The X Factor
Defining the Concept of Experience

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Abstract. The term User Experience has become mainstream. But what is an experience? In this paper I will give a definition of the concept, explaining it within the paradigm of evolutionary psychology. I will briefly describe its main components (executive functions, episodic and semantic memory), mechanisms (learning, reinforcement, evaluation), and goals (the motivational system and the inclusive fitness). Finally, I will provide some reasons of the usefulness of an explicit definition of experience, both within an academic context and the design and business practice.

We use our own experience and memory and wisdom and art Anaxagoras - Fragment 21b.

1 Introduction

The term user experience is 30 years old [26]. It has an official definition (ISO 9241-210), and is gaining momentum: a growing number of professionals define themselves as user experience designers, and the importance of the uxd is increasingly recognized by the industry.

Nonetheless, the concept remains elusive: Hassenzahl [20] calls it an *evasive beast*, Law et al. [27] gave five different definitions, the site All About UX cites 27 different *user experience definitions*.

Though some common elements recur, the concept seems more a family resemblance than a core concept: ux is seen as a holistic, multidisciplinary approach to design, where information architecture, interaction design, information design, graphic design, usability, accessibility, content management converge to the final product or service.

The concept of experience is usually only implicitly defined, and different aspects of it are usually reported: the needs; the perceptions and responses of the user to the product; how a person feels; the experiential, affective, meaningful and valuable aspects; the result of motivated action; the past experiences and the expectations; the interaction of internal states, a system, and a context; a momentary, primarily evaluative feeling.

Even when explicit definitions of experience are proposed [13,16], the authors are usually "not interested in experience per se but in experience in relation to interactive products" [21].

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If, in the last 30 years, a formal definition of the x of ux is still not emerged, is it really necessary? As a teacher in a course of human computer interaction I find the lack of an explicit and comprehensive definition of the concept particularly frustrating. Furthermore, I believe that a *working* conceptualization of experience could help the community to identify a shared methodology of research, analysis, design and evaluation of a product or service.

2 The Definition of the Concept

The Oxford dictionary defines the noun experience as

- Practical contact with and observation of facts or events
- The knowledge or skill acquired by experience over a period of time, especially that gained in a particular profession by someone at work
- An event or occurrence that leaves an impression on someone

The three meanings refer to 3 related but different things:

- the phenomenological experience of the conscious *me-here-now*
- the episodic memory of *memorable* experiences [28]
- the process of abstraction of a number of experiential episodes in a pattern/scheme/script [37]

The first meaning represents *what I'm experiencing right now, here.* If I'm mindless of what is happening, and if what is happening is nothing new (for example, I'm reading a book while I'm commuting, and nothing unusual happens) this event will somehow reinforce my scheme of that kind of event (the scheme of commuting) and I will forget the specific event [38]. If I'm living something new, or if something unexpected and worth noting happens, however, I will remember the most salient events of the episode.

To identify the commonalities of the different meanings of the term experience, I propose a definition of the concept based on its main attributes.

In my definition, a **prototypical** experience is the subjective, conscious, intentional representation of an episodic autobiographical event:

- it has a strong phenomenological grounding, and is lived as a non mediated, immersive flow of consciousness;
- is usually triggered by a motivation
- can be imagined, and therefore mentally anticipated
- can be the result of a decisional process, a choice
- can be planned, at different levels of detail
- can be remembered
- is usually subject of evaluations: before, during and after
- can trigger a learning process
- can become a habit

The episodic and semantic memory and the executive functions are at the basis of the experiences. From a phenomenological perspective, an experience is a temporal window of the salient events that happened, are happening or are expected or planned to happen. From the past, present or future experiences we can build mental representations. Those representations integrate a causal and motivational dimension (why), a temporal dimension (when), a spatial dimension (where), and are formed by instances of conceptual classes (what) and possibly other people (who).

Concepts are organized in semantic networks and in hierarchies (taxonomies). The temporal, causal and spatial dimensions are hierarchically organized as well. The causal dimension is organized in goals and task hierarchies.

3 An Evolutionary Perspective

To understand the role and the functions carried out by the experiences, it is useful to adopt an evolutionary perspective [9]. The evolutionary psychology is based on the assumption (shared with the evolutionary biology) that the purpose of all living beings is their inclusive fitness [29].

In a complex environment, the inclusive fitness can be better achieved trough the cultivation of a number of material and non material goods. An individual with good skills, a solid social network, living in a favorable environment and owning some material goods has greater chances to maximize her inclusive fitness. Following this reasoning, it is assumed that the basic needs (living in a safe environment, physical and mental health, good relationships, material and economic resources, autonomy, competence, identity, meaning [11,12,15] are assets that increase the odds to maximize the inclusive fitness of the individual [18,25]. Humans, therefore, evolved the drive to satisfy those basic needs, because this enhanced their inclusive fitness. This hypothesis extends the results of the use of an intrinsically motivated reinforcement learning system of an artificial agent [34].

Affective and cognitive functions are seen as *adaptations*: "mechanisms or systems of properties crafted by natural selection to solve the specific problems posed by the regularities of the physical, chemical, developmental, ecological, demographic, social, and informational environments encountered by ancestral populations during the course of a species' or population's evolution" [41].

The satisfaction of the basic needs becomes the *ultimate goal* [33]. The cognitive an affective systems evolved to orient the individual to identify and fulfill both the ultimate and the proximate goals, to explore and to exploit the environment.

3.1 Learning

Knowledge transforms information into decision making to increase the inclusive fitness trough the satisfaction of the basic needs and proximate goals. Learning is, in the evolutionary perspective, a form of adaptation.

From the evolutionary perspective, the function of the learning mechanisms is to improve the fitness, by mapping the environment and the behaviors that decrease the risk of dangers and increase the odds to fulfill one's needs.

Humans (and other animals) use two different strategies to learn to choose actions that lead to positive and prevent negative outcomes [2]: model based and model free (or value based). Model based strategies involve an internal representation of the environment, whereas model free ones associate a behavior within a context and it's *reward history* [42].

The model-based mechanism consists in the ability of the agent (biological or artificial) to build an internal, dynamic representation of a physical or conceptual environment. The main advantage is that a *journey* within a model is much more economical and less risk prone.

Some nodes and paths of the conceptual space have an affective valence, because they represent dangers or aversive situations (negative valence) or the satisfaction of goals, subgoals or basic needs (positive valence).

Trough the simulation it is possible to identify - and memorize - some paths; this corresponds to the planning process. Every choice we make at any junction corresponds to a decision making process.

The main disadvantage of this mechanism is that a systematic, brute force exploration of the conceptual space is prone to a combinatorial explosion, and it becomes necessary to employ some heuristics. The process of generalization of experiences in schemas constitute the main heuristic: every time an individual encounters a situation that is similar to a known pattern, she uses the schema as the model, and tends to adopt those behavioral paths that correspond to the past experiences [36] and reinforcements [7], therefore using the model-free mechanism of habits as well [10].

3.2 Planning

Szpunar [39] define planning as a multicomponent process that operates at various levels of abstraction and serves as a predetermined course of action aimed at achieving some goal. It involves defining a variety of goals and subgoals, prioritizing those goals, monitoring one's progress, and reevaluating the original plan. Planning is the process of identification and memorization of a path in a conceptual space. The process implies the identification of the goal and of the possible routes. The representation is hierarchical: the main goal is subdivided in subgoals, in a recursive way. The agent estimates the value of the main goal, the cost of the tasks (in terms of resources, time, physical and psychological fatigue) and their possible intrinsic value.

This metaphor is a spatial one: the navigation of a conceptual space, the identification of a path, the journey. What individuals plan is, however, a sequence of behaviors and actions. [31] use the theater metaphor: the agent is a director that images a plot, trough the recombination of episodic elements within the structure of schemas and scripts (episodic simulation). Both the planning and the evaluation assume the form of mental travels, away from the egocentric *me-here-now*, in space, in time - toward the future for the planning, toward the

past for the evaluation of past or ongoing experiences - and in the mind of other agents (theory of mind) [1,19,35].

The ability to simulate specific future events plays an important role in the planning process. The constructive episodic simulation hypothesis contends that episodic memory provides a source of details for (future) event simulations [1]. The constructive nature of episodic memory allows the flexible recombination of such details into a coherent simulation.

Episodic simulation supports autobiographical planning, trough the cooperation between the episodic memory system, that provides the content, and executive control processes, that allows the buffering and co-ordination of information [4].

3.3 Executive Functions

Executive functions play a fundamental role in devising, implementing, updating and evaluating plans and goal directed behaviors [5,14,22]. Inhibitory control, working memory and cognitive flexibility are the three main components of the executive functions. The working memory has the role to integrate temporally separate units of perception, action, and cognition into a sequence toward a goal [24], and to actively *play* with the representation. Inhibitory control allows us to avoid the distraction of salient internal or external stimuli that are in conflict with the plan and the goal. Cognitive flexibility allows to shift between subgoals (for instance, when a task is over), to identify creative and innovative ways to behave, and to adapt to unforeseen circumstances.

The dialog between executive functions, episodic and semantic memory allow the agent to:

- identify and represent the goal, map the goal hierarchy
- identify the *path*: the sequence of actions to reach the goal, and the sub-goals
- keep the goal and the path in mind
- at any juncture, start the appropriate action
- inhibit the alternative actions and the cognitive processes that can interfere
- monitor the action and detect any significant mismatch between the plan and the execution
- when required, update the plan; when opportune, modify the goal.

3.4 Evaluation

An important component of both learning mechanisms is the evaluation of the outcome and of the process that lead to it: only what *works* is reinforced. The evaluation, in the model-free mechanism, is mainly based on the dopaminergic liking-wanting system. The evaluation process of the model-based system, on the other hand, is much more complex, and is based on different mechanisms:

- the dopaminergic system, that is able to reinforce even the anticipation and the simulation of the experience;

– the cognitive evaluation of the process and the outcomes;
– the affective, emotional evaluation, both before, during and after the experience.

The evaluation of an experience depends also on its motivations: when extrinsic, goal oriented, the evaluation is mainly cognitive; when intrinsic, experience oriented, the evaluation is more emotional.

The Affective System. Within the perspective of evolutionary psychology, the main functions of the affective system are focused on:

– affective forecasting: the emotional anticipation of a simulated experience [17]
– the orientation of the behavior [40]
– the emotional evaluation of an ongoing or past experience [32].

3.5 Motivations

From a motivational perspective, it is possible to differentiate intentional experiences (those events we choose to live) and unintentional ones (events that happens but are not the result of any sort of decision from the subject). Intentional experiences can be differentiated between habits (model-free), goal oriented (model-based) extrinsically motivated experiences, and intrinsically motivated experiences. Among intrinsically motivated experiences, it could be useful to differentiate hedonic and eudaimonic motives.

It is important to observe that such categories are not mutually exclusive. Experiences are very often a mix of non intentional events, habits, goals and intrinsic motivations. Image a lunch with your colleagues; the lunch is a habit (every working day, at 1 pm, usually at the same restaurant), it is goal oriented (eating some food), it has some hedonic (that delicious dessert) and some eudaimonic aspects (spending time with the colleagues). If the restaurant is closed, and you are forced to take something at the fast-food nearby, the experience has an unintentional component.

In differentiating between hedonic and eudaimonic motives I will adopt the distinction made by Huta and Ryan [23]: the main function of hedonia is the self-regulation of emotions, and it's effect is strongest at the immediate or short-term time scale. The function of the eudaimonic motivated experiences is to fulfill at least one of the basic human needs (relationship, competency, autonomy, identity, self esteem, meaning). The two motivations tend to overlap (eudaimonic experiences tend to be associated by positive affect and emotions).

4 The Functions of Experiences

Experiences play a central role in both model-free and model based systems. The model-free learning mechanism requires the direct experience, and can not be mediated. It does not necessarily require, however, the full phenomenological

consciousness of the individual, and therefore does not always represent the typical experience.

The model-based system is more complex, and it allows different types of learning. A direct experience is not always required in the learning and decision making processes: cultural, mediated learning has an important role in both semantic acquisition and models building. Its most important way of learning, however, is trough direct, conscious experiences: they are by far the most important sources of the internal representations. The schemas that are formed by the generalization of recurrent experiences [8] are one of the models of internal representation upon which the goal oriented behavior is based. Episodic details - memorable experiences [3] - are another essential source for planning and decision making.

The model-based system uses all the three main ingredients of what we consider experience.

1. The schemata and the scripts that arise from the process of generalization of the experiences are at the basis of the internal representation of the model. The schemata build upon recurrent experiences constitute the building blocks for the model based reasoning.
2. The memorization of the most salient features and gestalts of an episode [3] allow to represent the outliers of the schema, and to give phenomenological color to the model. The specific episodic memories are necessary for:
   - identify specific environmental patterns (special cases)
   - estimate both the plausibility and the expected value of simulated scenarios
   - keeping track of the ongoing plans
3. The dialog between the executive functions, the episodic and the semantic memory allows the system to generate the representation, identify the goal, the plan, the tasks and actions, monitor the execution and the events, and correct the action or adapt the plan.

4.1 The Role of Products and Services

People can have experiences without products and services. Technology, tools and cooperative behaviors, however, are part of the material and non-material culture that co-evolved with the humankind, shaping our environment, our genes and our brain. Within the metaphor of planning as a journey towards a goal, artifacts and services constitute bridges that enable a path, or make it more convenient, easier, smoother, or pleasurable. In the evolutionary perspective, artifacts and services are *adaptations* in the same definition we cited in the previous paragraphs. The product-as-bridge can be seen as the basis of the design as problem solving, and constitutes a proximate explanation [33]. The product-as-adaptation constitutes an ultimate explanation, and is compatible with the iterative view of design as a dialog.

Technology can have an important role in helping people to fulfill their goals and satisfy their needs [20], and in the most recent drafts of the ISO 9241-11

revision it is recognized that products, systems and services can help a person to satisfy a wide range of goals [6]: output related outcomes, personal outcomes, usability outcomes, and safety goals like security and privacy.

5 The Utility of the Definition

I felt the urge to identify a definition of experience when, as a teacher of a HCI course, I attempted to explain what the user experience is. My feeling was that the main differences between the many definitions of ux were attributable to different, implicit concepts of experience and that, therefore, an explicit definition would have been a useful basis of explanation.

A second reason that motivated me to seek a founding definition was the observation that my syllabus was a list of topics and methods without a systematic organization; the definition justify the study those topics as the building blocks of experiences: the motivations, the definition of knowledge, the episodic and semantic memory, the executive functions, and the mental models.

Third, this perspective can help students (and practitioners and stakeholders) to resist the temptation to begin designing without a research phase. The experience perspective induces the designer to start a project by trying to identify the needs, attitudes, internal schemes and mental models, to produce experience maps and customer journeys, using tools and elicitation methods like interviews, laddering, task analysis, experience journey mapping, free listing, triadic sorting, and repertory grid.

Finally, it can have the strategic function to help an organization to find a competitive advantage trough positioning.

In his classic *What is strategy*, Porter [30] defines strategy as competitive advantage, that can be reached by strategic positioning or by improving the value chain. There are three ways to acquire a competitive advantage: doing something that is cheaper, or better, or different. Improvements in the value chain can guarantee a cheaper or a better product. Strategic positioning is oriented at creating a different product.

Studying the individuals' experiences, their motivations, their attitudes helps to identify unfulfilled needs, encouraging the exploration of spaces and opportunities of strategic positioning.

The user experience design, with his emphasis on the usability and the experiential components, can have a dramatic impact on the value chain of a product, or system, or service. The combination of experience research and ux design can become a central asset in the definition of the strategy and in reaching a sustainable competitive advantage.

References

1. Addis, D.R., et al.: Hippocampal contributions to the episodic simulation of specific and general future events. Hippocampus **21**(10), 1045–1052 (2011)
2. Akam, T., Costa, R., Dayan, P.: Simple plans or sophisticated habits? State, transition and learning interactions in the two-step task. In: bioRxiv, p. 021428 (2015). doi:10.1101/021428

3. Ariely, D., Carmon, Z.: Gestalt characteristics of experiences: the defining features of summarized events. J. Behav. Decis. Making **201**, 191–201 (2000)
4. Baird, B., Smallwood, J., Schooler, J.W.: Back to the future: autobiographical planning and the functionality of mind-wandering. Conscious. Cogn. **20**(4), 1604–1611 (2011). doi:10.1016/j.concog.2011.08.007
5. Banich, M.T.: Executive function: the search for an integrated account. Curr. Dir. Psychol. Sci. **18**(2), 89–94 (2009). doi:10.1111/j.1467-8721.2009.01615.x
6. Bevan, N., Carter, J., Harker, S.: ISO 9241-11 Revised: What Have We Learnt About Usability Since 1998?, pp. 143–151 (2015). doi:10.1007/978-3-319-20901-2_13. ISBN: 9783319209005
7. Bulganin, L., Wittmann, B.C.: Reward and novelty enhance imagination of future events in a motivational-episodic network. PloS One **10**(11), e0143477 (2015)
8. Conway, M.A.: Episodic memories. Neuropsychologia **47**(11), 2305–2313 (2009). doi:10.1016/j.neuropsychologia.2009.02.003
9. Cosmides, L., Tooby, J.: Better than rational: evolutionary psychology and the invisible hand. Am. Econ. Rev. **84**, 327–332 (1994)
10. Daw, N.D., et al.: Model-based influences on humans' choices and striatal prediction errors. Neuron **69**(6), 1204–1215 (2011). doi:10.1016/j.neuron.2011.02.027
11. Deaton, A.: Income, health and wellbeing around the world: evidence from the Gallup World Poll. J. Econ. Perspect. J. Am. Econ. Assoc. **22**(2), 53 (2008)
12. Deci, E.L., Ryan, R.M.: The what and why of goal pursuits: human needs and the self-determination of behavior. Psychol. Inq. **11**(4), 227–268 (2000)
13. Desmet, P., Hekkert, P.: Framework of product experience. Int. J. Des. **1**(1), 57–66 (2007). doi:10.1162/074793602320827406. eprint: z0024
14. Diamond, A.: Executive functions. Ann. Rev. **64**(1), 135–168 (2013). doi:10.1146/annurev-psych-113011-143750. eprint: NIHMS150003
15. Diener, E., et al.: Wealth and happiness across the world: material prosperity predicts life evaluation, whereas psychosocial prosperity predicts positive feeling. J. Pers. Soc. Psychol. **99**(1), 52 (2010)
16. Forlizzi, J., Battarbee, K.: Understanding experience in interactive systems. Hum. Comput. Interact. Inst. **37**(2), 261–268 (2004). doi:10.1145/1013115.1013152
17. Gilbert, D.T.: Prospection: experiencing the future. Science **317**, 1351–1354 (2007). doi:10.1126/science.1144161
18. Griskevicius, V., Kenrick, D.T.: Fundamental motives: how evolutionary needs in uence consumer behavior. J. Consum. Psychol. **23**(3), 372–386 (2013). doi:10.1016/j.jcps.2013.03.003
19. Hassabis, D., Maguire, E.A.: Deconstructing episodic memory with construction. Trends Cogn. Sci. **11**(7), 299–306 (2007). doi:10.1016/j.tics.2007.05.001
20. Hassenzahl, M.: User experience and experience design. In: The Encyclopedia of Human-Computer Interaction, 2nd edn. (2013)
21. Hassenzahl, M.: User experience (UX). In: Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine - IHM 2008, p. 11. ACM Press, New York (2008). doi:10.1145/1512714.1512717. ISBN: 9781605582856
22. Hofmann, W., Schmeichel, B.J., Baddeley, A.D.: Executive functions and self-regulation. Trends Cogn. Sci. **16**(3), 174–180 (2012). doi:10.1016/j.tics.2012.01.006
23. Huta, V., Ryan, R.M.: Pursuing pleasure or virtue: the differential and overlapping well-being benefits of hedonic and eudaimonic motives. J. Happiness Stud. **11**(6), 735–762 (2010). doi:10.1007/s10902-009-9171-4

24. Jurado, M.B., Rosselli, M.: The elusive nature of executive functions: a review of our current understanding. Neuropsychol. Rev. **17**(3), 213–233 (2007). doi:10.1007/s11065-007-9040-z
25. Kenrick, D.T., et al.: Renovating the pyramid of needs contemporary extensions built upon ancient foundations. Perspect. Psychol. Sci. **5**(3), 292–314 (2010)
26. Laurel, B.: Interface as mimesis. In: Norman, D.A., Draper, S.W. (eds.) Chap. 4, pp. 67–85. Lawrence Erlbaum Associates (1986)
27. Law, E.L.-C., et al.: Understanding, scoping and defining user experience. In: Proceedings of the 27th International Conference on Human Factors in Computing Systems - CHI 2009, p. 719 (2009). doi:10.1145/1518701.1518813
28. Pine, B.J., Gilmore, J.H.: Welcome to the experience economy. Harvard Bus. Rev. **76**(4), 97–105 (1998)
29. Ploeger, A.: Evolutionary psychology as a metatheory for the social sciences. Integr. Rev. **6**, 164–174 (2010)
30. Porter, M.E.: What is strategy? Harvard Bus. Rev. **74**(1645), 61–78 (1996). doi:10.1098/rspb.2008.0355. eprint: z0022
31. Schacter, D.L., Addis, D.R., Buckner, R.L.: Episodic simulation of future events: concepts, data, and applications. Ann. NY Acad. Sci. **1124**, 39–60 (2008). doi:10.1196/annals.1440.001
32. Schwarz, N.: Feelings-as-information theory. Handb. Theor. Soc. Psychol. **1**, 289–308 (2011)
33. Scott-Phillips, T.C., Dickins, T.E., West, S.A.: Evolutionary theory and the ultimate-proximate distinction in the human behavioral sciences. Perspect. Psychol. Sci. **6**(1), 38–47 (2011). doi:10.1177/1745691610393528
34. Singh, S., Barto, A.C., Chentanez, N.: Intrinsically motivated reinforcement learning. In: 18th Annual Conference on Neural Information Processing Systems (NIPS), vol. 17(2), pp. 1281–1288, June 2004. doi:10.1109/TAMD.2010.2051031
35. Spreng, R.N., Mar, R.A., Kim, A.S.: The common neural basis of autobiographical memory, prospection, navigation, theory of mind, and the default mode: a quantitative meta-analysis. J. Cogn. Neurosci. **21**(3), 489–510 (2009)
36. Suddendorf, T., Addis, D.R., Corballis, M.C.: Mental time travel and the shaping of the human mind. Philos. Trans. R. Soc. B Biol. Sci. **364**(1521), 1317–1324 (2009). doi:10.1098/rstb.2008.0301
37. Sweegers, C.C.G., et al.: Neural mechanisms supporting the extraction of general knowledge across episodic memories. NeuroImage **87**, 138–146 (2014). doi:10.1016/j.neuroimage.2013.10.063
38. Sweegers, C.C.G., et al.: Mental schemas hamper memory storage of goal-irrelevant information. Front. Hum. Neurosci. **9**, 629 (2015). doi:10.3389/fnhum.2015.00629
39. Szpunar, K.K.: Episodic future thought: an emerging concept. Perspect. Psychol. Sci. **5**(2), 142–162 (2010). doi:10.1177/1745691610362350
40. Tamir, M.: What do people want to feel and why?: Pleasure and utility in emotion regulation. Curr. Dir. Psychol. Sci. **18**(2), 101–105 (2009). doi:10.1111/j.1467-8721.2009.01617.x
41. Tooby, J., Cosmides, L.: The psychological foundations of culture. In: The Adapted Mind: Evolutionary Psychology and the Generation of Culture. Routledge, August 1992. doi:10.4324/9781410608994. ISBN: 1135648158
42. Wunderlich, K., Smittenaar, P., Dolan, R.J.: Dopamine enhances model-based over model-free choice behavior. Neuron **75**(3), 418–424 (2012). doi:10.1016/j.neuron.2012.03.042

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