Not sure if I found all inputs/outputs, but I also think that was not the point of the system. It was more to mirror/visualize the overall situation.”

2 - Do you have suggestion to make the system more understandable?
User n.2: “The time delay was a bit challenging. It would be nice to be able to identify how much influence a single user has on the visualization for the whole group. I think less rings, or less packed screen might be better. Maybe creating a set of rings and let them adapt to the groups behaviour while they float over the screen? When the rings move out the screen, create a new set of rings? Maybe create rings less often, put down the time resolution. Collect data for 2 min, analyze it and create on set of rings based on that? This might solve the problem with the experienced time delay, and create a more comprehensible picture in the end. Also then people might not try to find direct translations for their actions on the screen and think more about the “bigger picture”? I think it has to be clear if it is about direct, immediate symbolizing of ongoing actions or about one big picture representing a whole meeting, party, ... Maybe the time-resolution in which rings would be created could be dependend on the length of the event to be tracked?”

3 - What do you think the system you user-tested was?
User n.2: “Visualisation of peoples behaviour.”

4 - Did you feel represented by the system? When? How?
User n.2: “I felt personally represented when I could identify how i influenced the outcome on the screen. “See these wobbling rings? That was when I danced in front of the kinect?””

5 - Do you think the group was represented? When? How?
User n.2: “It was hard to tell how much effect only one person had on the whole groups’ representation. Also because you did not know how many people where analyzed right now.”

6 - Do you ever consider the mood of the people around you? In which situations?
User n.2: “I consider most the mood of people I care about. Or those who are sending strong signals about there emotions. But I can be quite oblivious or unsensitive, I have to admit.”

7 - How much does the general mood around you influences how you feel?
User n.2: “That’s hard to tell. If the whole group feels down, of course that has influence on you personally also. Sometimes I would make an attempt of cheering the group up, but would resign quickly, if it doesn’t work. For creativity in work, I think it can be important to have a good group vibe.”

8 - How much do you think your mood influences the general mood of who is around you?
User n.2: “I don’t express my emotions so much in general and do seldomly lead a group. So I think - not too much.”

User n.3

1 - Did you understand how the system worked? What did you do to understand it? How long did it take and why?
User n.3: “I understood that I was being tracked by the Kinect, but moving around and trying out poses or movements and making sounds was one way to guess how it worked, but you could never be sure. It took a little while to understand, since we were in a group in front of the camera.”

2 - Do you have suggestions to make the system more understandable?
User n.3: “Use different colours and more distinct shapes to create more visual contrast. Also, some form of written clues as to what is happening, for example, “test out your voice”. Also, more responsive would be good.”

3 - What do you think the system you user-tested was?
User n.3: “A group dynamics visualisation system.”

4 - Did you feel represented by the system? When? How?
User n.3: “Um, not really. I didn’t see myself as an individual, but as part of a group.”

5 - Do you think the group was represented? When? How?
User n.3: “Yes, with changes in the clustering of forms.”

6 - Do you ever consider the mood of the people around you? In which situations?
User n.3: “Yes, I’m sensitive to other peoples moods and temperaments.”

7 - How much does the general mood around you influence how you feel?
User n.3: “About 50-75% comes from the general mood.”

8 - How much do you think your mood influences the general mood of who is around you?
User n.3: “I don’t know, it depends how big the group is. If we’re only 2, then a lot. At a party, not a lot.”

User n.4

1 - Did you understand how the system worked? What did you do to understand it? How long did it take and why?
User n.4: “I did, more or less. The more we “played” the more was clear what is it and how does it work. Frist
one was a bit too slow so then I couldn't really follow which rings belongs to our movements. The second one was a lot faster and somehow more sensitive to what we do. The third game was the most clear and I think the key one to understand what the system is for - it was when you told us what we should do so then we could really observe the changing rings on the screen.”

2 - Do you have suggestion to make the system more understandable?
User n.4: “I would like to know what is the difference among the colors of the rings. Is there any meaning? (In the last one I know that red was that we are “open” and the blue when we were more close....or vice-versa) but in the first two I have no clue.”

3 - What do you think the system you user-tested was?
User n.4: “Something that react with people movements and voices and detects their “way of being” this particular time.”

4 - Did you feel represented by the system? When? How?
User n.4: “Not really. I don't know why, I guess it was hard to find “myself” among those hundreds rings.”

5 - Do you think the group was represented? When? How?
User n.4: “Yes, there were some moments that we were doing something all together and we saw this strong colors and bunch of rings. And also at the last game was so cool to see when we were hugging.”

6 - Do you ever consider the mood of the people around you? In which situations?
User n.4: “Yes, I do. Every time when I have to spend with people more than 1 hour. I just do it to somehow adjust myself to the situation and maybe find a fast escape if the mood is not convenient for me.”

7 - How much does the general mood around you influences how you feel?
User n.4: “It affects me a lot. Somebody's bad mood and rudness can destroy my best day.... But it depends :) I think I am the most influenced when I feel very bad or sick or I have a classic bad day with 0% of believing in myself.”

8 - How much do you think your mood influences the general mood of who is around you?
User n.4: “No clue.”

User n. 5

User n.5 did not answer to the questionnaire.
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