The Experiential Utility
How Behavioural Economics Can Help HCI to Define Quality

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Abstract. Economists define utility as the total satisfaction received from consuming a good or service. Neoclassical economics assume that humans act as perfectly rational agents whose ultimate goal is to maximize their subjective utility. Behavioral economists and psychologists, however, showed that people behave in ways that violate the neoclassical axioms, and follow a number of cognitive heuristics. Nonetheless, the concept of utility is useful, psychologically intuitive, and there is some evidence that some regions of the primates' brain encode a form of "common currency" of the value of a good [21].

I will present an experiential utility model that is psychologically plausible, and the main dimensions of the model will be mapped on an experiential utility space. The practical applicability of the map will be shown in a case study where two types of insurance companies - traditional (broker mediated) and direct (online) companies will be mapped on the dimensions of the experience utility map.

Neoclassical economists assume that people behave and think as perfect rational agents, the so called homo economicus.

If they were right, the hci field would be quite different. Even the concept of quality would be useless, because it would be translated in a form of expected value formula. Behavioral economists and psychologists, however, showed that the human behavior systematically differ from what predicted by the neoclassical school.

The first reason of that difference has been attributed to the bounded rationality: humans lack the computational resources to calculate the expected utility of every choice. A second stream of research showed that humans tend to rely on a number of heuristics instead of basing their decisions on the expected utility theorems.

Those researches proved that humans do not behave as the rationalist model expected. But there are reasons to believe that even for an artificial intelligence would be impossible to become an Olympian Rationality decision maker.

The first reason is grounded in computational theory: the computational complexity of many real world problems exceeds the power of the best computers, and many problems are even undecidable.

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A second problem is intrinsic to the rational models: to avoid the complexity of the distinction between risk and uncertainty, they assume that the probability estimates of any outcome should be subjective. This choice opens the gates to - well - subjectivity and heuristics. It looks like there can be no intelligence without heuristics.

The distinction between risk and uncertainty has been developed by Knight and Keynes in the twenties [32]. Risk is when probabilities are well-understood, uncertainty when there is insufficient information to form a probability judgment [31]. The subjective utility model is reasonable when the agent needs to handle risks, but becomes inapplicable when probabilities are uncertain, because the Bayesian inference is not rich enough to describe one's degree of confidence in one's assessments. [18]

When the problem is too complex, or the information is insufficient, a less analytical and more heuristic approach becomes mandatory. Indeed, there is increasing evidence that complex judgment tasks do not always need complex cognitive strategies to be solved successfully [28], and in some circumstances simpler rules lead to better performances than complex, rationalist approaches [29].

An evolutionary perspective sees heuristics as adaptations: the assumption is that the ultimate goal of cognition is to increase the reproductive fitness of genes, not to increase the rationality of humans [43]. Within this framework, human performance is assumed as normative.

If we accept the criticism to the rationalist approach, the rational utility theories will loose also their status of normative model. Nonetheless, they would maintain both a practical and a theoretical value. From a practical point of view, whenever applicable, the rational approach remains the best *weapon of choice*. From a theoretical perspective, it still constitutes the most important point of reference: the entire field of behavioral economics bases its research paradigms on the differences from the rational models.

The most important models of rational behavior are the Utility Theory proposed by Morgenstern and von Neumann, the Savage's Subjective Expected Utility Model, the Weighted Sum Model.

Although different, the models are based on two parts, conceptually similar to the map and reduce approach of some functional languages [9]. The map part applies a function to the relevant dimensions of the problem (the outcomes, in the Savage model, the features in the weighted sum model). The reduce function takes the vector provided by the map and generate a smaller vector (often a single value, like the utility value).

The aim of this work is to begin to define a framework - based on the evidences of the behavior economics - to estimate the subjective quality of an experience.

1 The Experiential Utility Model

The framework is based on the same two steps: the definition of the rules of the *reduce* function, and the identification of the dimensions to be mapped on the mapping function. I'm dividing the two steps for three reasons: for a matter of

clarity, because it is conceptually similar to the utility models, and because I believe the reduce function can be applied on different mapping functions, and it should be as *universal* as possible, whereas the mapping functions can be adapted on the specific knowledge domains.

The reduce function here proposed assumes that:

- the output value is not cardinal, but ordinal
- it is an estimate based on the affect heuristic
- the positive and the negative values are evaluated separately;
- it is influenced by:
  - the sum of the positive and the negative elements
  - the mean of the positive and of the negative elements
  - the maximum and the minimum (the absolute maximum of the negative elements)
  - the outcome (the end rule) of the experience

The mapping function is assumed to be a weighted vector of the following dimensions of an experience:

- the instrumental, extrinsic, functional value;
- the intrinsic value: its ability to fulfill one or more human basic needs, personal values, or interests;
- the ability to form an habit, or to become part of an existing one;
- the economic costs, in terms of money or the use of other valuable resources;
- the cognitive costs;
- the physical effort;
- the emotional component;
- the psychological time

1.1 The *reduce* Function

The assumption I'm making is that the synthesis humans make from the mapping of the salient dimensions of the choices is far more complex than a simple sum of the positive and negative values.

First, we tend to base our decisions both on cognitive and affective evaluations. Second, negative values are not just subtracted from the positive ones. Third, the gestalt of a past or foreseen experience is remembered (or imagined) and evaluated [17], and some characteristics (the maximum positive and negative aspects, and the outcome) are more salient and play a greater role in the utility evaluation. Forth, there is evidence that often the mean, and not the sum of the values is used in evaluating an option.

The Affect Heuristic. One of the characteristics of the experiential system is its affective basis [42]. Decisions are often based on subjective affective responses to the options, that humans believe is indicative of the options' values [34]. This process is known as *affect heuristic* or *feelings-as-information* [38]: people may

integrate - or just simplify - the judgmental task by asking themselves "How do I feel about it?". Slovic et al. [41] define affect as "the specific quality of goodness or badness (a) experienced as a feeling state (with or without consciousness) and (b) demarcating a positive or negative quality of a stimulus".

The affect heuristic is linked with affective forecasting, the prediction of how one will feel in the future. Affective forecasting can be divided into four components: predictions about emotional valence, the specific emotions experienced, their duration, and their intensity [47]. Affective forecasting has also the role to motivate the action of the agent, and feelings can signal the fitness value (and therefore the utility) of future events and choices.

In accordance with the evolutionary paradigm, the affect heuristic is not necessarily seen as a negative bias, because reliance on affect and emotion is a quicker, easier, and more efficient way to navigate in a complex, uncertain, and sometimes dangerous world [42].

1.2 The Gestalt of the Experience

Experiences can be remembered and imagined [7]. Tulving [46] defined the episodic memory as a time travel machine that allow us to mentally travel back to the past and forward to the future. The episodic memory summarizes the past experiences, retaining some important gestalt: the trend of the experience, the most intense moments and, if the experience is extrinsically motivated, it's end [2,22].

1.3 The Mean: More Is Less

List [26] did a field experiment at a sportscards show; the experimental design was an auction: a group of participants had to make a bid for a set of 10 good sportscards; another group had to make a bid for a set of 13 pieces: the same 10 good ones, and 3 poor ones. The mean offers for the set of just 10 cards was higher than the one of the 13 cards.

Kralik [24] showed the same result when testing nonhuman primates: when given a choice between a greater good alone versus the greater good together with a lesser one, the monkeys preferred the greater good alone, contrary to the utility maximization normative model.

In some circumstances, therefore, the mean, and not the sum of the values is used to evaluate different options.

2 The Mapping Function

The subjective utility models are completely abstract and universal: no assumption is made about which aspects an agent takes into account in evaluating the utility of a choice. The assumption I'm making here is that a limited number of experiential dimensions are evaluated, usually unconsciously, by human decision makers.

In this Sect. 1 will analyze some of the dimensions of the experiential utility model.

2.1 Motivation

Human behavior can be intrinsically motivated, extrinsically motivated or the result of habits.

Within the reinforcement learning paradigm, habits are described as a model-free mechanism, whereas goal oriented behavior as model-based [19].

A model-free system learns action values directly, by trial and error, without building an explicit model of the environment, and thus retains no explicit estimate of the probabilities that govern state transitions. In a model-based system, a cognitive map or model of the environment is acquired, which describes how different "states" (or situations) of the world are connected to each other. Action values for different paths through this environment can then be computed by a sort of mental simulation

The model-free mechanism avoids the representation of the structure of the activity and works by reinforcing successful actions. The goal-directed mechanism works by using an "internal model" of the task to evaluate candidate actions and outcomes [8].

Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable; extrinsic motivation refers to doing something because it leads to a separable outcome [36]. Intrinsic motivation is defined as the motivation to perform an activity for its own sake in order to experience the pleasure and satisfaction inherent in the activity. Extrinsic motivation focuses more on the consequences to which the activity leads than on the activity itself [13].

The Self-Determination Theory assumes that activities are intrinsically motivated when they provide satisfaction of basic psychological needs [36].

2.2 Goals

Fishbach and Ferguson [14] define a goal as a cognitive representation of a desired endpoint that impacts evaluations, emotions and behaviors.

Goals are represented in memory, can be activated, can be linked to multiple memories, as a wide array of interconnected memories related to the goal.

Goals contain information about end states, the reference points toward which behavior is directed. They can have different level of abstractness. They include the plans, behaviors and objects that enable one to reach that end state.

End states can be seen as means for higher-order goals, within a hierarchical organization. The end state has to be desirable, and has to be associated with a positive affect. This gives it a motivational force, linked to the value of the end state and it's attainment.

When people are actively pursuing a goal, they want (desire) those things that can help them achieve the goal, and should not want those things that prevent them from reaching the goal.

There is a relationship between goals and values [15]:

- priming a goal increases the value of the end state
- people assign positive value to things that are conducive for goal achievement and negative value to things that are detrimental for goal achievement.

- goals involve emotion and energy mobilization. People feel happy, satisfied, and/or relieved when they achieve a goal; they feel frustrated, tense, and/or depressed when they fail to achieve the goal; and they feel energized, eager, or vigilant in the process of striving toward the goal.
- goals are sensitive to changes in value—they become stronger or weaker if value increases or decreases, respectively.

2.3 Basic Human Needs

Deci and Ryan [11] define needs as innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being.

Baumeister and Leary [3] identify some criteria to identify fundamental human needs: they are universal, are activated frequently, influence and correlate with subjective well-being, influence cognition and emotions, affect a broad variety of behaviors and elicit goal-oriented behaviors believed to satisfy them. The *fundamental* needs are not derivative of other needs.

The identification of the list of the human needs is a difficult endeavor: different authors have diverse opinions. The following list is the integration of the work of a number of authors and models:

- health and physical wellness [10];
- safety [30];
- material and economical resources [10,12,30];
- the need of self realization, competence, and mastery [11,20,35,39];
- the need of autonomy [11,20,35,39];
- the need of relatedness [11,20,35,39];
- the need to develop an integrated self identity [5,37];
- the need to experience a meaning in life [16,44];
- the need of a good self esteem [4,27];
- pleasure, stimulation and hedonic needs [40].

An experience is supposed to have an intrinsic value if it satisfy at least one of the fundamental needs.

2.4 Cognitive Costs: The Fluency

When people perceive, process, memorize and recall information, they experience and implicitly evaluate the cognitive difficulty of the tasks, and this experience strongly influences judgments and decisions [33].

For example, people tend to associate fluency with truth and disfluency with untruth, feel greater confidence in their performance when a task is fluent. Fluency increases the likeability of a stimulus, its aesthetic value. Fluency tend to elicit positive affect, facilitate the decisional process and decrease the probability of purchase decision deferral.

Increasing trust, likeability, confidence, positive affect may have a strong positive influence on the user experience, improving the satisfaction and the usability of the product.

But how can fluency be obtained? A number of factors have been shown to influence it, and many of them can be directly addressed in the ux design process [1].

1. Perceptual fluency - the ease of processing the physical features of a stimulus
   - figure / background contrast: contrast increases fluency, and there is a linear correlation between contrast and prettiness judgment, and judgment of truth
   - font legibility: smaller fonts decrease the fluency of the task, whereas highly legible fonts increase it
2. Familiarity (mere exposure effect): things that are familiar - or just previously seen - increase the fluency, and are judged in a more positive light
3. Linguistic fluency
   - lexical fluency: using common instead of uncommon words increases fluency, and the author is judged as more intelligent
   - syntactic fluency: the use of simple syntactic construction of phrases
   - information intensity: there is a reversed-u shaped relationship, where too much information decreases fluency
4. Mnestic, categorical and semantic fluency
   - semantic fluency: elements with a common semantic root are processed more fluently, as are terms primed by semantically related concepts; conceptual analogies make subsequent information easier to process;
   - typicality: prototypical members of a category are judged as more fluent
   - memory availability increases fluency
5. Imaginative fluency: stories that elicit immersive imagination and transportation increase fluency
6. Decisional fluency: help the user to decide increases fluency and decreases purchase decision deferral

2.5 Psychological Time

Time plays an important role in the evaluation of an experience. As with the other dimensions, it is the subjective, phenomenological experience of time that is evaluated.

Time plays a role in different ways to the evaluation of an experience: both time discounting and fatigue constitute costs that can be mapped on the temporal dimension.

Time is seen as a cost when an experience is extrinsically motivated, whereas time spent in an intrinsically pleasurable experience is seen as a value. Furthermore, extrinsically motivated task tend to be perceived as boring or demanding. With extrinsically motivated experiences, time is seen as the delay from the onset (or the present moment) and the attainment of the valued goal.

It has been extensively demonstrated that both humans and animals value immediate reward more than delayed reward [23]. People tend to prefer to gain 70 euros now than 100 in a year, even if the difference represents an interest rate

that is really high. People use spatial metaphors to represent time [45], and the values of distant future outcomes are discounted (time is seen as a cost).

Mental fatigue refers to the feeling that people may experience after or during prolonged periods of cognitive activity. They generally involve tiredness or even exhaustion, an aversion to continue with the present activity, and a decrease in the level of commitment to the task at hand [6]. Mental fatigue tend to be observed when the executive functions are recruited for a long time on a task.

Mental fatigue has been associated with impaired cognitive and behavioral performance: tasks that engage executive functions show performance decrements over time [25].

Interestingly, some recent models [25] see mental fatigue as an affective evaluation of the allocation of limited resources (attention and executive functions) over time. Spending time over a task has opportunity costs, and cognitive fatigue is supposed to map the increasing cost in carrying an extrinsically motivated task. This view is consistent with the experiential utility model: time as a resource that becomes a cost if spent in an activity that is not intrinsically interesting.

3 The Experiential Utility Map

The main claim of this work is that the experiential utility of a product or service can influence the intentions of actual and potential users to adopt it. The direct consequence of this hypothesis is that mapping a product on the multidimensional experiential space, and comparing it with the direct competitors, can help designers and stakeholders not only to increase its experiential value, but also to identify a strategic position. Strategic positioning reflects choices a company makes about the kind of value it will create and how that value will be created differently than rivals. We can see the dimensions of experiential utility as the conceptual space where a product or service can find a *profitable market niche*. I will present a case study to exemplify the potential use of the experiential utility map in identifying the different market spaces of two types of insurance companies: the traditional ones, where a broker mediates the relationship between company and clients, and the direct, online companies. We will see that the two types of organizations map on different points of the space, and this can explain the choices of customers with different priorities.

3.1 The Case Study

Last year I was involved in a competitive usability test for an insurance company. Before the test, we interviewed the participants to investigate - among other things - why and how they chose their insurance company. Moreover, we were interested in understanding if they decided to choose a traditional insurance broker or a direct, online insurance. Four different basic motivations emerged from the research, that we synthesized in four personae.

For Ilaria, the first persona, the most important factor is to avoid to waste her time: she is interested in an insurance whose processes are fast and easy. She could accept to spend some more euros if the process can help her to save time.

Marco is price sensitive: he is interested in saving money. He is not very tech-savvy, so he asks her daughter to help him with Internet and the aggregators to find out the less expensive quote.

Alberto is overwhelmed by the complexity of the information required to choose an insurance policy: he is not an expert, and he wants somebody who he can trust and who can guide him with the choice.

Claudio has a brand new car. With the old one, he was price sensitive, mainly interested in saving money. Now, however, he is more interested in the coverage of the policy, and he can accept to spend something more to have better guaranties.

Not surprisingly, Ilaria and Marco opted for a direct insurance, whereas Alberto and Claudio preferred to rely on a broker.

We represented in Fig. 1 the main needs, the influencers, the criteria for the inclusion set, the extension of the research process, the channels used to gather information, the criteria used to make the final choice from the inclusion set, and the channel of subscription (the traditional broker channel vs online).

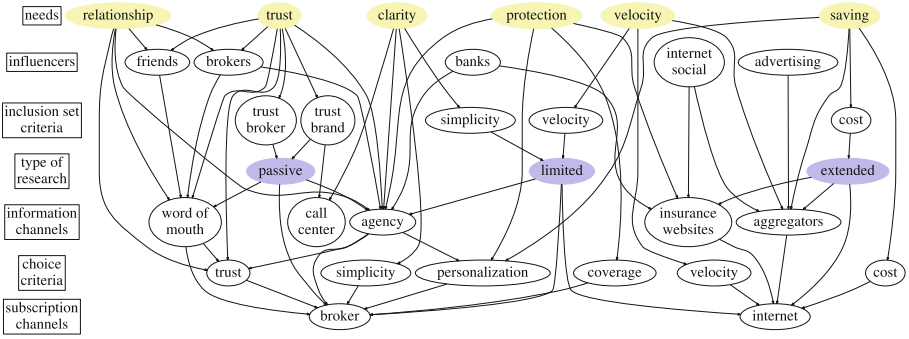

Fig. 1. Motivational graph

Figure 2 represents the positioning of the two kinds of companies on the experience utility map. Direct companies tend to have lower premiums and faster subscription processes. Traditional companies (at least in Italy) have a richer portfolio. Furthermore, people like Alberto appreciate the presence of a broker, who helps him to overcome the complexity of the choice of an insurance product, and who increases him trust in the company. The trust, and the personal relationship with the broker, have been mapped on the intrinsic motivations dimension, and the presence of the broker as a mediator decreases the cognitive costs of the choice.

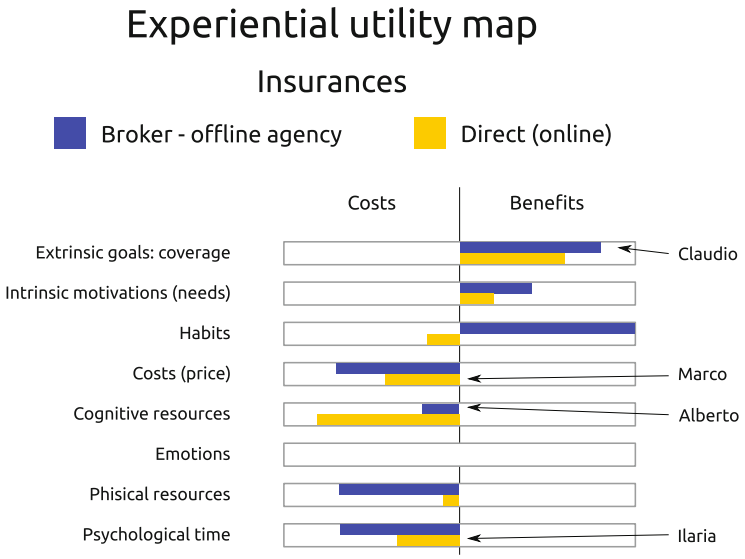

Fig. 2. Experience utility map

4 Conclusions

In this article, I presented a first version of a model of experiential utility. The model is still under development, and some parts need to be refined. Nonetheless, the model defines a multidimensional space that can be used to map the values and costs of a product or service. Positioning a product on the experience utility map can help stakeholders and designers to discover a market niche, identify its strengths and weaknesses and increase its overall quality.

It is often asked if an experience can be designed. The position here held is that ux designers design products and services, not experiences, but they are - at least implicitly - aware that the value of their work is evaluated in experiential terms. The aim of the experiential utility model is to provide a methodological toolkit to design and evaluate the quality of a product or service.

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