TAKING INTO ACCOUNT LIFE SITUATION DURING A CO-CREATIVITY SESSION: AN EXPLORATORY STUDY

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Abstract

Users today are looking for an experience and not only for technology. Products must be acceptable and desirable, and in this regard must be designed with the needs and desires of the end user. To facilitate the integration of the usage, esteem and technique triptych into the product design process, an ergonomist and a product designer are also involved. That necessarily implies working on methods that promote co-creation. In this perspective, we focused on two complementary approaches, the User eXperience and the life situation resulting from tangible elements and from intangible elements. In this article, we will ask how the life situation elements are treated by the design team during the phases of analysis and ideation of the co-creativity process through the compilation of all the traces of the project. Our exploratory study on an industrial project highlights the complementarity of the paper's tools, the verbal and non-verbal communication during the co-creativity project, to integrate all the elements of the life situation. Moreover, our results show that the tools used are not sufficient to collect and to keep all the information useful during the creativity process.

Keywords: Design process, Life situation, Co-creation, Creativity, Case study

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1 INTRODUCTION

Users today, are looking for an experience and not only for technology. Products must be acceptable and desirable, and in this regard, must be designed with the needs and desires of the end user. This new dimension requires design teams to change their design approach and to work on methods and tools to take into account these needs and desires (Barcenilla and Bastien, 2009; Nielsen, 1994; Sagot et al., 2003). This new vision represents a real challenge for companies involved in innovation.
In this philosophy, many works in user centred design propose to integrate this approach into the product design process (ISO 9241-210, 2010; Keates and Clarkson, 2003).
One of the specificities of user-centered design is to integrate either the user (ISO 9241-210, 2010; Keates and Clarkson, 2003) or experts in human factors that guarantee the user's expectations and needs, such as ergonomists and product designers (Sagot et al., 2003; Ulrich and Eppinger, 1999), or other expertise such as psychology, sociology, anthropology, etc.
In our work, we choose to focus on the integration of an ergonomist and a designer in order to ensure the vision of the usage, esteem and technique triptych to the future product (Guerlesquin et al., 2010; Nelson et al., 2013; Quarante, 1994).
The involvement of the ergonomist, the product designer and the technical experts necessarily implies working on methods that promote co-design and co-creation. The nuance between the two terms seems important to us. Co-creation refers to "creativity that is shared by two or more people" (Sanders and Stappers, 2008). This is an integral part of co-design which "refers to co-creation used in the course of the design process" (Stappers et al., 2012). Co-creation brings a dimension of personalized experience (Prahalad and Ramaswamy, 2004). The joint integration of ergonomics and product design within a co-creative context makes it possible to design an experience rather than a technology.
In this perspective, we focused on two complementary approaches: the User eXperience approach (Hassenzahl, 2010), which is defines by the "perception and reaction of a person resulting from an effective and/or anticipated use of a product, system or service" (ISO 9241-210, 2010); and the life situation approach, characterized by a dialogue between the people, the tasks, the tools, the contexts and the events (Valentin et al., 2010). Life situation is the result of determining and tangible elements, such as the characteristics of the user, the environment and the product, and of intangible elements, such as the user's emotions and perceptions. This combination creates an experience. In the context of co-creativity, the notion of life situation seems to be more relevant to explore. Indeed, the tangible elements are easily accessible by the design team, whereas the other elements, such as the perceptions or the reaction that defined the user experience, are only accessible by the user.
In this article, we will ask how the life situation elements are integrated in the product design by the design team during the phases of analysis and ideation of the co-creativity process through the compilation of all the traces of the project. The traces group what is done, what is written, what is recorded, etc. namely, the text, the pictures, the gestures, the artefacts, etc. (Derrida, 2014).
To answer this question, we propose a state of the art on design methods integrating the human factor and on the life situation. Thanks to this state of the art, we propose a framework of analysis of the life situation elements used during the first step of the co-creativity process. In order to validate the relevance of this framework and understand how the life situation elements are treated during the phases of analysis and ideation of the co-creativity process, we measure which elements of this framework are discuss during a design process.
This study will allow us to understand the use and monitoring of knowledge linked with life situation in the early phases of a design project.

2 STATE OF THE ART

2.1 Product design and human factor

To develop a new product that is both desirable and acceptable, we need to integrate the end user into the design process. This is the purpose of user centred design (ISO 9241-210, 2010). This movement aims to place the user and the human factors experts at the heart of the product design process. With this aim the design team must be able to integrate the user in all its functional, social and emotional dimensions (Barcenilla and Bastien, 2009; Brangier and Barcenilla, 2003). To achieve this goal,

ergonomists and designers must become actors within the design process, alongside the mechanical engineers (Bazzaro et al., 2012; Nelson et al., 2013).
Indeed, according to the IEA, "ergonomists contribute to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people." (IEA, 2000). The product designers "acquire a deep understanding of user needs through empathy and apply a pragmatic, user-centric problem-solving process to design products, systems, services, and experiences." (ICSID, 2015). The ergonomist and the product designer are guarantor respectively for the functions of use and esteem of the future product in accordance with the user requirements. To assure the technical vision of the product, the mechanical engineer works in collaboration with the human factors experts. In this perspective, it is necessary to implement a design process to integrate all these experts: ergonomists, product designers and engineers. Many authors from engineering (Pahl and Beitz, 1996; Ulrich and Eppinger, 1999), ergonomics (Sagot et al., 2003) and industrial design (Quarante, 1994; Ulrich and Eppinger, 1999) have proposed several models to integrate at least one of the actors of the design team.
In another way, the design models from user centred design (ISO 9241-210, 2010) or universal design (Keates and Clarkson, 2003) allow the integration of all the actors of the design team.
In this article, we focus more specifically on the beginning of the product design process in co-creation. In the different models presented above, the authors agree on the phases of needs analysis (ISO 9241-210, 2010; Keates and Clarkson, 2003; Quarante, 1994; Sagot et al., 2003; Ulrich and Eppinger, 1999) and conceptualization or ideation (ISO 9241-210, 2010; Pahl and Beitz, 1996; Ulrich and Eppinger, 1999). According to these models, we define the first steps of the co-creation process (Figure 1). During the step "generate ideas in co-presence", several co-creativity sessions are set up by the design team.

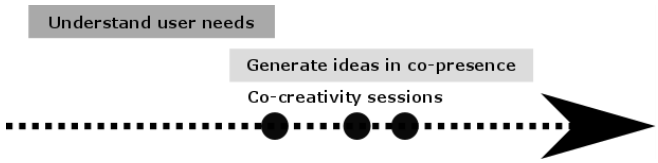

Figure 1. First step of a co-creation process

Next, we will present what this experience is through the notions of user experience and life situation.

2.2 Designing an experience around the life situation

The notion of User eXperience (UX) come from the design of interactive systems (Arhippainen and Tähti, 2003; Barcenilla and Bastien, 2009; Hassenzahl, 2003; ISO 9241-210, 2010).
UX is described as the "perception and reaction of a person resulting from an effective and/or anticipated use of a product, system or service" (ISO 9241-210, 2010). This experience is the result of perceptions, reactions or emotions of the interaction between the user, his product and his environment (Arhippainen and Tähti, 2003; Barcenilla and Bastien, 2009; Hassenzahl, 2010; Kremer and Lindemann, 2015). The dreams and memories of the users also take an important place in the definition of this experience (Arhippainen and Tähti, 2003; Visser et al., 2005).
Other authors propose a complementary approach, by questioning the notion of life situation. Maguire defines the context of use as a combination of the user, the task, the environment (physical and organizational) and the technical environment (Maguire, 2001). Valentin refers to the life situation characterized by a dialogue between the persons, the tasks, the tools, the contexts and the events (Valentin et al., 2010). This concept can be compared with the rule of three units of the theatre - action, time, place - around one person or more (Boileau, 1815; Roubine, 2004).
In this regard, life situation is the activity created by three determining elements to form an experience. Some elements, such as the characteristics of the user, environment and product, are tangible and accessible to the design team. These elements are treated and analyzed by the design team during the analysis phase "understand the user needs".
The others elements, such as the perceptions, feelings, and reactions, are intangible and only accessible by the user. These elements can only appear during the working phases in co-presence, in the same place and same time.
We propose a representation of our approach to the life situation in Figure 2.

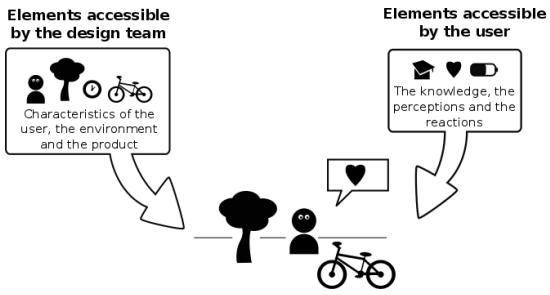

Figure 2. Our proposition of representation of Life situation

We are interested more specifically in this notion of life situation, in the context of product co-creation. Indeed, this definition of the lived experience by the user is more exhaustive in the product design context. Furthermore, the theatrical dimensions of life situation bring us closer to common design tools such as mapping and storyboarding.
In the rest of this article, we will ask how the life situation elements are treated by the design team during the co-creativity session.
To answer this question, we will firstly to measure which elements of framework of analysis of the life situation elements treated during the phases of analysis and ideation of the project. Secondly, we will test this analysis framework on an industrial project carried out in the context of co-creativity on the first steps of the process and through the compilation of all the traces of the projects.

3 LIFE SITUATION FRAMEWORK AND EXPERIMENTAL PROTOCOL

In this section, we are interested in the link between co-creation and the "representations" of the life situation in an industrial project. Firstly, we propose to construct a framework to understand and analyze all the elements and characteristics inherent to the life situation represented by the design team. Secondly, we will present our test protocol to test our life situation framework in an industrial context of co-creativity.
Definition of the framework:
Firstly, we propose to construct a life situation framework. This framework will allow us to study how the life situation is taken into account during the project. To establish this list, we identified first the theoretical criteria specific to the literature. Our criteria are extracted from the literature on both tangible and intangible product design.
According to the definition of the life situation, we identify five elements to consider during the project, as proposed in Figure 3: the user, the environment, the product, the activity of the user and this state during the action. This list of characteristics is constructed according to the literature on mapping (Daumal, 2015; Lallemand and Gronier, 2015; Martin and Hanington, 2012) and on storyboarding and storytelling (Atasoy and Martens, 2011; Carroll, 2000; Lallemand and Gronier, 2015; Martin and Hanington, 2012; Truong et al., 2006). These two families of tools allow us to represent the life situation during the design process.
Indeed, the mapping tools, such as the user journey map, are designed to represent graphically the interactions between the user and his product. It allows us to discuss the life situation and improve it (Lallemand and Gronier, 2015; Martin and Hanington, 2012; Patton et al., 2015). The storyboarding or storytelling tools are designed to illustrate the interaction between the user and his/her product. It is a story that makes it possible to visualize the activities linked with life situation and to create empathy (Lallemand and Gronier, 2015; Martin and Hanington, 2012).
Each element is detailed in Figure 3 and below:

- The user
  When we speak about life situation, the user is characterised by four criteria: his/her physical characteristics, cognitive abilities, social environment, and personality and values.
  The physical characteristics group together sociodemographic criteria, for example age or profession (Martin and Hanington, 2012; Rabardel et al., 2002), motor (Arhippainen and Tähti, 2003) and physical abilities or anthropometrics information (Kroemer, 2008), etc.
  The cognitive abilities are defined by mental process, skills (Jordan, 1998, 2000), memories (Visser et al., 2005), and experiences (Arhippainen and Tähti, 2003; Rabardel et al., 2002; Visser et al., 2005).

The social environment is defined by the people who act with the user, the social relations (Brangier and Barcenilla, 2003; Carroll, 2000; Jordan, 2000; Martin and Hanington, 2012; Truong et al., 2006) or the social factors (Arhippainen and Tähti, 2003).
The personality and values (Jordan, 1998, 2000) of the user group together his or her tastes, dreams (Visser et al., 2005), lifestyles (Brangier and Barcenilla, 2003) and habits.

- The environment
  The environment of the action can be divided into two categories; the physical and the temporal environment. The physical environment can be divide into the place (Arhippainen and Tähti, 2003; Atasoy and Martens, 2011; Lallemand and Gronier, 2015; Martin and Hanington, 2012; Truong et al., 2006; Visser et al., 2005) and the physical or aesthetic ambience (Arhippainen and Tähti, 2003; Brangier and Barcenilla, 2003; Rabardel et al., 2002). The temporal environment (Arhippainen and Tähti, 2003; Hassenzahl, 2003; Visser et al., 2005) can be a schedule or the duration of the action (Atasoy and Martens, 2011; Daumal, 2015; Lallemand and Gronier, 2015; Martin and Hanington, 2012; Truong et al., 2006).
- The product
  The product can be defined by its functionalities and technical characteristics (Atasoy and Martens, 2011; Carroll, 2000; Daumal, 2015; Lallemand and Gronier, 2015; Mahlke, 2007; Quarante, 1994) and its aesthetic and sensory characteristics (Arhippainen and Tähti, 2003; Desmet and Hekkert, 2007; Mahlke, 2007; Quarante, 1994).
- The activity
  The activity is characterized by the motivation (Arhippainen and Tähti, 2003; Carroll, 2000; Daumal, 2015; Hassenzahl, 2011; Lallemand and Gronier, 2015; Mahlke, 2007) and the action (Atasoy and Martens, 2011; Brangier and Barcenilla, 2003; Daumal, 2015; IEA, 2000; Martin and Hanington, 2012) of the user.
- The state of the user
  The state of the user during the action is characterized by three criteria which evolve during the action (Atasoy and Martens, 2011; Carroll, 2000; Daumal, 2015; Lallemand and Gronier, 2015; Martin and Hanington, 2012). A physical and sensory state (Hassenzahl, 2011; Visser et al., 2005), a cognitive state and a sentimental, emotional and hedonist state (Desmet and Hekkert, 2007; Hassenzahl, 2003, 2011; Norman, 2005; Visser et al., 2005) can be defined during the action.

This first study allows us to set up a framework of analysis of life situations elements represented during the project.

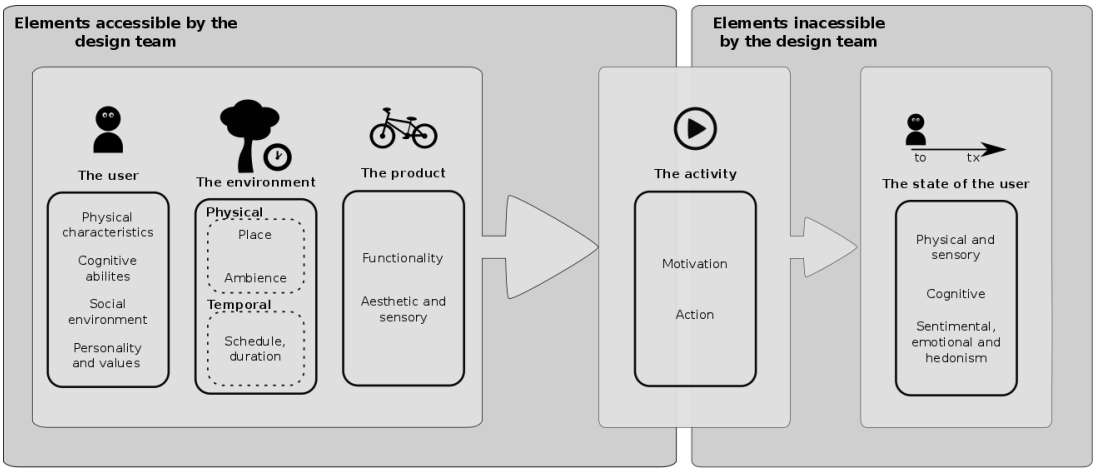

Figure 3. The life situation framework

Test protocol:
We have applied this list to an industrial and confidential project about a professional joystick.
For our study we have focused on the first step of design process: "Understand user needs" and "Generate ideas in co-presence". At each design step studied, the main design team is minimally composed of an ergonomist, a product designer and a mechanical engineer. For the analysis step, these three people worked together, and for the creativity step the creativity team is composed by the main design team,

helped by seven others people. We can note that some people have dual profiles, for example an engineer/product designer.
The process studied is described in Figure 4.

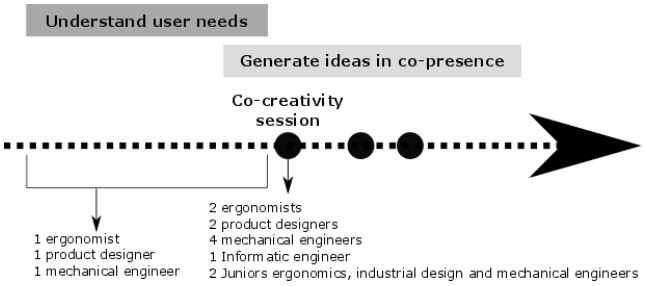

Figure 4. The process studied for this project

We have studied two types of results:

- The boards generated during the phase of analysis by the ergonomist, product designer and mechanical engineer. For this type of document, we performed a qualitative analysis of content (Dumez, 2013) through a manual counting of the illustrations, symbols or words used on the boards to communicate the analysis to the whole project team for the co-creativity session.
- The verbatim and gestures of the 10 actors generated during the co-creativity session. For this type of element, we performed a qualitative analysis of content through a manual counting of the verbatim and gestures through the analysis of the session video.
- The boards generated during the co-creativity session by the 10 actors. For this type of document, we performed a qualitative analysis of content through a manual counting of the illustrations, symbols or words used on the boards to communicate ideas about the project.
- The three items thus recorded are classified in our life situation framework.

We present the main elements measured obtained below

4 RESULTS

In this section, we are interested in the use of the life situation "representations" during the co-creativity session of an industrial project.
We analyze three moments around the session:

- The analysis result "before" the session
- "During" the co-creativity session
- The co-creativity result, "after" the session

Before the session, we accounted for 41 analysis boards made by the main design team. During the sessions, we recorded three hours of work with ten participants. After the session, we accounted for 29 ideas board made by the design team in co-presence.
We present this process in Figure 5.

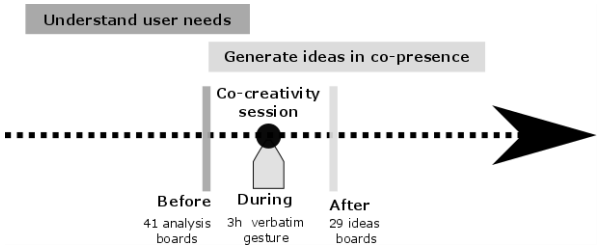

Figure 5: The process studied for this article

Before the co-creativity session, 41 boards are created to analyze the user needs by the design team, presented in Figure 6.

Figure 6. Distribution of the analysis boards between the project actors

Some boards are common to the ergonomist and the product designer. The ergonomist works on the user on 7 boards, the environment on 3 boards and the activity on 8 boards. The product designer creates 9 boards about the user and 14 about the product. The mechanical engineer generates 5 boards on the product.

We can observe a large variation in the "life situation" data throughout the process studied. We represent this distribution in Figure 7.

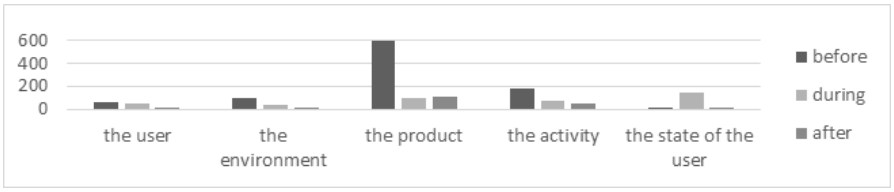

Figure 7. Distribution of the Life Situation data on the project

Before the co-creation session, we can observe analysis rich in "environment", "product" and "activity" data. We can count 60 data about the user as his training or its anthropometric dimensions, 94 about the environment, 698 about the product, with extensive benchmarking on all the products of the same family, 181 about the activity and 13 about the state of the user. The environment data refer to the place with 66 for information, 19 for ambience and 9 for time.

During the session, the distribution between the categories is more equitable, with 45 data about the user, 35 about the environment, 101 about the product, 70 about the activity and 143 about the state of the user. The vision of the user is more distributed. It is interesting to note that the state of the user is described more by gestures than words. Indeed, for the criterion "physical and sensory" state to describe what the user does with his product, we account 66 gestures and 48 verbatim during the co-creativity session.

After the session, most of the data are lost. Indeed, only the element about the product (113) through technical solutions and the activity, in particular the action (54), are used.

We made a focus on the evolution of the vision of the user throughout the process studied. We represent this distribution in Figure 8.

Figure 8. The vision of the user

We can see that before the session the user is mostly represented by his physical and cognitive characteristics, with 33 information for physical characteristics and 17 for cognitive abilities. The social environment, with 8 data, and personality and values, with 2 data, are less represented.

During the session, these data are better distributed across the categories, with 20 physical characteristics data, 13 social environment data, 6 personality and values data and 6 cognitive abilities data.

After the session, the vision of the user is almost absent from the boards. Indeed, we can count only 1 information about the physical characteristics of the user.

5 DISCUSSION AND PROSPECTS

To assure the integration of the usage, esteem and technique triptych to the product design process, the design team should be composed of an ergonomist, a designer and an engineer (Guerlesquin et al., 2010; Nelson et al., 2013; Quarante, 1994). This multidisciplinary collaboration is in the framework of co-

creativity (Sanders and Stappers, 2008) and makes it possible to design an experience instead of a technology (Prahalad and Ramaswamy, 2004).
The life situation, in accordance with the co-creation process and the design tools, resumes and completes the concept of the User eXperience (Hassenzahl, 2011; ISO 9241-210, 2010).
In this article, we have introduced a framework of life situation criteria to understand how the life situation elements are treated during the design process. This framework is the synthesis of the cross between literature - including UX and life situation literature - and some common design tools, such as mapping tools and storyboarding tools (Carroll, 2000; Lallemand and Gronier, 2015; Martin and Hanington, 2012). These elements taken separately do not allow us to have a complete view of what we call the life situation.
To understand how the life situation elements are treated during the phases of analysis and of ideation of the co-creativity process and so to understand the integration of the usage, esteem and technique triptych to the first step of the product design process, we have compiled all the traces about these elements from an industrial project carried out in the context of co-creativity. This exploratory study is carried out for the first steps of the co-creativity session, namely "understand user needs" and "generate ideas in co-presence". Our framework is constructed as a guide to understand and analyze the life situation "representation" around determining and tangible elements, such as the characteristics of the user, the environment and the product, and from intangible elements, such as the emotions and the perceptions of the user during the action. This framework makes it possible to quantify all the representations of the life situation during a design project.
Our studies highlight many points. We can note a large variation within the data between the different formats studied: boards or verbatim and gestures. Indeed, the intangible elements of the life situation, such as the states of the user during the action, or some imperceptible elements, such as the values or personality of the user, are developed more during the creativity session. We note an inverse effect on the tangible elements. This is particularly evident on the physical characteristics and cognitive abilities of the user and on the product data. These elements are treated less in the session than in the analysis step. This difference raises the contribution of co-creativity sessions by allowing us to pass from a technology centred to a user centred design focusing on the characteristics and needs of the user. Indeed, this type of format provides a more complete vision of the experience (Sanders and Stappers, 2008; Visser et al., 2005), in particular by providing data only accessible to the users such as dreams, experiences, etc.
We can note two phenomena: the data collected before and during the session are complementary and a large number of elements are lost at the end of the session. Consequently, the tools used are not sufficient to collect and to keep all the information used during the creativity process by all the different actors. Indeed, during the session, we can note the importance of the non-verbal communication. This phenomenon can come from the diversity of the profiles of the creativity team actors. Indeed, to understand themselves, some actors prefer to use gestures. According to Visser, the gestures have two roles during the session: construct and represent the artefact and facilitate the organization and the interactions between the participants (Cash and Maier, 2016; Eris et al., 2014; Visser, 2011). Some authors highlight the importance of gestures in the co-located and collaborative design process (Cash and Maier, 2016; Eris et al., 2014; Visser, 2011). The gesture is a trace (Derrida, 2014) of this design process, which allows the different actors to communicate, exchange or defend an idea.
In the framework of a multidisciplinary process, with actors from different cultures, the variety of traces used during the project - text, picture, verbal and non-verbal communication - allows the team project to have a more complete vision of the life situation. The classical organization in product design, which doesn't integrate totally the diversity of the traces in the project, may explain the loss of data all along the co-creativity process. Indeed, there is no transverse tool making it possible to combine all the traces of the projects, the traces being inherent to any type of experience (Derrida, 2014) and to represent the totality of the life situation. A unique federator and accepted by all tool should make it possible to capitalize on the knowledge of the project more efficiently. For this purpose, our life situation framework seems to be the frame for a future tool.
Some authors propose to go further in the co-creation process by integrating the end users as an actor within the process (Sanders and Stappers, 2008). Indeed, the user is a real guarantor of the integration of the human factor in the design project. In this perspective, it seems interesting for us to enrich our framework through other tools, like the personas. This design tool is already proposed as part of co-creation by some authors (Bornet and Brangier, 2016). This tool will make it possible to develop the

intangible data about the user, for example his personality, tastes, dreams, etc., and to federate all the project actors around the human factor. Our framework should be a common referential that allow the project to go further than the common XAO tool used in design projects by the technical experts, and allows the different points of view of the actors to converge (Darses de Montmollin, 2013), from different cultures such as the ergonomists, the product designers or the users.
In the continuation of our study, it will be interesting to put our framework to the test on a greater diversity of project of the same typology, for example a video game joystick. Indeed, the professional character of the project can explain the lack of emotional, hedonism or aesthetic data. It will be interesting to measure the contribution of the final user and others areas of expertise as psychology, sociology or anthropology, to this type of co-creativity session.

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