A framework for user experience, needs and affordances

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Y*our most unhappy customers are your greatest source of learning*. With these words, in 1999 Bill Gates summarised two of the most relevant aspects underlying the success of a product: the happiness of the customers and the importance of learning from mistakes. More or less at the same time, researchers in Design often tried to assess the quantity of said mistakes: for instance, in 1997 a study pointed out that market failures constitute more than 99% of the submitted projects in industry (Stevens & Burley, 1997).

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Another research (Den Ouden, Yuan, Sonnemans, & Brombacher, 2006), highlighted how high is the number of cases where the dissatisfaction of the customers is caused by so called soft failures, when products function according to the specification, but not according to the consumer's expectations. Contrariwise, a recent paper analysed many award-winning successful products, in order to identify the features that distinguished them from competitors (Saunders, Seepersad, & Hölttä-Otto, 2011). Assuming that successful products typically delight customers by satisfying their needs in particularly innovative or unexpected ways, the study found out that, on average, successful products present multiple innovative characteristics, but more than two-thirds of them outperform users' expectations in terms of interaction.

In the last years of twentieth century, it was already well acknowledged that it is not possible to reduce an interactive product to its functions and its easiness of use. Indeed in 1996 the ISO 9241-11 involved the satisfaction of the user in the definition of usability (1996: p 2), considered as being both objective and subjective. Nevertheless, this definition did not include one aspect that the previously mentioned studies demonstrated to be of prime relevance: the pleasure of the users. Probably this limitation is among the reasons that motivated the shift from the ISO 9241-11 to the ISO 9241-210, which states that the design addresses the whole User Experience (2010: p 7). User Experience (UX) is herein defined as a consequence of the presentation, functionality, system performance, interactive behaviour, and assistive capabilities of an interactive system, both hardware and software. It is also a consequence of the user's prior experiences, attitudes, skills, habits and personality. With respect to the ISO 9241-11, the concept of usability is thus broadened by means of its re-interpretation from the perspective of the users' personal goals, which can include perceptual and emotional aspects (2010: p 7).

Design of interactive products must address the whole user experience. In the last years, this sentence has become a sort of mantra, as UX has become an established field of research in Design (Hassenzahl & Tractinsky, 2006). Different models and frameworks have been proposed in order to represent the kaleidoscopic nuances that compose the UX. However, so far these models have raised different criticisms: among the others, according to Xenakis and Arnellos (2013, p 2) *such approaches hardly lead to recommendations that can be safely generalised in design methodologies, like all those practical design methods, which are based on affordance theory*. The present study deals with this issue and tries to lay down the foundations for a prescriptive formulation of the design for the UX.

Furthermore, despite the evidence that the design of an interactive artefact is actually the design of behaviours and experiences, the aim of designing experiences carries some risks. First of all, experiences with products are to be ascribed just in part to the products, as the remaining part is due to the context in which the interaction occurs and to the user itself. As Redström (2006: p 124) pointed out, the aim of designing experiences necessarily leads to the attempt of designing the user, which means trying to design something that is not there for us to design. However, as confirmed by the findings discussed at the beginning of this introduction, the issue of users' pleasure is always there to be fulfilled. Hence, the whole UX has to be considered, including users' personal goals, expectations and emotional aspects, without neglecting the agency of people interacting with technology (McCarthy & Wright, 2004: p 10).

Borrowing the words of Enrico Gismondi, as reported by Verganti (2009: p 2), User Experience Design should be about making proposals to people: the experience provided by the artefact should be the result of a proposal made to the users, not an imposition. However, UX Design deals with the intertwin-

ing relationship between the objective and subjective, the internal and external aspects composing human−product interactions: an issue to be solved is then that of framing from a unique perspective the product, the user and the context. For this purpose, designers need a tool capable of seizing both the user and world around her: a suitable one is still modelling affordances.

Affordances can be summarised as action possibilities offered from the environment to the animals that are capable of seizing these offering. A step affords step-ability to a man, not to a toddler. Thanks to their versatility, affordances have been studied under different perspectives. For instance, Galvao and Sato (2005) used affordances as an instrument for understanding the relationships between technical functions and user tasks. Maier and Fadel instead argued that the concept of affordance is more fundamental than other concepts, such as function, and hence developed an affordance-based approach to design (Maier & Fadel, 2009). Nonetheless, as pointed out by Overbeeke, Djajadiningrat, Hummels, and Wensveen (2002: p 9), an affordance refers to the inextricability of both perception and action, and a person and his environment. However, they continued arguing that many researchers concentrated on the structural aspects of affordances whilst neglecting the affective aspects and lamenting this clinical interpretation of affordance. In fact, people do not act *only because a design fits their physical measurements*. Different scholars have so far agreed on the wider possibilities of use for affordances and in last ten years the concept has been expanded in order to develop different kinds of affordances for different kinds of actions (Bærentsen & Trettvik, 2002; Pols, 2012).

The assumption that motivates this work is that there is still room for development of the concept of affordance, which can be used as a basis for a model of UX: if there are different kinds of affordances for different kinds of actions, it is possible to imagine *experiential affordances*. By means of a formulation in affordances terms, it would be indeed possible both to develop prescriptive tools or guidelines for designers, and at the same time to help them with focussing on proposing, and not imposing, experiences. Moving from the latest advances in UX research and Affordance Theory, the main question that this paper addresses is: how can we set the basis for a prescriptive foundation of UX, which does not force potential users into predestined experiences?

The question is investigated in several steps: Section 1 overviews the main approaches to UX. Starting from their development, the differences between the most relevant schools of thought are highlighted, as well as the criticisms that accompany this vein of research. By means of a critical discussion, a suitable approach for the scope of the study is adopted.

Section 2 defines the concept of affordance and draws a parallel between Affordance theory and User Experience research, grounded on some of the main existing affordance characterisations. At the end of the section, the

experiential affordances are defined and a characterisation of affordances suitable for a UX framework proposed.

In Section 3 such a framework is explained by means of an example and discussed with other exemplary applications. Eventually, Section 4 highlights the implications of the framework, as well as its limitations, and then draw the conclusions of this work.

1 *Approaches to user experience*

At the end of last century, *experience* became a buzzword in the design field. According to Bargas-Avila and Hornbæk (2011: p 2698), early UX practitioners argued that usability research was too focused on task efficiency and work, and that more encompassing notions of quality were needed. As pointed out by Hassenzahl and Tractinsky (2006: p 91), first writings about UX were mostly programmatic, trying to establish this new discipline, and gradually such papers have been replaced by more conceptual works, with the expectation of having a concrete impact on design culture. Indeed, in the XXI Century User Experience research has gained momentum and a number of frameworks aiming at the description of experiences have been proposed.

Different scholars have tried to identify the dominant schools of thought about UX models and several classifications have been proposed so far. Among them, the most remarkable appears to be the one proposed by Blythe, Hassenzahl, Law, and Vermeeren (2007: p 1), which distinguishes between *holistic* and *reductive* approaches. At a glance, the former reflects a phenomenological view of experience, based on the work of philosophers such as John Dewey (1934), whereas the latter tries to reduce the complexity of experiences by means of constructs derived from cognitive psychology.

Among the holistic ones, the book *Technology as experience* (McCarthy & Wright, 2004) is based on the assumption that thoughts, ideas, and emotions are entities that could not exist separate from our bodies and separate from each other, in an abstract way. Conversely, models based on cognitive psychology shred user experiences by means of identifiable and measurable constructs, in order to break down the complexity of experiences into evaluative constructs, such as usability, aesthetics, emotions, pleasure.

According to Wright and McCarthy, such separation would sound like *an anathema to Dewey* because of the oversimplification of experiences they perform. In their opinion, the division of emotions and behaviours destroys the phenomenon object of investigation; therefore, Wright and McCarthy emphasise the *importance of looking at experience in terms of the interplay between sensation, emotion, intellect and action situated in a particular place and time. This is what experience researchers mean when they talk about a holistic approach* (Wright & McCarthy, 2010: p 14).

Thus, they take a quote from Buchenau and Suri as a model of holistic comprehension of experiences: *What is the experience of a run down a mountain on a snowboard? It depends on the weight and material qualities of the board, the bindings and your boots, the snow conditions, the weather, the terrain, the temperature of air in your hair, your skill level, your current state of mind, the mood and expressions of your companions* (Buchenau & Suri, 2000, as cited in Wright & McCarthy, 2010: p 14).

The authors agree on the complex nature of experiences. Nevertheless, from a designer's perspective, facing such intertwining relationships raises many issues. For instance, a snowboards designer might consider the coupling with different types of boots, but eventually she certainly hope that the user of the table will wear good ones. In the same fashion, a snowboard should be designed for adapting to different snow, weather and terrain conditions, but said factors represent just external variables to the designer and not object of design. A very soft snow has to be taken into account as a possible scenario, but cannot be *designed*. Moreover, if a snowboarder encountered bad weather or poor snow conditions, would she address the failure of the experience to the object of the design?

The intention of including this complexity into design can be interpreted in Redström's writing (2006: p 124) when he says that *the intention to design the user experience is but the latest in a progression towards the user becoming the subject of design. With its ambition to create a tight fit between object and user, this development seems to point to a situation where we are trying to optimise fit on the basis of predictions rather than knowledge, eventually trying to design something that is not there for us to design.*

In turn, approaches such as that of McCarthy and Wright represent a valuable tool for holistically understanding experiences, for gathering data and getting inspiration for design solutions. Contrariwise, as part of models aiming at the development of guidelines, they may generate an *experience-paradox*: by considering the wholeness of nuances that constitute an experience, such approaches may end up with falling short of considering the net of experiences encountered by different users of the same artefact.

In this sense, it is widely accepted that an experience cannot be guaranteed. By means of our designs, we should not force people to feel related to someone, or stimulated. Using Redström's words, *we therefore risk trapping people in a situation where the use of our designs has been over-determined and where there is not enough space left to act and improvise* (Redström, 2006: p 124). Hence, our snowboard should not perpetually offer a thrilling sense of challenge to people, becoming itself a designer of people's behaviour. A snowboard should not impose challenge, but just afford it.

Under the perspective of setting the basis for a prescriptive approach, the present paper assumes a position more aligned to that of Hassenzahl (2010: p 73). Rich experiences are not ubiquitous in everyday life, nonetheless they are unique and similar at the same time. On the one hand, every experience is unique: each snowboarder has diverse skills and backgrounds, encounters different external conditions and faces them with various moods and dispositions. On the other hand, experiences with products can be somehow similar, because many snowboarders aim at improving, or love to be challenged, and so on. This because not all the snowboarders, in every situation, aim at extreme performances: some, in spite of being very competitive, may occasionally go snowboarding just to hang out with friends. The model of Hassenzahl, whose validity has been supported by subsequent studies (Karapanos, 2010: p 16), will be taken as reference for this study. Therefore, the next paragraph will be devoted to the illustration of said model.

1.1 Hassenzahl's model of user experience

Hassenzahl (2010: p 11) defines interaction as a goal-directed action mediated by an interactive product. Following the three level hierarchical organisation of goals proposed by Carver and Scheier (1998), on the lowest level Hassanzahl places *motor-goals* (e.g., pressing the keys of a cellphone), performed in order to accomplish a *do-goal* (e.g., sending a text message). At the highest level there are *be-goals,* which motivate an action. According to Hassenzahl, sending a text message is not a meaningful action in itself: the *be-goals* (e.g., feeling closer to a distant person), arising directly from basic human psychological needs (Hassenzahl, Diefenbach, & Göritz, 2010), give meaning to the action (see Sheldon, Elliot, Kim, & Kasser, 2001, for a list of psychological needs behind pleasurable events).

According to Hassenzahl (2003: p 32), the designer combines product features in order to convey a certain product character. However, users perceive features in a fashion that determines the apparent product character, which consists of a combination of *hedonic* and *pragmatic* qualities. Pragmatic qualities are those that support the achievement of motor-goals and do-goals, whilst hedonic qualities are related to be-goals.

In order to include the context of the interaction, Hassenzahl exploited the concept of usage modes (2003: pp 39–40), originally proposed by Reversal Theory co-creator Michael Apter (1989). Usage mode can be either *goal mode* (*telic* mode in Apter's formulation) or *action mode* (*paratelic* mode). In *telic mode,* goal fulfilment is in the fore, since the current goal has a certain importance and determines all actions and the product is just a means to an end. In *paratelic* mode, it is the action to be in the fore, determining goals 'on the fly'. The specific usage mode is often triggered by the situation, nevertheless some mechanisms such as frustration or satiation may revert the usage mode the user is in (Apter, 1989: pp 50–51).

According to Hassenzahl (2003: p 40), the perception of a product character as primarily pragmatic or hedonic is not influenced by usage modes. However, judgements and emotional reactions depend on the product's momentary fit to the usage mode. Thus, usage modes play the role of moderator between the product character and its consequences. Hence (Hassenzahl, 2004: p 322), using a product with a specific product character in a specific situation leads to consequences, such as emotions (e.g., satisfaction, pleasure), explicit evaluations (i.e., judgements of appeal, beauty, goodness), or overt behaviour (i.e., approach, avoidance). *Satisfaction* appears when one is pleased about the confirmation of the prospects of a desirable event, whereas *pleasure* requires no expectations (Hassenzahl, 2003: p 38). As a consequence, *satisfaction* is linked to the success in using a product to achieve particular do-goals, *pleasure* is linked to using a product in a particular situation and encountering something desirable, but unexpected: it has been shown (Hassenzahl et al., 2010) that needs fulfilment is related to positive affect and can be understood as a source of pleasure.

Hassenzahl's model of User Experience, as described herein, can be represented as in Figure 1.

Hassenzahl's model is here taken as a reference for further development. However, it is important to note that, according to Hassenzahl, products trigger emotional and behavioural reactions by means of attributes that are *perceived* by the user, such as pleasant/unpleasant, ugly/attractive, etc.: this formulation is thus heavily dependent on the perception of the users and only indirectly on the product itself. For this reason, in order to obtain a representation that is less dependent on users' perception, in the remaining part of the study the authors refer directly to the product *features* that lie beneath the perception of the attributes. Hence, in the following descriptions of Hassenzahl's model, hedonic and pragmatic features of products are considered and referred as to the features of products (e.g., functionalities, characteristics and so on) that support the fulfilment of, respectively, be-goals and do-goals. As clarified in the continuation of the study, the subjectivity of the user is still taken into account by means of an affordance-based formulation.

This section has discussed the main approaches to User Experience and their drawbacks and has proposed a possible approach for overcoming them. In Section 2, a definition of the concept of affordance is provided, as well as its extension toward a more comprehensive account. Eventually, a type of affordance, suitable for the experiential level, is proposed, defined and discussed.

2 *Affordances and the levels of human (inter)actions*

The concept of affordance is defined as *what it [the environment] offers the animal, what it provides or furnishes, either for good or ill* (Gibson, 1979: p 127). Thus, by definition affordances connote something referred to both the
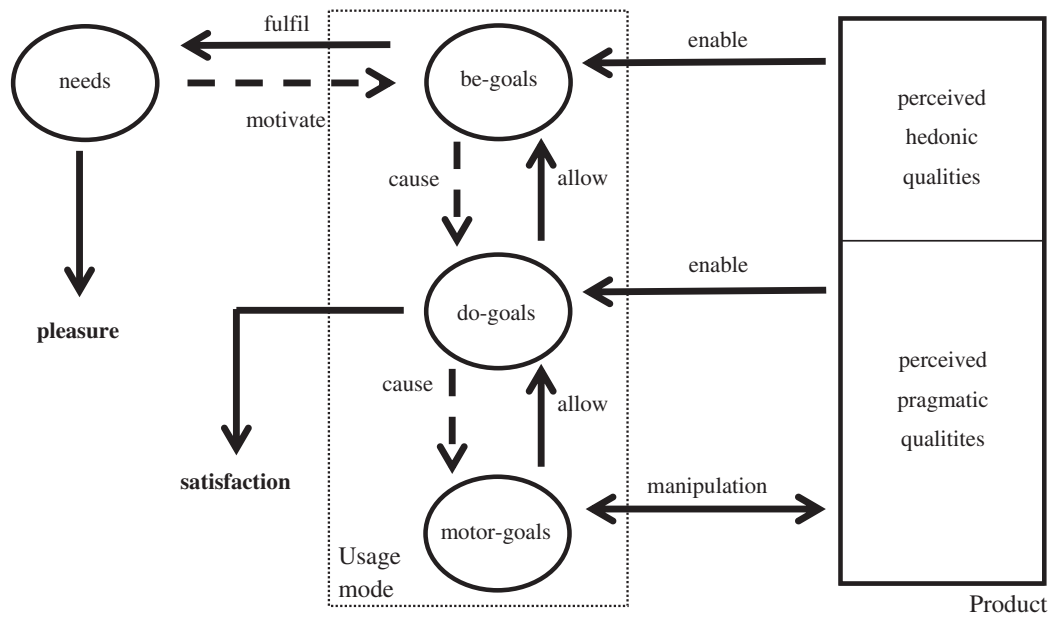
Figure 1 Representation of Hassenzahl's model of User Experience in the view of the authors (dashed lines represent causal relationships; solid lines, others). Needs constitute the motive of be-goals, which in turn generate do and motor-goals. At the level of motor goals, the manipulation of the product takes place. The achievement of do-goals triggers satisfaction, whereas the fulfilment of a be-goal satisfies a need, triggering pleasure

environment and the animal, and it is not possible to think of affordances as exclusive properties of the environment. For instance, the statement 'a stairway affords step-ability' *per se* does not make sense, as an adult can probably step onto the stairs whilst a toddler cannot.

In the environment of our everyday living, a chair affords our sitting, a switch affords our turning on a light, a mobile phone affords sending text messages between users, and so on. Nevertheless, if we gave a closer look to mentioned examples, we would recognise different types of actions. Pols (2012), based his work on the assumption that research into affordances has not investigated what an action is, nor has distinguished its different levels. The same objection was raised also by Bærentsen and Trettvik (2002: p 53). Indeed, in order to overcome this limitation, they combined affordances with aspects of Activity Theory, according to which activities are made up of actions, which are constituted by operations (Bærentsen & Trettvik, 2002: pp 53−54). With regard to the example of the text message, sending a text message is an activity, whilst scrolling menus or writing the text are actions, pressing the buttons are operations. A goal may then remain constant, but the ways to achieve that goal may differ according to circumstances. Therefore, I can directly reply to a text message by using the appropriate function, or I can reply to it after making a telephone call, by retrieving the message in the archive and then selecting the function 'reply'.

Bærentsen and Trettvik pointed out that Gibson focused on the operational level and therefore Gibson's affordances may be regarded as *operation* possibilities. Then they proposed to adapt the concept of affordance to all three levels of activity (activity, actions and operations), introducing three hierarchical levels of affordance: at the lowest level they placed the already mentioned *operational* affordances, then the *instrumental* affordances, related to actions instrumental to performing activities, and finally the *need related* affordances, which involve the goals and the motives that determine activities.

Similarly Pols (2012) assumed that, since actions can be described in different ways, affordances can also be described in different ways. Pols firstly recognised *basic actions*: for instance, sitting, intentionally blinking, waving, etc. Then, he showed that these actions have consequences, as a letter or a number will appear on the screen of my mobile phone once a key is pressed. According to Pols, this is called *effect* of the basic action. A series of combinations of actions and effects constitutes a *plan*: Finally, actions may have *consequences in a social sense*: for instance, think of the murdering of the heir to the Austro-Hungarian throne, Archduke Franz Ferdinand of Austria in Sarajevo, Bosnia. This assassination, performed on 28 June 1914 by Gavrilo Princip, a Bosnian Serb student, led to the break out of World War I. Nevertheless, the only action actually carried out by Princip was to pull a trigger; the effect of this action was the shot of a bullet that, addressed to the Archduke, executed the plan of the student. The social consequences of this plan are well known.

Therefore in Pols' view artefacts may, in a hierarchical way, afford basic actions, afford the effects of the actions, afford the execution of plans and eventually afford social actions. In his works, Pols also highlighted the knowledge necessary to the user for the perception of said affordances. More in details, affordances of basic actions do not require any knowledge since, similarly to Gibson's affordances, they are directly perceived. With regard to the effects of basic actions, according to Pols (2012: p 117) all that would strictly be needed for an observer to perceive effect would be the capability of correlating causes and effects. Of course, in the case of brand new functionalities, such knowledge has to be learnt; however, the comprehension of the functioning of parts or the knowledge of cultural symbols may help in perceiving them. At the level of the plans, users should be provided with the appropriate information in order to build a correct mental model of the artefact; hence, it is up to the designer the provision of information about the use plan of the artefact (Pols, 2012: p 119). Finally, abstract, institutional and social knowledge are needed in order to understand and perceive the opportunities for social actions.

The frameworks proposed by Pols and by Bærentsen and Trettvik aimed at a better formalisation of the notion of action. Their characterisations of affordances present many similarities and, to a certain extent, appear to share

the same basis with the hierarchical organisation of human goals proposed by Carver and Scheier (1998), discussed in the previous section and constituting the basis for Hassenzahl's model of User Experience. Therefore, in the next paragraph the application of such an affordance characterisation to User Experience research is discussed.

2.1 How a product can afford an experience

In order to build an experiential account of affordances, it is possible to establish a link between basic actions and the motor-goals discussed by Carver and Scheier (1998), insofar as basic actions are those actions performed in order to achieve a motor-goal. In the remaining part of this paper, the possibilities for basic actions will be referred as *Manipulation Affordances*. At the second level of Carver and Scheier's hierarchy of human goals appear do-goals. Linking human goals hierarchy with Pols' characterisation of affordances, the level of do-goals can be said to be occupied by both *effects* and *plans*, whereas Bærentsen and Trettvik regard this level as that of *actions*. Indeed, splitting Bærentsen and Trettvik's *actions* in its two components, namely effects and plans, may be useful for preventing usability problems: in fact, it would be easier for a designer to recognise whether the user cannot figure out which effects a manipulation will produce or, conversely, the use plan provided is hard to understand. Hence, an object should afford effect and use to users, then the following discussion will refer to these affordances as respectively to *Effect Affordances* and *Use Affordances*.

Finally, Caver and Scheier put be-goals at the top of their hierarchy: be-goals, such as *be a nice person*, *be unique*, are self-referential and close to people's selves, in that they motivate the action and provide it with meaning (Hassenzahl, 2010: p 13). The reasons of be-goals stem from basic psychological needs (Hassenzahl et al., 2010). An artefact may afford the accomplishment of a be-goal to a user by enhancing the fulfilment of underlying psychological needs. The so-called *need related affordances* (Bærentsen & Trettvik, 2002: p 59) were linked to the motives why people perform activities. Within the scope of this article, it is possible to develop Bærentsen and Trettvik's need related affordances, and therefore to postulate the *Experience Affordances*.

An artefact affords an experience to a user when presenting certain features that contribute to the fulfilment of a basic psychological need of the user. In order to *perceive* it, the user should be in the proper usage mode: for instance, the user is not totally focused on the achievement of goal (*telic mode*), but she is enjoying the interaction itself (*paratelic mode*). Furthermore, it is worth noting that the perception of Experience Affordances is not linked to how an experiential feature is achievable by a user, whereas it has to be intended as concerning the *disposition* of the user toward an experiential affordance. When not in the right usage mode, a user may easily ignore a certain

experiential feature, in spite of being conscious of its existence. The usage mode, in a UX formulation, modifies the perceptual probability of an affordance as, according to Lu and Cheng (2012: p 7), although an object has an affordance for a user, the situation itself impacts the perceptual probability of the affordance.

With regard to the model proposed by Pols (2012), the analysis of the social consequences of actions, as well as the characterisation of related affordances, goes beyond the scope of this study; nevertheless, Experience Affordances may encompass certain social consequences of interactions performed in order to fulfil social needs, such as influence or popularity (Sheldon et al., 2001: p 339).

It is possible to adapt the table used by Pols to describe his model (Pols, 2012: p 120), as in Table 1.

In this section, affordances have been described and modelled from an experiential point of view. In the following section, this characterisation of affordances is applied to Hassenzahl's model of User Experience and the resulting framework of User Experience is discussed.

3 A framework for user experience

The previous section has shown how different kinds of actions arise from different kinds of goal: being affordances opportunities for actions, it is possible to define different types of affordances. According to Carver and Scheier, be-goals give meaning to human actions, but, as disclosed in the previous section, not all human activities stem from be-goals: high-level goals are used in some circumstances, whereas in many cases behaviour is guided by goals at lower levels (Carver & Scheier, 1998: p 87). In grocery shopping or dish washing for instances, people lose sight on be-goals and focus on concrete aspects of their activities and hence aim at attaining a do-goal and not at fulfilling a be-goal. Nevertheless, the fulfilment of a be-goal may occur in everyday activities as well, such as driving a car.

Contemporary cars are enhanced with many features for increasing safety and control of the vehicle. The overall *usability* of the car is improved, since ease of driving is raised, nevertheless features such Electronic Stability Program (ESP) present the drawback reducing the immediacy of the feeling of driving. As a consequence, a passionate driver may desire a more direct feeling of driving and enjoy an old-fashioned guiding without electronic aids. A driver may, if in the right mood, give herself the treat of driving like a professional driver, the pleasure of feeling wild also in a luxury car.

To be like a professional driver, to feel free from the restrictions of electronic controls are be-goals that give meaning to the do-goal of driving. For this reason, a growing number of cars offer possibilities for multi-modal driving,

Table 1 Descriptions of the different levels of affordance

Affordance	Goal to be achieved by the user	Information/disposition needed to perceive it	Example
Experience affordance	Be-goal	Right usage mode	Be closer to a distant person
Use affordance	Do-goal	Mental models; use plan	Send a text message
Effect affordance		Capability of correlating cause and effect; optionally, functioning of parts, cultural symbols	Type letters, move a slider across a menu…
Manipulation affordance	Motor-goal	Perceptual info	Press a button, move a finger on a touchscreen

such as that in Sport Mode: by selecting the Sport Mode, the balance of the car, as well as its propulsion, are made sportier, whilst the effects of electronic control are reduced, where not suppressed at all.

Analysing this example under the light of the affordances characterisation discussed in the previous section, a car affords *manipulations* to the driver, such as inserting the key into the keyhole, handling the steering wheel, pressing the pedals and also clicking the button that enables the Sport mode. Said manipulations cause *effects*: by turning the steering wheel it is possible to control the wheels, by pressing the pedals it is possible to accelerate or to brake, by clicking the button the balance of the car is modified and the ESP is disabled. The combination of actions and their consequences constitute the *use* of the car, which is possible as far as the required combination of manipulations and effects is suitable with the capabilities of the user.

The levels of both use and effect affordances corresponds to do-goals in the hierarchy of goals proposed by Carver and Scheier (Table 1); a do-goal may be to go and pick up an old aunt, or to move from a place A to a place B as easy as possible. The accomplishment of a do-goal brings emotional consequences such as satisfaction or frustration and the features related to the use of the car of the car are the pragmatic ones: their suitability with the characteristics of the user constitutes manipulation, effect and use affordances.

Nevertheless, it is plausible that the trip from place A to B should be not as easy as possible, but as funny, or pleasurable as possible. The usage mode switches so to paratelic mode, in which the behaviour itself is in the fore and the goal of going from A to B is essentially an excuse for the behaviour. The driver who wants to be wild or to drive like a pro may therefore enjoy exploiting the best performances of her car.

A feature such as Sport modality enables the achievement of a be-goal, and may be regarded as hedonic. However, said be-goal stems from basic psychological needs of the user: picking among the list of Sheldon et al. (2001), the

need for stimulation may lay beneath such a be-goal. By means of Sport Mode, the car affords the fulfilment of a need of the driver, and said affordance can be regarded as an *Experience Affordance*.

The central point is that the car does not impose a sporty guiding, but *affords* it (by clicking a button). The user is free to choose a more comfortable balance when she is not in the right situation (for instance, during a traffic jam) or even when her driving is moved by another be-goal, such as being romantic during a journey with the partner.

However, as far as a feature of the artefact enables the achievement of a be-goal (e.g., to be like a professional driver), the artefact affords an experience to the user. The user then can perceive this affordance if she is in condition of focussing on a be-goal, and her behaviour is not subsidiary to the achievement of a do-goal. The achievement of a be-goal fulfils, as seen in Section 1, a basic psychological need and hence causes pleasure; thus by affording an experience, artefacts may provide users with pleasurable interactions.

It is possible to adapt Hassenzahl's model of User Experience in order to express the relationships among users and objects in terms of affordances; a representation of such a framework is shown in Figure 2.

The multimodal drive enhances with hedonic elements a daily activity such as driving. It is possible to recognise examples of products capable of achieving be-goals not by means of a different functionality, but thanks to, for instance, a peculiar shape. From this perspective, one can consider Excalibur, the toilet brush designed in the mid-nineties by Philippe Starck, as a successful example of product affording experiences.

By means of its shape resembling a sword, Excalibur introduces a playful element such as *challenging the dirt*. A person aiming at being ironic, for example, may be in need of fulfilling again a need for self-actualisation. It is clear that the be-goal of being ironic is not ubiquitous in everyday lives and the users do not have urge to achieve it. Nevertheless, Excalibur does not impose its playful challenge, because it is always there to simply perform its function of removing dirt: as far as the user is in the right mood to be challenged, Excalibur *invites* users to challenge the dirt. The do-goal Excalibur aims at achieving is not motivated by a be-goal, but only enriched by it.

There are classes of products where the distance between do-goals and be-goals is subtle at the point that they seem to overlap, as for toys and games: to a certain extent, the goal of said products is a need fulfilment. Nevertheless, also for toys and games it is possible to distinguish do-goals (the practical scope of the game) from be-goals (the motives why people play). For instance,

Experience affordances

Basic psychological need to be fulfilled	Hedonic features

Perceived when in the right usage mode

needs ← fulfil — be-goals

needs ⇢ motivate ⇢ be-goals

be-goals ← invite/enable — Experience affordances

needs → pleasure

be-goals ↕ cause / allow do-goals

do-goals ← invite/enable — Use affordances

do-goals → satisfaction

Use affordances

Physical and mental (cognitive) skills of the user	Pragmatic features

Perceived thanks to mental models or use plans

do-goals ↕ cause / allow motor-goals

Effect affordances

Functioning of the artefact caused by manipulation	Pragmatic features

Directly perceived; perceived by knowledge of cause/effect ratio or cultural symbols

Manipulation affordance

Physical compatibility between user and artefact	Pragmatic features

Directly perceived

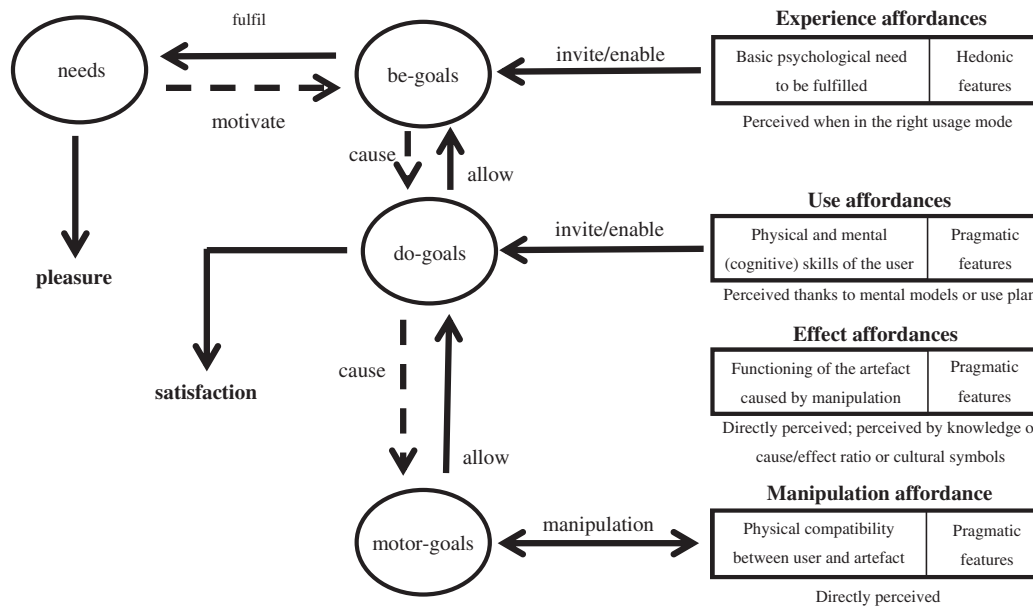motor-goals ↔ manipulation ↔ Manipulation affordance

Figure 2 A framework of User Experience in interaction based on affordances. Affordances' components are highlighted into the boxes, whilst the elements allowing their perception are reported below the boxes. As for Figure 1, needs constitute the motive of be-goals, which generate do and motor-goals. At the level of motor goals starts the manipulation of the product. The achievement of do-goals triggers satisfaction, whereas the fulfilment of a be-goal satisfies a need, triggering pleasure

considering a tennis match played on Nintendo WII, playing tennis implies do-goals such as hitting the ball, sending it towards the opponent's court and so on. Hence, the Use Affordances offered by the WII consist in the possibilities of accomplishing said goals, by means of combinations of Manipulation affordances (e.g., offered by the WII controller) and Effect Affordances (e.g., the virtual racket is moving on the screen). It is eventually up to the player to carry her own motives to play, such as improving, staying in good shape, have fun with friends, etc. As far as the WII enables the achievement of said be-goals, the product affords an experience.

3.1 Why affordances? Products as facilitators

Most of the examples previously discussed do not introduce new possibilities of use with respect to traditional products: before their launch, it was already possible to drive a car sportingly even without a dedicated function, to perform everyday activities with sense of humour. In this sense, even cars without Sport Mode may support reckless driving, affording that experience to a willing user. Nevertheless, by means of an intentionally designed feature, a product facilitates such experiences to users, becoming to a certain extent responsible of them. In this case, some cars can be said to be inviting the user to a sportier driving. With or without the multimodal driving, a car may afford an experience of sporty guiding to a user, but the one presenting such a feature is more likely to help users in achieving her be-goals; consequently, users attribute to the products the cause of their experiences (Wiklund-Engblom, Hassenzahl, Bengs, & Sperring, 2009: p 669).

Hedonic features may, then, either *invite to* or *enable* the fulfilment of a be-goal; a similar possibility is offered by pragmatic features with respect to the do-goals. For instance, the possibility of fastening a seat belt belongs to the level of Use Affordances. All of the cars in the market afford their fastening, however some of them *invite* us to accomplish this task: in this case, the product is intentionally designed to influence the users' behaviour and may be included in the domain of Persuasive Technologies (Fogg, 2003; IJsselsteijn, 2006).

The double meaning of *possibility for experiences* is well embodied by an example discussed by Hassenzahl (2010; p 72), which relates to a prototype of tablet developed in a workshop with Samsung. Such tablet is capable of hiding and showing content if tilted in a certain way, allowing the user to keep secrets by concealing media she does not want to share with anybody. Ignoring the fact that this feature can work insofar as nobody else knows its existence, it however facilitates the achievement of the be-goal of being autonomous, and hence may trigger pleasure to a user by fulfilling her psychological need for autonomy. The tablet helps users with being autonomous by *inviting* them to keep their secrets hidden. Nevertheless, this happens as far as a user has a secret to hide: the tablet affords keeping a secret to users who have some.

On the contrary, one may not have, for instance, the need for autonomy, while desiring to feel more close to her partner: in this case the tablet could be used for making a surprise to the partner, by suddenly revealing a sweet picture previously hidden. This represents a different Experience Affordance afforded by the device: affording surprises. Moreover, nothing prevents a user from exploiting the feature in order to make jokes to friends, and so on. The functionality of hiding/revealing content lies below the experience of being autonomous by keeping one's own secret. Such a feature can be regarded as hedonic, since it enables the achievement of a be-goal. Even so, the experience of keeping a secret cannot be imposed, unless users pay the price of giving up personal interpretation of 'use' (Redström, 2006: p 134). Designing an experience implies the elimination of the free space for use interpretation, thus adapting the user to the artefact. Conversely, designing *for* an experience is closer to *making a proposal* (Verganti, 2009: p 51) to people. The artefact should adapt to the context and to user's disposition and still should leave enough space for other interpretations. Affordances can describe not only how these proposals are made, in terms of features of the artefacts and characteristics of the user, but also how clear the proposals are, in terms of how affordances are perceived. Furthermore, by means of affordances, it is possible to reckon about possible alternatives in case the user refuses certain proposals, by considering other possibilities available to the user.

In this section, a framework of User Experience in interaction has been formulated in terms of affordances. This framework has been described by means of

exemplary products, thanks to which the relationship between artefacts, users and designer has been discussed. In the next section, the implications of such a model, as well as its possible developments and limitations are presented and the conclusions of this study are drawn.

4 Discussion

The main question this paper has dealt with concerns the development of a prescriptive foundation of the design for the UX, avoiding the imposition of experiences to users. The question has been addressed arguing that there is still space for developing the concept of affordance. More specifically, it is possible to develop an experiential account of affordances.

Thus, firstly the main approaches to UX have been presented and discussed. Secondly, by assuming the existence of different kinds of affordances as opportunities for different kinds of actions, the theoretical basis shared between Affordance and UX theories has led to the postulation of Experience Affordances. Finally, a framework for describing UX in interaction, whose validity was discussed by means of examples, has been outlined.

Such a framework sets the basis for a shift of UX research toward affordances; in spite of being just a first step toward a methodology for affording experiences, the implications of the presented framework, as well as its limitations, are discussed in the remainder of this section.

4.1 Implications for design and for future research

In his inspiring work, Redström (2006: p 136) argued that there are fundamental problems associated with design as not only centred on the user but also increasingly about designing what use and user should be like. These problems are often concerned with user experience: UX designs are, in a considerable part, predictions about future and, although designers possess the knowledge for making reasonable predictions about future, *their ideas about future use is just as much a prediction as anyone else's*.

Among the possible solutions, Redström proposed: what would happen if we used our knowledge about current practices not to answer certain questions by our design, but to avoid answering them? (2006: p 136).

The authors suggest that, by reasoning in terms of affordances, designers may leave the necessary room to spare for users and their interpretations of objects: there is a subtle, albeit important difference, between stating 'this chair is for sitting' and 'this chair affords sitting (to a user)', as the first one imposes the function the objects, whilst the second one claims one possible use among the various possibilities. In spite of the impossibility of taking in account all the potential alternative uses, by means of affordances the designer has at least to acknowledge the existence of other possibilities (Cascini, Del Frate,

Fantoni, & Montagna, 2011: p 3). A chair affords sit-ability to a user, but at the same time may afford step-ability to her and may not afford climb-ability to a toddler. A product may afford the fulfilment of a psychological need to a user, but this formulation leaves a way out for her. This is the main reason why, in the authors' opinion, affordances are a suitable formulation for discussing about UX: affordances are relational constructs expressing possibilities for actions; in some cases, these possibilities are explicit invitations, still they can be modelled as affordances. By means of affordances, it is easier for designers to reason about how to design *for* experiences, and at the same time to avoid forcing users into such experiences. With reference to the example of multimodal driving, the possibility of switching between a Normal Mode and Sport Mode prevents the user from feeling tired and uncomfortable in a traffic jam or when driving on streets in poor conditions. Conversely, the experience of driving a high performance car can be spoiled by a traffic jam or even by a bad disposition of the user; nevertheless, some journeys could become less harsh if such high performance cars had a 'comfort mode' that they usually do not present. In the authors' opinion, affordances are a suitable tool by means of which designers' proposals can be expressed: affordances sounds like invitations, questions, which users can avoid answering, postpone, or even refuse.

Future developments of the present framework may help overcoming the already mentioned lack of prescriptive tools for UX design. Indeed, given the relational properties of affordances, it could be possible to move to a prescriptive level by exploiting the knowledge about their constituents: for instance, among the constituents of Experiential Affordances it is possible to recognise the psychological needs of users, the features of the objects and the usage mode. A suitable topic for future research is related to the analysis of the usage modes of certain artefacts, for instance to individuate situations in which usually users are in telic or paratelic mode. This would facilitate the development of features capable not only of fulfilling one or more psychological needs, but also of supporting users' usage mode. Another interesting field for future investigations regards the whole class of products that enable (and in some cases even invite to) the fulfilment of be-goals by means of alternative uses of products (Cascini et al., 2011), under the light of the presented framework.

Summarising, this paper tried to address two topics of discussion in User Experience research; in both cases the turn to affordances, despite being only a preliminary step, represents a valuable path for reaching a way out of the exposed issues. Nevertheless, the presented framework presents some limitations, which are analysed in the following paragraph.

4.2 *Limitations of the proposed framework*
The framework exposed in Section 3, albeit quite general, appears to be properly suitable not for every kind of interactive products. For instance, let us

consider a decorative object, such as a souvenir. A souvenir may be judged as an interactive object, although users' interaction with it is mostly a *contemplative* one, and may trigger pleasurable experiences as well. Furthermore, it may in some cases afford pragmatic uses: for example, a knick-knack may easily become a paper holder. Nevertheless, the proposed framework seems to be more relevant to products intended for more *transformative* interactions. A further limitation is that the framework aims at describing UX in interaction, while it is currently not suitable for analysing its evolution over time (Kujala, Roto, Väänänen-Vainio-Mattila, Karapanos, & Sinnelä, 2011).

The presented work reflects a Gibsonian view upon affordances, considering them in a binary way as existing or not existing. As McGrenere and Ho (2000: p 2) argued, this formulation does not address the grey area where an action possibility exists but it can only be undertaken with great difficulty: for example, a stair that is climbable but only with great difficulty. At the moment, the framework does not include tools for evaluating the quality of affordances. Thus, with special concern to Experience Affordances, the introduction of measurable indicators of the 'degree' of existence may end up with being a valuable tool for assessing the quality of designs.

Finally, the framework is focused on an individual level. At the current stage, the experiences with products when situated in social interactions (Battarbee, 2007) were out of the scope of this work. Indeed, the processes of co-experiences are considered in the model only in situations where the need to be fulfilled is a social one, such as relatedness or popularity.

4.3 Conclusions

In previous studies, the quality of interaction was found to be one among the most important aspects determining the success of a product. In order to underline such relevance, design practitioners have focused on the whole user experience with products, approaching it by different points of view. Nevertheless, an experience cannot be designed nor guaranteed: it can only be designed for, or in other words afforded. Interactive products should then afford the experiential to users, in order not only to trigger pleasure when the users are in the proper usage mode, but also to avoid provoking frustration in case the users simply need to fulfil a basic task. The framework presented herein helps conceptualising such aspects and sets the basis for further attempts to provide designer with guidelines on how to design for experiences.

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