A dynamic view on the consumer's utility

Dipl.-Kffr. Marie-Kristin Franke

Universität Hamburg, Arbeitsbereich Marketing und Innovation
Von-Melle-Park 5, 20146 Hamburg, Germany, Tel.: +49 40 42838 7836
Email: franke@econ.uni-hamburg.de

Prof. Dr. Thorsten Teichert

Universität Hamburg, Arbeitsbereich Marketing und Innovation
Von-Melle-Park 5, 20146 Hamburg, Germany, Tel.: +49 40 42838 4643
Email: teichert@econ.uni-hamburg.de

***Abstract**: Not only in marketing utility represents a core construct which is used to explain human decision-making behaviour. Recent research has shown that individual (purchasing) decision-making processes can be understood more profoundly by considering different mental utility phases. Based on this notion we derive a conceptual foundation which integrates the different research streams and which provides a basis for future empirical work. Specifically, we propose a multi-phased concept that helps to provide a dynamic view on the consumer's utility appraisal within the consumption process. It differentiates between five distinct utility stages, through which consumers pass recurringly as time elapses. We propose decision utility as the core component of the consumption process. The subsequent post-decisional and consumption phase is assumed to be dominated by re-evaluation utility and experienced utility. After all remembered utility and predicted utility might direct future decisions and thus moderate the consumer's repeater propensity. Each of the phases will be analysed separately from a marketing and from a neuroeconomic perspective to outline each discipline's contribution to a dynamic schematization of utility. Furthermore possible interactions between the phases and their effect on subsequent purchases shall be considered. The findings of this article might contribute to a more profound understanding of consumer decision-making behaviour and thus may create valuable insights for marketing.*

***Keywords**: Utility, neuroeconomics, dynamic, consumption, decision-making, appraisal*

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Introduction

The consumption process can be regarded as a fundamental variable in marketing. Altogether this includes the consumer's choice of a product or service as well as its ex-post appraisal. Within the consumption process the utility that is attributed to the good before, during or after the purchasing decision can be an essential indicator for the consumer concerning e.g. satisfaction or repurchasing intentions. Thus the consumer's utility appraisal is of great impact for successful marketing and business in general. Consequently maximizing the consumer's utility throughout the (whole) consumption process should be a major objective in marketing. Thus it seems to be important for marketing theory and practise to know how the relatively abstract construct of "utility" is actually conzeptionalized. In classic utility research utility is regarded as a static variable. Recent research has shown though that utility may be considered as a dynamic process which adjusts depending on the specific consumption circumstances.

At the same time it has to be kept in mind that the consumption process itself is quite complex. In order to generate a better and more realistic understanding of this multifaceted process it appears to be useful to examine the diverse conditions before, during and after the actual purchasing decision separately.

Therefore the objective of this conceptional paper is to analyse these diverse sub-processes within the consumption process and to examine to which extent different states of utility can be identified. Our objective is to derive a conceptual foundation which integrates the different research streams and which provides a basis for future empirical work. We combine selective research findings from marketing (particularly consumer behaviour) with neuroeconomic learnings since classical methods of marketing research may not completely reproduce what exactly occurs in the consumers' heads during purchasing decisions. This limitation can be offset with the help of neuroscience. Neuroeconomics combines historically different disciplines and tries to analyse and understand economically relevant behaviour by applying neuroscientific methods (e.g. Camerer et al. 2005; Kenning / Plassmann 2005). Modern imaging techniques (especially functional magnetic resonance imaging (fMRI)) can contribute to a more profound understanding of human decision-making behaviour by making hitherto invisible processes within the brain observable. Consequently numerous

neuroscientific experiments examine human decision-making and appraisal processes (e.g. Schmitz / Johnson 2007). Moreover recent neuroeconomic findings show the additional benefit of the methodology for marketing research, for instance concerning advertising effects during purchasing decisions (Plassmann et al. 2007). Therefore the second objective of this work is to illustrate the benefit and relevance of neuroeconomics for purchasing decisions and appraisal processes.

We compare selective research findings from two inherently different disciplines, marketing and neuroeconomics, in order to present a proposal for a precise distinction of utility phases and thus try to provide a more profound understanding of the purchasing and consumption process. Based on former research we propose a differentiation between five distinct states of utility in total – before, during and after a purchasing decision. From marketing perspective characteristic behavioural scientific phenomena will be listed for each phase along with the associated sub-processes. Then for each sub-process neurophysiologic correlates will be identified, which are of particular relevance for this specific phase. In this way the complex purchasing decision and appraisal process can be broken down into distinct phases with characteristic phenomena.

This paper aims at supporting studies that view utility as a dynamic construct. We contribute to this area of research by integrating several inherently different perspectives and theoretical approaches into one holistic conceptional framework. Our long-term objective is to provide a sound conceptional basis for future empirical research on intertemporal utility dynamics.

Conceptional frame

Classical economic models conceptionalize utility as a static, calculable parameter, which can be computed from the individual's rational expectations concerning the likelihood of an event to occur and its hedonic consequences (e.g. von Neumann / Morgenstern 1947). Findings from empirical psychology improved the concept of absolute utility by pointing out the importance of relative reference points (Kahneman / Tversky 1979). None the less also the famous Prospect Theory (Kahneman / Tversky 1979) as well as its enhancements (e.g. Lopes / Oden 1999; Birnbaum / Chavez 1997) merely consider utility as a static variable that results from a mathematical maximization function. Recent research highlights the sequential, heuristic character of decision-making and its situativity though (Brandstätter et al. 2006).

These advancements in decision and utility research as well as first conceptional considerations by Kahneman et al. (1997) indicate that (purchasing) decisions can be understood more profoundly if the pre- and post-choice appraisal processes are incorporated in the research design. Hence Kahneman et al. (1997) differentiate the utility generated in the moment of choice from several temporally deferred utility phases in order to assess their retroaction on the moment of choice. They distinguish between the consumer's hedonic consumption experience, his or her memory of that specific experience, and the expectation regarding the consequences of future decisions as further utility phases (Kahneman et al. 1997).

Therefore a dynamic perspective of utility, in terms of regarding utility as a continuously altering outcome of an intertemporal multi-phased utility appraisal process, seems valuable to improve the holistic understanding of the consumption process.

The article is structured as follows: The utility derived from a purchasing decision is likely to be a core component in the consumption process. Therefore we propose decision utility as a starting point for the examination of the consumption process. This phase can be characterized essentially by the consumer's appraisal processes concerning the purchase, which eventually lead to an immediate choice of a product or service. An essential amount of research, both in marketing and in neuroeconomics, has already focused on purchasing decisions.

Following the consumer's choice we suggest that post-decisional appraisal processes and the consumption experience should be examined to provide a holistic view. Firstly we propose that the initial purchase decision is followed by a re-evaluation phase during which the consumer re-assesses the decision made, compares the chosen with the foregone alternatives and computes a re-evaluation utility. Eventually the consumption experience should follow. Accordingly we propose that the subsequent utility phase is determined by the consumption experience. Based on his or her experience, the consumer can generate a so-called experienced utility.

It can be assumed though that the consumption process does not terminate with the purchasing decision and the consumption of the product or service. Rather the consumer's experiences may possibly influence future purchasing decisions – that is the consumer's repeater propensity – in a positive or negative way. In this context we propose that the memory of the experience might have a significant impact. Namely the retrospective appraisal

of the experience could lead to a remembered utility, which includes the dynamic schematization of the experience in memory. Remembered utility might then bias the consumer's expectations concerning future purchasing decisions. In case of repeated purchasing situations (e.g. repurchases) a phase of predicted utility is likely to succeed. In this context predictions should describe the utility appraisal of a future (intertemporal) decision (Berridge 1999; Kahneman et al. 1997).

Each of the phases will be analysed separately from a marketing and from a neuroeconomic perspective to outline each discipline's contribution to a dynamic schematization of utility. Furthermore possible interactions between the phases and their effect on subsequent purchases shall be considered.

The core: decision utility

In the proposed conceptional frame decision utility represents core concept. A lot of research has already analysed decision-making. The actual purchasing decision can be regarded as the first step in the consumption process. Decision utility thus describes the utility that is inferred from the moment of choice (Kahneman et al. 1997). Respectively it indicates the degree of wanting (Berridge 1999) which precedes the subsequent decision-making process and the actual choice.

Generally the concept of decision utility is based on the classic expected utility theory by von Neumann and Morgenstern (1947). This describes normatively how people make rational decisions. Given certain assumptions the rational decision maker chooses the alternative that most likely provides the maximal expected utility (von Neumann / Morgenstern 1947). It has been shown though that decision makers only act with a limited rationality (e.g. Simon 1955). Following this notion the descriptive Prospect Theory characterizes empirically observed behavioural anomalies. Hereafter utility is not regarded as absolute, but is weighted relative to a reference point (Kahneman / Tversky 1979) – which led to major implications for marketing, e.g. concerning pricing (von Nitzsch 1998).

It is therefore evident that real-life decisions are more than strictly rational processes. Rather the consumers' choices are also influenced by non-rational behavioural phenomena. Hence within the decision-making process some behavioural scientific phenomena may be identified that clearly characterize the decision-making phase and therefore determine decision utility: first of all following the notion of expected utility theory, purchasing decisions follow the

consumer's expectations, which are essentially guided by ratio. Furthermore emotions and trade-off valuations may become apparent in the explicit moment of choice and may influence the decision-making process. In this context a network of different neural structure is of importance in this utility phase: the prefrontal cortex, the amygdala, and the ventral striatum (NAcc).

The consumer's expectations

What the consumer expects from a purchase essentially guides his or her choice. Many neuroeconomic studies, which focus on decision-making, base their computation of decision utility on the learnings from the Prospect Theory (Kahneman / Tversky 1979). Consequently decision utility can be roughly calculated from summing up expected reward and expected loss – weighted with their likelihood of occurrence respectively in case of uncertain decisions.

Expected reward on the one hand is related to an activation of the ventral striatum and the anterior cingular cortex (Knutson et al. 2001). The ventral striatum codes reward magnitude and probability during reward anticipation (Yacubian et al. 2006). In order to assess the expected reward this neural area integrates signals from the prefrontal cortex, the amygdala, and the hippocampus as well as dopaminergic input from the midbrain (Knutson et al. 2001). The Nucleus accumbens (NAcc), as a part of the ventral striatum, is of special importance. It reacts in expectation of reward (Breiter et al. 2001, Yacubian et al. 2006) in a magnitude-proportional manner, which is not evident in the anticipation of loss (Trepel et al. 2005; Knutson / Peterson 2005).

Studies which directly measured the activity of nerve cells using EEG-electrodes, e.g. in the parietal cortex of primates, could show that during the execution of decision-making processes the activation in this brain area correlated with the consideration of probability and extent of reward. This brain area therefore seems to be of importance when deciding between two alternatives (Dorris / Glimcher 2004).

Expected loss on the other hand is by far not researched as well as the expectation of reward. The insula seems to play an important role concerning loss though (Camerer et al. 2004). For instance a recent study by Knutson and colleagues (Knutson et al. 2007) could show that the price level of a consumer good correlates with the activation of the right insula. This activation did not signal the absolute price however, but depended on the product, which

should have been bought at this price. This effect also documents the relevance of reference dependence in purchasing decisions.

Other neuroscientific studies point out the importance of the amygdala in the expectation of a loss (e.g. Trepel et al. 2005, Yacubian et al. 2006). For instance, Yacubian et al. (2006) could show that the loss-related expected value (and the associated prediction error) is represented by the amygdala. This fact is consistent with findings of e.g. Breiter et al. (2001) that associate the amygdala to predicting aversive events.

The role of emotions in a purchasing decision

Furthermore the consumer's purchasing decision is influenced not only by more or less rational expectation but also by the context. Thus mood, emotions, and their anticipation respectively will have an effect on the decision (Frijda 1994; Mellers et al. 1999; Wertenbroch 2000; Zeelenberg et al. 2000). For example people, who are in a good mood prior to a choice (e.g. a purchase), are more optimistic (e.g. Wright / Bower 1992) and willing to take risks (Kahn / Isen 1993) than people in a bad mood. Too much activation on the other hand reduces the search for alternatives (e.g. Fiedler 1988) and the use of information (e.g. Forgas / Bower 1987; Mellers et al. 1999) during the decision-making process.

After all neuroscience can show that emotions have significant effects on decisions – a fact that is often ignored in economic theory. As the somatic marker hypothesis (Bechara / Damasio 2005) states, decision-making is influenced by marker signals which arise in bioregulatory processes, including those that express themselves in emotions and feelings. These emotional processes are induced by certain stimuli (e.g. a consumer product) and influence decision-making on a conscious and non-conscious level providing valuable explicit and implicit knowledge to the consumer for making fast and advantageous decisions. Bechara and Damasio (2005) refer to the amygdala as the essential neural structure related to emotions. In contrast to previous assumptions which relate the amygdala exclusively to processing negative signals associated with fear, it seems that the amygdala is in charge of attracting attention to stimuli of behavioural relevance. On the one hand an activation of the amygdala plays an important role initiating instinctive aversive behaviour provoked by fear. On the other hand it signals the importance of very positive, significant stimuli (Murray 2007). The relevance of an amygdala activation becomes evident when e.g. during a selling situation a subject has to estimate the personal, monetary counter value compared to the loss of a product (Weber et al. 2007).

The ventromedial prefrontal cortex (VMPFC) than integrates the emotions into the purchasing decision (Bechara / Damasio 2005). As Bechara et al. (1997) could show the VMPFC guides decisions by sub-consciously integrating emotions in the decisions and thus creating a hunch which decision is advantageous for a person, maximizing decision utility.

The *influence of emotions on decisions* is even stronger the more the consumer likes the brand and the more brand knowledge he or she possesses. In a study by Deppe et al. (2005) subjects were asked to make binary (purchasing) decisions between two brands of consumer goods. If the target brand was the subject's favourite (first choice) brand, an increased activation of the VMPFC was observed indicating that emotions are especially relevant for decisions concerning favourite brands. Furthermore an increased activation of the anterior medial prefrontal cortex and of areas of the cingular cortex was observed. Both are associated with integrating background knowledge and episodic memory retrieval. Subjects therefore remembered emotional experiences with their favourite brand while making the decision. At the same time a reduced activation of the DLPFC, posterior prefrontal cortex and occipital cortex was found. These brain areas are associated with working memory, planning, and reasoning based decision-making, which means that strategic reasoning is reduced in decisions involving favourite brands. Thus this study in the broadest sense illustrates a trade-off in the importance of brain areas related to cognition and emotion in decision-making.

Emotionally guided behaviour has a "dark side" as well through promoting behavioural *anomalies* (Kahneman et al. 1991) and thus inhibiting decisions, which might rationally provide the greatest utility.

On the one hand emotions, especially negative emotions, may induce risk avers behaviour. In order to prevent or at least minimize negative outcomes consumers prefer alternatives which are linked to the status quo (Chernev 2004; Kahneman et al. 1991). The reason for this behaviour is a general loss aversion. Since potential losses loom larger than gains in the phase before the actual choice (Kahneman et al. 1991), loss aversion describes an exaggerated anxious reaction to impending losses (Camerer 2005). Findings from Shiv et al. (2005) illustrate for instance that emotionally impaired subjects with focal lesions in areas related to emotion, as the orbitofrontal cortex, the right insula and the amygdala, made more advantageous decisions in this positive-expected-value gamble. Emotions therefore influence risk-taking behaviour.

Furthermore loss aversion leads to another decision anomaly – the so-called *endowment effect*. According to this phenomenon consumers understate their true willingness to pay and overstate the minimum acceptable price at which one would sell a good – meaning consumers are more reluctant to give up a good they possess for money than to purchase it for the same price (Kahneman et al. 1991). Moderating variables are the degree of emotional attachment the person feels towards the item (Ariely et al. 2005) as well as the value and the perceived attractiveness (Ariely et al. 2005; Strahilevitz / Loewenstein 1998). Some studies relate the endowment effect to an activation of the amygdala (Weber et al. 2007). Others, like Knutson et al. (2008), observed an insular activation for preferred products during selling which is interpreted as predicting individual differences in susceptibility to the endowment effect.

Trade-off valuations

When faced with a purchasing decision consumers have to choose between different product or service alternatives which vary in e.g. appearance, quality or price. This logically induces trade-off valuations. The individual's preference is an important component of decision-making in every day life and a primary moderating variable when it comes to trade-offs.

Neuroeconomic studies in realistic settings have shown that *preference* is generally predicted by an activation of the nucleus accumbens (NAcc) (Knutson et al. 2007; Knutson et al. 2008). When it comes to a trade-off with for instance a high price an additional activation of the insula and the mesial prefrontal cortex can be observed prior to a purchasing decision (Knutson et al. 2007). Furthermore Paulus and Frank (2003) found an activation of both the ventromedial prefrontal cortex (VMPFC) and the anterior insula, which may correspond to the competitive influence of *appetitive* (what is liked) versus *aversive* (what is disliked) *stimuli* when making preference judgements.

Lastly preference and the associated neural activations are moderated by the consumer's *brand knowledge*. According to a study by McClure and colleagues (2004) preference appears to result from the interaction of two separate brain systems situated in the prefrontal cortex. When consumers make judgements based solely on sensory information and no brand information is accessible preference is represented by an activation of the ventromedial prefrontal cortex (VMPFC). This neural structure signals basic appetitive aspects of reward. Brand knowledge biases preference-based decisions though. It recruits the hippocampus, dorsolateral prefrontal cortex (DLPFC), and midbrain. The DLPFC is commonly associated

with working memory and is necessary for employing affective information in decision-making. The hippocampus processes affective information and is important in recalling affect-related information (e.g. Markowitsch et al. 2003). Therefore it can be assumed that these brain structures are involved in biasing the consumer's perception based on prior affective biases and altering the choice if brand knowledge is accessible.

Altogether it can be concluded that the decision utility phase is essentially characterized by the consumer's appraisal processes prior to a product or service choice. Significant neural structures involved are the prefrontal cortex, the amygdale, and the ventral striatum/NAcc.

Post-decision and consumption phase

Succeeding the consumer's choice we propose that the post-decision an consumption phase consists of two distinct types of utility – namely re-evaluation utility and experienced utility.

Re-Evaluation Utility

After the actual decision/choice the decision maker commits to the chosen alternative (Heckhausen 1987). Prior to the actual consumption experience a counterfactual thinking can take place (e.g. Byrne 2002; Mellers et al. 1997). During this process the consumer compares the chosen alternative with the other foregone alternatives in terms of a "What could have been…"-thinking process. Especially if decisions are made under uncertainty, the choice can lead to negative emotions in the re-evaluation phase. In case the choice seems wrong at hindsight after going through the counterfactual process (Gilovich / Medvec 1995), a feeling of *regret* may arise (Bell 1982; Loomes / Sudgen 1982; Zeelenberg et al. 2000). This often occurs in case of a divergence from the status quo (Tsiros / Mittal 2000). After all the difference between chosen and foregone alternatives is essential (Inman et al. 1997). There is a tendency though to ex-post upvalue the alternatives which not have been chosen while devaluating the chosen alternative at the same time (Gilovich / Medvec 1995). Regret can result from action as well as inaction (Gilovich / Medvec 1995) and is therefore linked to a felt personal responsibility. This again induces a learning process and the consumer focuses on finding a solution to the negatively interpreted situation and on avoiding similar situation in the future (Zeelenberg et al. 2000). Important brain structures involved in this utility stage are the prefrontal and the cingular cortex.

Regret essentially characterizes the re-evaluation phase. While *feeling regret* structures of the orbitofrontal cortex and the amygdala are involved (Coricelli et al. 2007). Furthermore the prefrontal cortex is the central neural structure for anticipating regret (Simonson 1992) and for experiencing regret (Camille et al. 2004; Coricelli et al. 2005). Its activation increases proportionally to the increasing regret (Coricelli et al. 2005). Furthermore Coricelli and colleagues (2005) observed an increasing activation of the cingular cortex and the hippocampus, which correlated with the magnitude of experienced regret. In this context the anterior cingluar cortex is especially involved in processing conflicts, the hippocampus selects corresponding experiences and memories.

The activation of these neural structures therefore helps the consumer to assess the *consequences of the regretted action*. At the same time these brain areas induce the reversal learning process (Rolls et al. 1994) associated with regret and thereby cause an adoption of behaviour for future decisions.

Additionally Coricelli et al. (2005) could show that people feel increasingly avers about decisions that are associated with regret. This is reflected as a cumulative effect in an increasing activation of the prefrontal cortex and the amygdala. Likewise Aholt et al. (2007) find an activation of the amygdala related to the appraisal of a decision.

Moreover, relating to regret, Aholt et al. (2007) point out a cingular activation during the purchase decision and during the ex-post appraisal of the decision respectively. The previously mentioned activation of the amygdala could only be observed during the ex-post appraisal process though. Consequently it can be assumed that the anticipation of regret is related to weaker negative affect than the actual realization of regret.

Overall the consumer's goal during the re-evaluation phase is to decrease the negative emotion of regret and thus maximize re-evaluation utility. Thus possibly existing cognitive dissonances (Festinger 1957) have to be reduced. This can happen e.g. by upvaluing the chosen alternative or by devaluing the foregone alternatives respectively (Fischer / Wiswede 2002).

The second phase of the decision-making and consumption process is therefore characterized by handling and reducing conflicts. The prefrontal and the cingular cortices are essential neural structures involved in this phase.

Experienced Utility

In contrast to the decision-making phase the phase of experienced utility focuses on the hedonic experience, namely the pleasure and pain which is experienced during the actual situational handling and consumption of the chosen good (Kahneman et al. 1997). Accordingly the experienced utility is determined by the liking of the product and the consumption experience (Berridge 1999). Therefore the appraisal of the hedonic consequences is essential for the consumer in this utility phase. The prefrontal cortex and the ventral striatum are central neural structures which can be associated with these processes.

During this stage of the appraisal process it is advantageous for the consumer to perceive his or her experience as positive in order to maximize experienced utility. It is important to note though that the experience is always assessed relative to a reference point (Monroe n. n.), which again adapts with further experience (e.g. Aggarwal et al. 2000; Kalyanaram / Winer 1995; Karande et al. 1998). Generally the consumer's main objective is to generate lasting satisfaction with the product experience. Hence satisfaction research (e.g. Fazio 1986; Taylor / Baker 1994; Homburg et al. 2006; Ofir / Simonson 2007) as a substantial research area in marketing is concerned with the impacts of the consumption experience.

The *difference between expectation and actual experience* seems as the most critical factor in this context (e.g. Huber et al. 1997). As neuroeconomic studies show expected reward should be clearly differentiated from actually experienced reward. Thus this stage of the appraisal process differs essentially from the decision-making phase, since the neurophysiologic encoding of reward is executed by different neural structures than the expectation. The discrepancy between the two leads to the reward prediction error (Schultz 1998). In this context the ventromedial prefrontal cortex (VMPFC) provides critical feedback when the reward received is different than expected (Knutson / Peterson 2005). At the same time this neural structure is of great importance when it comes to the direct experience of reward (Knutson / Peterson 2005). Yacubian et al. (2006) state on the other hand that the ventral striatum and the amygdala are involved in distinctively processing the value of a prediction and subsequently compute a prediction error compared to what has been actually received. Therefore a homeostatic balance of both systems might be important for generating adequate expectations under uncertainty.

Next to assessing the difference between expectation and actual experience consumers also perceive whether the outcome itself is pleasurable or not and to what extent the product experience is better or worse than expected. Regarding *positive experiences* Trepel et al. (2005) and Yacubian et al. (2006) highlight the importance of the ventral striatum (including the NAcc). Furthermore the dorsal striatum correlates with the processing of the experienced reward regarding intensity and valence (e.g. Delgado et al. 2003; Trepel et al. 2005). A *negative experience* on the other hand correlates with a cingular activation (Gehring / Willoughby 2002; Trepel et al. 2005) as well as with an activation of the amygdala (Trepel et al. 2005; Yacubian et al. 2006).

Furthermore O'Doherty et al. (2001) point out the relevance of the prefrontal cortex during the neural encoding of experiences. According to their findings positive experiences (e.g. gains) are represented in the medial prefrontal cortex area, negative experiences (e.g. losses) on the other hand in the lateral area.

These neural mechanisms offer the opportunity to modulate perceived experiences by providing additional stimuli through marketing. Accordingly a neuroeconomic study could show that for instance a raise in price level has positive effects on the subjective taste of wine (Plassmann et al. 2008).

Following the findings of O'Doherty et al. (2001) it could be concluded that experienced utility is generated at least partially by a trade-off between the medial and the lateral prefrontal cortex: namely a received reward led to an increased activation of the medial prefrontal cortex which is accompanied by a reduced activation of the lateral prefrontal cortical area and vice versa. The measured level of neural activity in the corresponding cortical areas correlated with the magnitude of experienced reward or loss.

In this context other neuroeconomic studies highlight the importance of the prefrontal cortex as well. They only find a correlation with received reward, meaning a positive experience, though (e.g. Knutson et al. 2003; Trepel et al. 2005).

Since experiences are perceived subjectively, *interindividual differences* in the activated brain areas can be observed during the consumption experience. Gutchess et al. (2006) could show for instance that ones cultural background influences the areas of neural activation while processing the experience. According to their findings a more object-related processing of information takes place in western individualistic cultures (activation in the left medial temporal gyrus), whereas Asian collectivistic cultures show a rather holistic processing of information (activation in the fusiform gyrus).

As mentioned earlier reaching ex-post *satisfaction* with the decision is one essential characteristic of the experienced utility phase. Satisfaction is subject to direct, moderating influences. For instance it is influenced negatively by felt regret (Inman et al. 1997). The consumer's repurchasing and complaint intentions (Tsiros / Mittal 2000) as well as customer loyalty directly depend on whether the consumer is repeatedly satisfied with the consumption experience (Homburg et al. 2006).
Aholt et al. (2007) pointed out that the prefrontal cortex is an important neural correlate when it comes to generating ex-post satisfaction with a decision, for instance as a positive outcome of the counterfactual thinking process.

In summary it can be concluded that experienced utility is characterized by the hedonic experiences of the consumer with the chosen product or service and that the prefrontal cortex and the ventral striatum are central neural structures during this phase.

The consumer's repeater propensity

We assume that whatever the consumer has experienced while consuming the good will influence his or her future decisions. In this context we assume that remembered utility as well as predicted utility provide important indicators for the consumer.

Remembered Utility

This utility phase is characterized by subjective, retrospective records of the total hedonic pleasure or displeasure associated with past outcomes at a later time (Berridge 1999; Kahneman et al. 1997). The generation of remembered utility is based on information stored in memory. The consumer can retrieve the stored information in order to assess future decisions or experiences. Accordingly mediotemporal brain structures such as the hippocampus, the parahippocampus (e.g. Squire / Zola-Morgan 1991), and the amygdala (e.g. Erk et al. 2003) are substantial during this utility phase.

During the *consolidation of memory* – meaning the transfer of memory content from working memory to long-term memory – the type of memory content determines the brain areas involved. In case of factual memory content, such as explicit facts or events, the hippocampus

and parahippocampal areas are activated. In case of emotional memories the amygdala plays a significant role (Trepel 2004).

Furthermore in a state of *emotional arousal*, the consumer's attention is higher when processing commemorative information (LaBar / Cabeza 2006). The decoding of the remembered emotion at a later point of time re-activates the emotional state which he or she felt during the encoding. For instance the amygdale is activated if phrases are remembered that have been learned in an anxious state (Erk et al. 2003). Hence during the remembered utility phase the consumer reverts to sentiments he or she felt during the experience phase.

Especially when consumers are confronted with a purchasing situation or the appraisal of a consumption experience, recognition of the good can help to retrieve previously made consumption experiences, which can provide valuable information. Recognizing products or services is crucial in that case. The brain areas involved in recognition incrementally depend on the type of recognition.

Several regions within the temporal lobe are involved in human recognition memory. Each region supports a different memory function. According to a study by Yonelinas et al. (2001) *associative recognition* – the association between e.g. an item and a colour – led to hippocampal and parahippocampal activation. Recent findings in animals suggest as well that the parahippocampal region may be involved in the visual associative recognition memory for configurations of stimuli (Düzel et al. 2003). These studies highlight the involvement of the parahippocampal region in the long-term coding of associative relationships between stimuli.

Recognition of previously learnt familiar objects on the other hand led to an activation of the left middle temporal gyrus and the left middle occipital gyrus suggesting the retrieval of item familiarity relied on occipital-temporal regions rather than on hippocampal or parahippocampal regions (Yonelinas et al. 2001). So both types of recognition recruit partially distinct areas of the temporal lobe.

Recognition of known or famous faces, e.g. testimonials used in advertisement, is associated with a widespread network of bilateral brain activations involving the prefrontal, lateral temporal, and mesial temporal (hippocampal and parahippocampal) regions compared to the recognition of recently encoded faces or unfamiliar faces seen for the first time (Leveroni et al. 2000).

Finally regarding remembered utility it is important to note that *memory is dynamic*. Generally the retrospective appraisal process is characterized by memory biases: for instance information, which is consistent with ones opinion, expectation or mood, is remembered easier (Cohen 1981; Fischer / Wiswede 2002). Moreover memories are often appraised and reconstructed retrospectively as more positive than they have actually been experienced in order to correspond to previous expectations (Mitchell et al. 1997). Remembered utility is biased in a similar way. For example recently experienced events or extreme hedonic events are overly represented in remembered utility (Schreiber / Kahneman 2000) – a phenomenon that Kahneman et al. (1997) labelled Peak-End-Evaluation.

These dynamic effects can be employed in marketing strategy. In this sense the actual "real" memory of a possibly negative event can be ameliorated by supplying ex-post positive advertisement information to the consumer (Braun 1999). Memory biases hinder an objective, realistic processing of the information though. Rather they lead to a subjective distortion of memorized events and of remembered utility respectively. This again shows that memory is an active, dynamic construction process during which information is gathered, stored and used to guide later decisions. Mediotemporal brain structures such as the hippocampus, the parahippocampus, and the amygdala are substantial during this utility phase.

Predicted Utility

So far an actual, pending purchasing decision and its consequences has been examined. This chapter however focuses on future decisions and thus provides an indication for e.g. future repurchases. Hoyer and Brown (1989) could show for instance that decision-making processes in repurchasing situations deviate with increasing product experience from initial decision-making processes.

In this context predictions describe appraisal processes about the utility of future (intertemporal) choices (Berridge 1999, Kahneman et al. 1997). It is important to note though that utility predictions are not robust throughout time. Rather predicted utility varies depending on whether a decision is to be assessed in short or long-term future. Accordingly different cortical regions are central neural correlates of this phase.

Different theories consider the aspect of *foresight* for future decision-making – each from a different perspective. For instance, affect-dependent time discounting postulates that affective utility dimensions are discounted steeper than cognitive utility dimensions. Consequently

cognitive utility dimensions dominate decision-making with increasing temporal distance of the pending decision (e.g. Loewenstein 1996; Metcalf / Mischel 1999). The Temporal Construal Theory describes a similar dynamic (Trope / Liberman 2000; 2003), but focuses on the relative meaning of abstract and concrete attributes of utility throughout time. Trope and Liberman argue that decisions in distant future are made based on abstract information. Concrete information on the other hand is used for decisions in near future. Thus the focus of utility appraisal shifts from abstract to concrete product features with decreasing temporal distance of the decision.

On a neural level Bechara and Damasio (2005) point out the importance of the prefrontal cortex for prediction processes. Generally this brain area helps to predict future emotions by making the consequences of one's own actions visible. Within this relatively broad area different activations can be observed depending on the point of time the future decision is to be made: the caudal/posterior areas of the ventromedial prefrontal cortex represent concrete decisions in near future, whereas an activation in rostral/anterior areas corresponds to abstract decisions in distant future (Anderson et al. 1999; Bechara / Damasio 2005; Damasio 2005). These different neural activation patterns, which vary with the temporal distance of the decision, are consistent with the assumptions of the Temporal Construal Theory mentioned above in terms of temporally inconsistent decision behaviour.

Further neuroeconomic studies focusing on the neural differentiation of time dependent decisions likewise contribute to the validation of the Trope / Liberman's (2000; 2003) and Metcalf / Mischel's (1999) assumptions. These identify other brain areas as relevant though. Concerning prompt decisions (immediate reward) McClure et al. (2004a) found an activation of dopaminergic structures, like the ventral striatum, which are also associated with impulsive behaviour (Congdon / Canli 2005). Temporally distant decisions (delayed reward) on the other hand led to an activation of the (dorsolateral) prefrontal cortex and surrounding areas. These brain areas are related to cognitive processes and future planning (Smith / Jonides 1999). Thus, based on these neuroeconomic findings, it can be presumed that (intertemporal) decision-making is characterized by a competition between automatic, low-level processes and higher-level processes in terms of planning (McClure et al. 2004a).

The assumption of a rather cognitive information processing in case of temporally distant decisions is supported by a fMRI-study by Tanaka et al. (2004) as well. Likewise they observed an activation of the prefrontal cortex and the ventral striatum related to immediate reward. On the other hand a possible higher but delayed reward led to an activation of the dorsolateral prefrontal cortex.

Finally animal studies show comparable results: mediotemporal structures and the hippocampus are relevant for decisions that do not have immediate but merely delayed consequences. This again indicates a dominance of (cognitive) memory processes for actions with great temporal distance (Campbell et al. 2006).

Resulting from the demonstrated temporal dynamics it can be subsumed that different facts play a role for predicting utility depending on the temporal proximity of the decision. Furthermore the explanatory power and the rationality of predicted utility are questionable, since prediction biases occur (Gilbert / Wilson 2000; Kahneman / Snell 1992). These result from the fact that future decisions cannot be fully anticipated. Often the utility prediction occurs independently from future reality, but resembles the consumer's hedonic wishful thinking in an idealized context instead. This again necessitates an ex-post correction of the predicted utility (Gilbert et al. 2002).

At the same time the present situational context and conditions bias the utility prediction (Gilbert et al. 2002). Kahneman and Snell (1992) showed that individuals predict utility assuming their present hedonic needs – e.g. when predicting the future liking of a good consumers overestimate their future preference and the amount consumed. Similarly Loewenstein (1996) highlights the importance of one's overall psychological condition (e.g. excitement or boredom) which influences the individual's expectations. In this respect it is hard for the consumer to predict utility for a different psychological state (Loewenstein 1996).

The fifth utility phase is characterized by the individual's expectations as well as cognitive processes. Different cortical regions are especially important in this phase depending on the temporal proximity of the future decision.

Conclusion: Utility as a dynamic construct in the consumption process

Selected brain areas such as the prefrontal cortex, the amygdala and the ventral striatum seem to be of special significance during purchasing decisions and the following appraisal processes (table 1). Following this notion a distinct number of brain areas can be directly associated with the consumption process and the associated utility appraisal. Similarities, differences and interactions of the different utility phases with in the consumption process can be highlighted based on the identified neural correlates.

----- Table 1 -----

As the table shows, the decision utility phase (wanting) can be characterized by a trade-off between positive (ventral striatum) and negative (insular cortex, amygdala) expectations. The prefrontal cortex integrates emotional signals into the (not strictly rational) decision. At the end the consumer chooses a specific product or service, which promises to generate maximal decision utility. Nevertheless the assumed utility-maximizing choice taken in the decision phase may trigger regret (e.g. due to the foregone alternatives or risk avers behaviour) in the subsequent phase and therefore may reduce re-evaluation utility. In order to minimize such negative effects, the consumer already anticipates possible ex-post regret (Aholt et al. 2007; Cooke et al. 2001; Gilovich / Medvec 1995; Inman / Zeelenberg 2002) or other emotions felt during the following consumption experience (Zeelenberg et al. 2000) in the decision phase.

Re-evaluation utility can be characterized by handling conflicts (e.g. counterfactual thinking). Potential conflicts following the decision are triggered by experienced regret (amygdala, cingular cortex). To a certain extent processes overlap with the decision phase. Namely the negative emotions that might have been anticipated during decision-making lead to a similar neuronal activation in the phase of re-evaluation. Also the emotions triggered by counterfactual thinking may influence the emotions experienced during the following consumption experience (Larsen et al. 2004). Therefore re-evaluation utility directly influences experienced utility.

To a certain degree the phase of experienced utility also seems to show analogous activation patterns to the decision utility phase (ventral striatum, amygdala and prefrontal cortex). Thus it seems that the ex-ante appraisal processes are reflected partially in the experienced utility phase. The actual positive or negative experience of the consequences and the consumer's satisfaction that go along with the previously purchased good are essential in this phase

though. With growing experience even loss aversion in future decisions can be reduced (Novemsky / Kahneman 2005).

Remembered utility seems to differ significantly from the antecedent appraisal processes since the consumer's memory is essential during this phase. By activating mediotemporal neural structures (hippocampus, parahippocampal cortex) memories (e.g. brand knowledge or previous consumption experiences) are consciously accessible. Thus remembered utility influences the consumer's future decisions and experiences and the computed utility by signalling which decisions und experiences are worth repeating (Kahneman et al. 1997). It is known from memory research though that the memory of experiences is very plastic and dynamic. In this sense experiences may be remembered falsely – namely individuals remember things they never actually experienced (e.g. Markowitsch 2002). Nevertheless real memories can be modified ex-post as well by supplying positive or negative information (e.g. Braun 1999).

Lastly predicted utility seems to be concerned with intertemporal decisions and depends on the temporal proximity of a future decision. Prompt decisions in short-term future on the one hand seem to be rather guided by emotions. Temporally distant decisions in long-term future on the other hand are dominated by an activation of the dorsolateral prefrontal cortex, which indicates a more cognitive information processing. To what extent purchasing decisions are subject to the influence of emotions therefore depends on the temporal distance of future decisions. Nevertheless prediction biases may generally occur during this utility phase.

Finally it can be concluded that breaking down the consumption process into different utility phases is a promising approach to capture the varying consumer utility throughout time. As shown each utility phase is determined by different neural processes which help to clearly differentiate the phases.

Discussion

The conception of utility as a dynamic construct has major implications for marketing practice. Successful product or service marketing is not solely depending on the consumer's purchasing decision at the point of sale. A number of variables before (e.g. advertising impact, experience) and after (e.g. satisfaction, peer group) purchase are essential as well. Nonetheless classical marketing concepts often focus solely on singular phases of the decision-making and appraisal process. Market success however may be improved by considering the entire consumer's decision-making and appraisal processes for developing

integrated marketing concepts. Marketers should investigate which context determines the consumer's utility at which point of time. Possible practical questions are: Which components (e.g. anticipated regret, loss aversion) dominate the consumer's decision-making process during the decision for or against a product or service (see decision utility)? How can the product or service experience be optimized (e.g. with respect to satisfaction) in order to increase the future repurchasing probability (see experienced utility)? How can marketing influence the consumer's memory of the experience with the product (see remembered utility)? At which point of time would the consumer buy the product again (see predicted utility)? Over all it appears to be instrumental for marketers to consider the different utility phases with which consumers are confronted.

The marketing instruments and the marketing mix could be adapted and targeted to the requirements of each utility phase. Thus marketing could (re)act in a differentiated manner in order to satisfy the consumer's predominant needs in each phase and to thereby successfully position and market the product or service. Consequently firms would try to optimize their customers' utility and thereby (implicitly) contribute to their customers' happiness.

From a scientific perspective, our work provides a holistic concept of dynamic utility with a close to reality view on the consumption process. It illustrates that the consumer's utility might indeed be seen as varying depending on the phase of the consumption process. The concept presented here supports Daniel Kahneman's notion that a rethinking in decision-making research is essential: neighbouring streams of research such as psychology or neuroscience should be aligned in order to obtain an enriched perspective on utility that is as close as possible to reality.

Combining neuroscientific methods and findings with models from economic research allows examining the basics of consumer decision-making from a new perspective. Differentiating distinct utility phases that the consumer passes throughout time can provide an innovative perspective on the consumption process. Linking selective findings from behavioural science with the corresponding cerebral correlates provides a sound methodological foundation of the distinct phases within the consumption process. Additionally it allows for an exact discrimination of different phases in purchasing and consumption situations. Furthermore, as Shiv et al. stated, "the integration of neuroscience with decision-making offers tremendous potential for future research in decision-making" (Shiv et al. 2005a, p. 385). Thus including neuroscientific findings in the examination of consumer purchasing decisions and the

subsequent appraisal processes is a promising approach to study and appraise real-life decision-making.

There are, however, still limitations when transferring neuroscientific results to studies of consumer decision-making. Most neuroeconomic studies dealing with decision tasks fail to fully mimic real-life decision-making behaviour. Decisions are regularly simulated by applying artifical lotteries. Thus subjects are not dealing with realistic decisions (Knutson / Peterson 2005; Breiter et al. 2001). This constitutes a major restriction to the findings as recent behavioural scientific studies indicate major differences in decision-making depending on whether the decision is based on an actual real experience or a hypothetic lottery scenario (e.g. Hau et al. 2008). They are only few neuroeconomic studies that implement realistic decisions (e.g. Aholt et al. 2007; Knutson et al. 2007; Weber et al. 2007). Consequently the hitherto existing findings from neuroeconomic decision-making research may only be used with caution and should be complemented by future research applying realistic paradigms.
In sum, the dynamic view on utility provides both scientific as well as practical implications. Examining this concept more closely should facilitate an even better understanding of the consumption process. Future research should gain and transfer scientific insights for marketing practise and thereby assist to develop holistic, effective marketing concepts and strategies.

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Table 1. Overview of relevant neuroeconomic studies

Behaviouralscientific phenomenon	Sub-processes	Brain area(s) involved	Neuroeconomic evidence with consumer behavioural or *related* background
The core			
Decision			
Expectations	Expected reward	Ventral Striatum (NAcc)	Knutson et al. 2001; Breiter et al. 2001 Trepel et al. 2005; Yacubian et al. 2006
	Expected loss	Amygdala	Trepel et al. 2005; Yacubian et al. 2006
		Insula	Camerer et al. 2004; Knutson et al. 2007
Emotions	Emotional influence on decisions (Somatic Marker Hypothesis)	PFC Amygdala	Bechara/Damasio 2005
	Anticipation effects/hunch	PFC	Bechara et al. 1997
	Trade-Off between emotion and cognition (based on brand knowledge)	PFC DLPFC	Deppe at al. 2005
	Risk avers behaviou	PFC Amygdala	Shiv et al. 2005
	Endowment effect	Amygdala	Weber et al. 2007
		Insula	Knutson et al. 2008
Trade-Off Valuations	Preference prediction	Ventral Striatum (NAcc) PFC	Knutson et al. 2007
	Trade-Off appetitive vs. aversive stimuli in preference judgement	PFC Linke Insula	Paulus/Frank 2003
	Preference depending on brand knowledge	PFC DLPFC	McClure et al. 2004
Post-decision and consumption			
Re-Evaluation			
Regret	Experiencing regret	PFC	Camille et al. 2004; Coricelli et al. 2005
		Amygdala	Breiter et al. 2001; Coricelli et al. 2005; Coricelli et al. 2007
	Evaluating the consequences of regret	Cingulärer Cortex Hippocampus	Coricelli et al. 2005
	Realization of regret	Cingular Cortex Amygdala	Aholt et al. 2007
Experience			
Consumption experience	Expected vs. actual experience	PFC	Knutson/Peterson 2005
		Ventral Striatum Amygdala	Yacubian et al. 2006
	Positive experience	Ventral Striatum	Trepel et al. 2005; Yacubian et al. 2006
		Dorsal Striatum	Trepel et al. 2005
		PFC	O'Doherty et al. 2001; Knutson et al. 2003; Trepel et al. 2005
	Negative experience	Cingular Cortex Amygdala	Trepel et al. 2005
		Cingular Cortex	Gehring/Willoughby 2002
		Amygdala	Yacubian et al. 2006
	Interindividual differences	Medial left temporal Gyrus Fusiform Gyrus	*Gutchess et al. 2006*
Satisfaction		PFC	Aholt et al. 2007
The consumer's repeater propsensity			
Memory			
Storage of emotions & experiences		Amygdala Median temporal Lobe Hippocampus	*LaBar/Cabeza 2006*
		Amygdala	*Erk et al. 2003*
Retrieval of object/stimuli information	Associative recognition	Hippocampus Parahippocampus	*Yonelinas et al. 2001; Düzel et al. 2003*
	Objectspecific recognition	Medial temporal gyrus	*Yonelinas et al. 2001*
	Recognition of known or famous faces	Parahippocampus	*Leveroni et al. 2000*
Prediction			
Foresight	Short-term future	(Caudal/posterior) PFC	Bechara/Damasio 2005
		Dopaminergic limbic system	McClure et al. 2004a
		PFC Ventral Striatum (as parts of the limbic system)	Tanaka et al. 2004
	Long-term future	(Rostral/anterior) PFC	Bechara/Damasio 2005
		DLPFC	McClure et al. 2004a
		DLPFC	Tanaka et al. 2004