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KREA-FUN: UX for Business Applications

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Abstract

This report is about how to enhance business software applications with engaging interaction. A methodology is presented that provides a structured way to elicit how to turn boring tasks into enjoyable challenges, giving users the possibility to grow or compete, or empowering users to perform sophisticated tasks and as a consequence gain social appreciation. The report is addressed to practitioners who want to know more about how to make applications more appealing and to researchers, who want to see theories from emotion, motivation and organizational growths successfully put into interactive applications.

Keywords: user experience, fun-of-use, business goals, interaction pattern, user interface engineering

Table of Contents

1 Introduction 1

2 KREA-FUN: a moderated Requirements Elicitation format 2
2.1 The Quality Model 2
2.2 Preparation 4
2.3 Exploration 4
2.4 Transformation 5
2.5 Evaluation 8

3 KREA-FUN in Field Studies 10
3.1 Call Center 10
3.1.1 Implementation 12
3.1.2 Evaluation 13
3.1.3 Results 15
3.2 Technical Client Support 19
3.2.1 Implementation 20
3.2.2 Evaluation 20
3.2.3 Results 22

4 Lessons learned 25

5 Acknowledgments 28

References 29

1 Introduction

The development of business applications calls for inspiration and know-how on the part of the designers to find the balance between business and user goals. If an ideal balance is achieved between these goals, the software can support the achievement of the expected results for the company and also generate a positive user experience (UX) for its users. In addition, we have to consider the existing gap between the world of creativity (e.g., in design) and the world of structured thinking (e.g., in engineering).

Nevertheless, to make a product successful, design and engineering have to work hand-in-hand. Other industries have regarded that fact as essential for long time (e.g., with cars that must be functional on the one hand but emotionally appealing on the other hand to be a success on the market). Whereas usability has been a topic in the Human-Computer-Interaction (HCI) community for 15 years, software-makers and their clients are just at the beginning to realize the importance of hedonic aspects [29][48]. This new way of looking at products (i.e. as combination of functions and hedonics) cannot only be applied to material products but also to software products, like business applications [45]. The users of such software are forced to use it as part of their jobs. It would be beneficial to their motivation, their health and their performance if the application they use is not only functional in the sense that the job can be done with it, but that doing the job is a pleasure for them [43]. The challenge is in engineering intrinsic aspects into the product in a systematic way by applying creativity techniques and finding a decent equilibrium between the right amounts of functional aspects and hedonic aspects.

In the following chapters we will introduce different types of intrinsic aspects as potential bridges between users´ and the businesses´ goals (chapter 2.1) and a empirically validated systematic theory-based methodology to tune up interactive systems in a way that meets human delighters (chapter 2.2). In chapter 2.3 we introduce evaluation criteria for the resulting ideas. In chapter 3 we present two field studies in which KREA-FUN has been applied. Finally in chapter 4 we present lessons learned from different case studies, where KREA-FUN has been applied.

This report integrates the content of different papers that were written about KREA-FUN, see papers [36], [37], [38], and [44].

2 KREA-FUN: a moderated Requirements Elicitation format

We have developed a systematic method to facilitate the elicitation and identification of ideas for new and innovative ways how users of software might enjoy more fun when working with the software: the KREA-FUN workshop.

KREA-FUN packages many important principles from the intersection of usability engineering, requirements engineering, emotional design, creativity and psychology with the intention to improve the interplay between organizational goals and user goals. Figure 1 sketches the four phases, namely preparation, exploration, transformation, and evaluation, as well as the information and techniques that serve as input for the workshop. Each element will be explained in the following sections of this chapter.

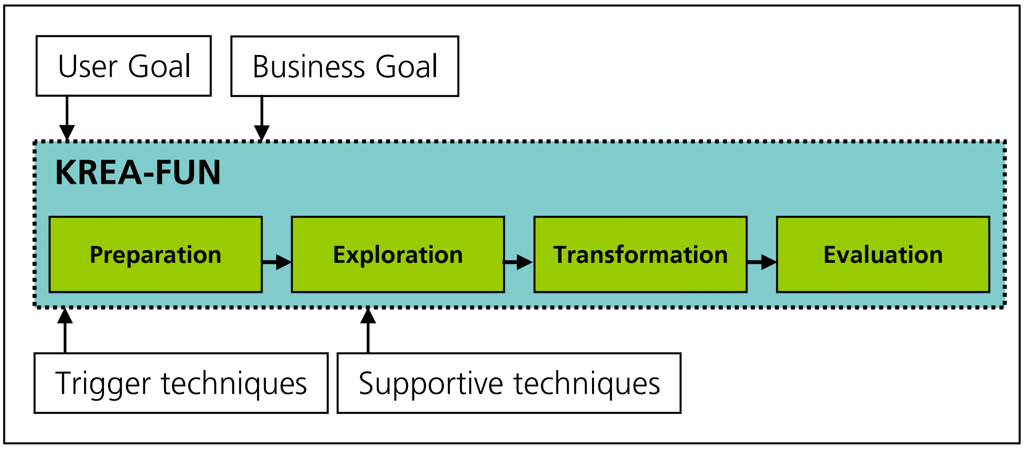

Figure 1: The KREA-FUN workshop: Inputs and process

2.1 The Quality Model

Typically, organizations pursue other goals than people strive for. Thus organizations pay their employees, i.e. the users, to follow their business goals. Obviously, there is a gap between the users' interest and the businesses' interest. Usually, the user of software wants to pursue his interest and neglect the one of the organization, e.g. to write a letter to his friend instead of writing an invoice for another company. But some organizations manage to present their own goals in a way that is tempting for the employees. A good example illustrating is the Google Image Labeler, based on the ESP Game [1]. Google's goal is to get good and comprehensive image labels for its image search functionality, for free. Hence, they set up a collaborative online tagging game that makes it fun to label images: Two randomly paired players try to find the same words describing a randomly selected picture without being able to communicate with each other. Thus Google can benefit from people who are even not connected with this organization – they employ the interest of humans in playing and comparing each other. This example shows how the gap between user interest and organizational goals can be closed and brought to a win-win situation: both, organization and users, are satisfied with the result. This process can be seen as building a bridge that closes the gap between satisfying user interests and organizational goals. There is not only one bridge of joyful interaction that can be built to span a problem, but several ones. To build our "bridges" on solid ground, we have developed a model that guides our efforts.

The e4 FUN quality model [9] [51] approaches the concept of joy during the usage of interactive systems in a cognitive behaviorist manner. It completely abstains from subjective experience and focuses on behavioral and cognitive effects software properties have on users. Hence, fun-of-use in the e4 FUN quality model is not about feeling happiness, but about motivation, attitude, creativity, concentration and willingness, i.e. user experience, to work. It is divided into the following four dimensions:

Execute-FUN is when nothing hinders me: Here, user goals and business goals match. The application should not prevent the user from accomplishing his task, but allow for an effective, efficient and adequate working, that is, usability. This dimension is mainly founded on models of human cognition and human failure.

Engage-FUN is when I meet my motives: In this dimension, the user knows and has accepted the business goals. The user is pursuing plain goals, but might lose sight of the goals, or the goals lose priority due to external factors. The key concept of this dimension is motivation; users shall be (re-)motivated and engaged during interaction.

Induce-FUN is when I change attitude: Users who are not aware of or interested in business goals should be "persuaded" to subsequently adhere to them. Here, users' attitude should change towards a predefined goal. Its key concepts are attitude and persuasion.

Expand-FUN is when I get illuminated: The main concept in this dimension is creativity. The target behavior for the users would be to acquire new tasks or goals by developing novel and creative ideas or usage scenarios the product has not been designed for.

Bridging means that each of the dimensions described above, is able to initiate the desired change in motivation, attitude or mood. For the "engage" dimension for example the challenge of our approach is to propose interaction designs that strengthen the motivation of users and therefore support the achievement of the business goal "performance".

2.2 Preparation

In the preparation phase before the actual elicitation of ideas for engaging applications the moderators ensure an activation of relevant and useful knowledge and information. With regard to the quality model, they have to identify users and business goals and the quality level the organization targets (from mere usability to creativity support).

For business goals, the moderators have to find out what the organization pursuits and which business goals have been already defined. For the workshop it will be especially interesting what qualitative aspects (aside from the pure quantitative) are considered important in the organization (most efficiently done by interviews with the management). Such aspects are, for example, how the management interacts with the employees and employees with each other, how proposals by employees are regarded and handled by the management etc. The 7-S-Model [50] that relates quantitative and qualitative aspects of business can help to discover possible implicit business goals when analyzing the organization. If identification is not possible beforehand, this activity has to be postponed to the workshop and business goals must be elicited later.

2.3 Exploration

Exploration refers to the usage of pre-existing associations between cognitive elements in order to activate and understand the problem and solution space. These associations can be internally or externally triggered and pre-structured. The principles used for the exploration phase basically are free, structured or intuition triggered associations. Domain experts will be supported by moderators to find creative ideas for engaging interaction. The software that will be spoken about in the workshop was agreed on beforehand. If the business goals or the software under consideration are not entirely known by some participants or the moderators they should be presented to all for having a common level of knowledge.

The software to be enhanced should be investigated in terms of activities it supports, the context it is used in (e.g. frequently or sporadic), how it is currently used (e.g. what people typically do with it), who uses it (e.g. users' education), and if there are any already known issues that should be addresses with the ideas to be developed. Moderators use these facts as background in the workshop. They can be used later as starting point for further investigations into enhancements of the software. During the exploration phase, the participants try to evoke reactions from the domain experts. The goal is to activate the experience of the domain expert and gather implicit knowledge from them. Most probably, some of the domain experts will state a problem that exists with the current version and how it could possible be solved. All participants are then asked to comment on how this problem might be solved in a novel way.

Each idea is noted down on a paper card that is then hung up in front of the group. When the initial round of free ideas comes to end, the moderators use creativity techniques to route the participants further away from controlled thinking, provoke divergent thinking, and elicit more ideas (for example with the "Lotus-Blossom Technique").

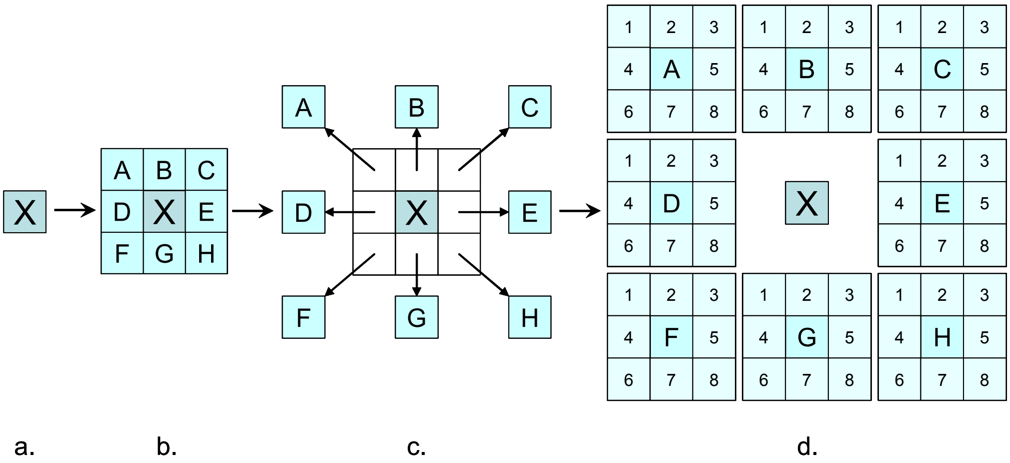

Figure 2: The Lotus-Blossom-Technique: a) an initial idea is the seed; b) some adjacent ideas are added, that in c) are takes as seeds themselves, to produce more ideas as visualized in d).

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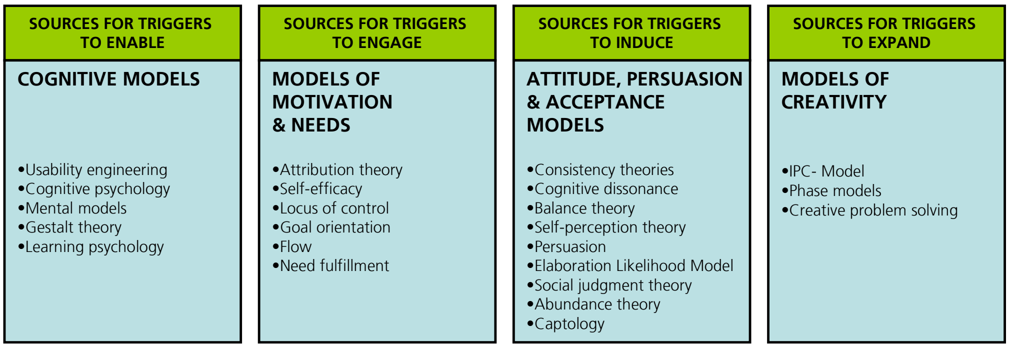
2.4 Transformation

The Transformation phase, concerned with modification or creation of associations, refers to associations that are improbable or impossible from a certain starting point, but become probable by moving away from that starting point. Included in this phase are such principles as alienation, analogy, induction, transfer, adoption. We primarily use a trigger based technique in this phase. The trigger words are used to formulate questions, signal words, or scenarios in support of the participants' divergent thinking about user goals. Our set of triggers was derived from psychological models that explain mechanisms of thought, behavior, or attitude. We extracted essential concepts and gained useful knowledge about the relationship between specific psychological models and the dimensions of the quality model.



SOURCES FOR TRIGGERS TO ENABLE	SOURCES FOR TRIGGERS TO ENGAGE	SOURCES FOR TRIGGERS TO INDUCE	SOURCES FOR TRIGGERS TO EXPAND
COGNITIVE MODELS	**MODELS OF MOTIVATION & NEEDS**	**ATTITUDE, PERSUASION & ACCEPTANCE MODELS**	**MODELS OF CREATIVITY**
•Usability engineering •Cognitive psychology •Mental models •Gestalt theory •Learning psychology	•Attribution theory •Self-efficacy •Locus of control •Goal orientation •Flow •Need fulfillment	•Consistency theories •Cognitive dissonance •Balance theory •Self-perception theory •Persuasion •Elaboration Likelihood Model •Social judgment theory •Abundance theory •Captology	•IPC- Model •Phase models •Creative problem solving

Figure 3: Psychological models are sources for trigger words

Execute – FUN is when nothing hinders me

This quality dimension is one of the most well understood ones among practitioners and is encapsulated in the traditional discipline of usability engineering, using a wide range of knowledge from the areas of cognitive psychology, mental models, gestalt theory, learning psychology, etc. ([10], [11], [24], [40], [47], [60], [61]).

Engage - FUN is when I can satisfy my needs

The key psychological construct to be applied in this dimension is motivation. Motivation refers to the initiation, direction, intensity, and persistence of behavior [23] and can be divided into extrinsic and intrinsic motivation.

Extrinsic motivation can be reached by reinforcement and reward, a concept that has been successfully transferred into economies in order to provide controlling instruments.

Intrinsic motivation means that the motivation to perform a certain activity comes inherently from performing the activity itself. This motivation is also observed as being enjoyable, enabling curiosity, interest, etc. There is not one single model of intrinsic motivation, but rather a canon of theories that orbit around the concept: Among them are attribution theory [63], self-efficacy [3], locus of control [55], goal orientation [4], flow [13], and need fulfillment [34], [41], [54]. Generally, the latter (need fulfillment) theories propose typical classes of needs that every human has to some extent. Unless a need is satisfied, a person initiates actions to satisfy those needs. Most of these models propose different levels of needs. There are the basic (hygiene) factors, which are needed for the absence of negative states, and the motivating factors needed for the presence of positive states.

Induce - FUN is, when I change attitude

The most relevant psychological concepts for this dimension are attitude, persuasion, and acceptance. There are numerous theories around these concepts, such as consistency theories [33], cognitive dissonance [20], or balance theory [32], which imply that we must be consistent in our beliefs and values. Other methods are the self-perception theory [5], persuasion [9], elaboration likelihood model [51], social judgment theory [59], and abundance theory [14]. The research area that applies the concept of persuasion (influence, motivation, etc.) to computing technology with the goal of changing people's attitudes or behavior is called captology [21].

Expand – FUN is when I get illuminated

Mainly theories from the area of creativity in cognitive or organizational psychology are used to understand the mechanisms of this dimension. We derived triggers from rather process-oriented theories as well as from theories of cognitive problem solving. A complete and comprehensive model that summarizes different approaches is the IPC- Model [56].

Process-oriented theories tend to propose several steps derived from natural cognitive mental processes following each other within creative thinking [25]. The number of steps varies among the different concepts [15], [52].

From a cognitive problem solving perspective, the underlying principles in creativity techniques can be reduced to two areas: first, the usage of pre-existing associations (exploration & evaluation [7] between cognitive elements, and second, the modification or creation of new associations and elements (combination & transformation [7]).

It has been shown that this structured approach fosters divergent thinking and produces new ideas for the resolution of the mismatch between user and business goals. In the end, there is a set of novel ideas how a specific user goal might be brought in alignment to the business goal.

Additionally to the Trigger-Technique, we use a set of supportive techniques [2], [17], [18], [49] (e.g. Lotus-Blossom Technique or Six-Thinking-Hats, to moderate the workshop and prevent the participants from falling into local minima.

Enable	**Engage**	**Induce**	**Expand**
Usability • Usefulness • Relevance • Consistency and standards • Simplicity • Visibility • Self-evidency • Clear structure • Help and documentation • Error Prevention and handling • Forgiveness • Error recovery • Undo and redo • Efficiency • Shortcuts • Workload reduction • Supportive automation: • Reduce memory load • Free cognitive resources for high-level tasks	*During first contact* • Promises • Commitment • Positive product-image • Visual attractively • Wealthiness *During first interaction* • Personalization • Stimulation • Power, control • Wealthiness • Success • Autonomy • Communication *Extrinsic motivators (Anonymity and voluntariness are moderating factors)* • “Cafeteria“ and “stock-market“ models • Material appeal • Status boost • Combining ranking with extrinsic appeals • Information ledge	*Change attitude/Captology* • Goal Substitution • Mere Exposure • Ease Memory • Elaboration-Likelihood • Consistency/ Commitment • Mere-Ownership • Oversufficient-Justification • Reactance Reduction/ Increase • Low-Ball • Forced-Compliance • Equity Theory • Door in the face/ Thats not all • Mood • Social Proof • Authority/ Expertise • Being persistent • Scarcity • Reduction • Tunneling • Suggestion • Self-Monitoring • Surveillance • Cause and Effect/ Simulation • Attractiveness/ Liking • Similarity • Trustworthiness/ Credibility • Social Facilitation/ Learning • Normative influence	*Creative problem solving* *Exploration* • Free association • Structured association • Intuition triggered association *Evaluation* • Argumentation • Confrontation • Empirical evaluation *Combination* • Alienation • Analogy • Induction (analysis, abstraction, reduction) • Transfer • Adaption *Transformation* • Restructuring the concepts • Moving or ignoring system boundaries • Forgetting • Decomposing parts of the structure • Inference • Reformulation *Creativity processes* • Analytical step (problem analysis; goal definition) • Intuitive step (actual creative phase) • Critical step (selecting relevant ideas)

Table 1: Triggers for FUN derived from different psychological models

2.5 Evaluation

After the workshop has been held, each single idea produced in the workshop is put to an evaluation phase. In the evaluation domain experts rate if a particular feature that realize that specific idea should be tested empirically for the expected fun effect.

For this evaluation, each organization imposes its own quality system with individual quality criteria that are important in the specific business context. Some typical criteria for industrial partners are the effort of implementing the feature, expected novelty, expected marketing advantages, and expected effect of the feature in the running application. The Fraunhofer-IESE as research partner is interested in proving that certain principles from one domain can be successfully transferred to another. For that purpose there must be chance that the effect of a new, innovative feature can be tested empirically. According to both qualities some of the ideas are discarded, some are put on hold, and other are identified for further processing.

3 KREA-FUN in Field Studies

Altogether KREA-FUN was applied five times with companies of different domains. In these workshops more than 120 ideas for interaction concepts were generated. Some of these ideas were evaluated in eight different laboratorial and field studies with more than 150 participants. Results showed improvement in the working behavior and higher acceptance of the software. In this chapter we will report about two recent field studies the domain of customers support in which KREA-FUN was successfully applied.

For many business domains, positive user experience is crucial for success, such as in the customers support context, where the work can involve confusion or frustration as well as joy and satisfaction in solving customers' problems [42]. Software in this context means knowledge management systems that enable their users to communicate with customers, resolve problems, and develop relationships in order to achieve the business goals. Just making this product usable does not necessarily ensure that it is beneficial for the people [46], but it is also necessary to satisfy users' goals. Millard (2005) states that agents need to perceive the goodness of the software. One way to achieve this is to enhance emotional factors such as enjoyment, satisfaction, and fun. These emotional factors influence the usage of software; therefore, their effect can trigger a good or bad user experience.

3.1 Call Center

This section presents the efforts realized in a call-center of a German telephone company aimed at enhancing UX and hence creating a positive influence on the emotional state of the employees. The software presented, Excalibur, helped the call agents to capture the customers' personal data and their problems. It also guided the agent through the "best solution", like a wizard assistant. The solutions have been developed previously by the process department and are constantly updated based on the feedback given by the agents after a call.

Seven people participated in the workshop, including two expert call agents, two call-center managers, two software developers, and one user experience expert.

The first step of the workshop was to explore and define the user and business goals that are to be achieved by the implementation of new interaction concepts in the software (preparation, see section 2.2). In this case, the following goals were selected and refined from an initial list of aims:

User goals

Fun: The call agents do not perceive the image of Excalibur as attractive and pleasant; they do not have fun when using the software. The agents wanted to use Excalibur not only for working, but as a means to amuse themselves.

Acceptance: The agents wanted to use Excalibur like a social platform to support the work relationship between the different groups within the company.

Utility: The agents wanted additional functionalities to increase the use of Excalibur for secondary tasks, such as work break sensor or online chat.

Business Goals

Quality of the documentation: Excalibur offers ready-made solutions for previously detected problems. These solutions are called Troubleshoots. They guide the call agents to the best solution when attending a call, like a wizard application. This should be an interactive process; the agent has to click through this wizard function at each call. The problem is that the more experienced agents do not use this wizard function during a call, but rather give the clients a known solution and pick the shortest Troubleshoot in Excalibur, even if this solution does not match the real problem. This generates a serious problem with the documentation about the clients' issues. The company wanted to reduce the gap between registered and real problems and therefore wanted to motivate the agents to capture the real problem in Excalibur in order to achieve a balance between the quantity and the quality of their work.

Exploration of new solutions: The expert agents no longer use the wizard function to attend to the clients. They resolve the client questions based on their knowledge and experience gained in the past. They have their "favorite Troubleshoots" and use only these to attend the calls. This behavior is problematic because new and revised Troubleshoots remain unknown and unused. The objective in this case was to inspire and stimulate the agents to become acquainted with new Troubleshoots and learn new ways to treat the calls.

The second and third phase (exploration and transformation, see section 2.3 and 2.4) was characterized by finding ideas to improve the software used in the call-center and as a means for achieving the goals defined during the first part of the workshop. Using triggers from motivational theory, the participants were encouraged to generate innovative solutions based on free association. For this workshop part, two creativity techniques were used: Brainstorming, for generating initial concepts/topics, and the Lotus Blossom Technique, for routing the participants further away from controlled thinking, provoke divergent thinking, and elicit more ideas.

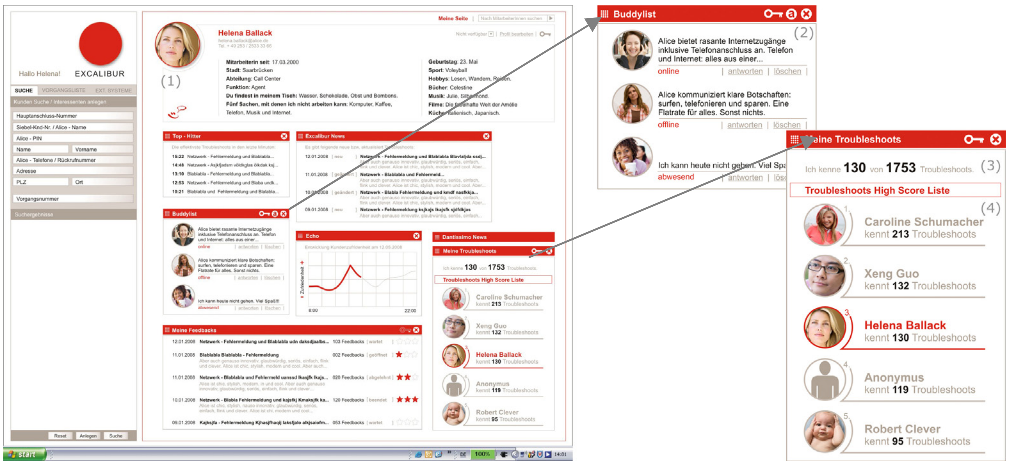
The fourth part of KREA-FUN (evaluation, see section 2.5) comprised the prioritization of the ideas generated. Only the most important and interesting topics for the participants were refined. The ideas were assessed as being questionable or reliable; the reliable ones should offer more possibilities when implemented and tested as well as a stronger effect.

At the workshop, 44 ideas were generated to improve Excalibur and achieve the goals described above. Out of these ideas, eleven were selected as candidates for the implementation. Four of these were assessed as being questionable and the other seven were assessed as being reliable. Later, these seven were fully implemented.

3.1.1 Implementation

The seven ideas were classified into two groups: The first group contained patterns from the social or computer-mediated interaction domain and the other group comprised functionalities related to Excalibur and the workflow of the call agents.

Excalibur is a web application and the new functionalities were embedded into its "homepage" as web widgets [62]. This homepage stays open as long as an agent has not answered a call. When a call is answered, this page is substituted by the wizard application of Excalibur. Figure 4 shows the prototype used by the agents during the test phase.



Alice bietet rasante Internetzugänge inklusive Telefonanschluss an. Telefon und Internet: alles aus einer...

Alice kommuniziert klare Botschaften: surfen, telefonieren und sparen. Eine Flatrate für alles. Sonst nichts.

Ich kann heute nicht gehen. Viel Spa

Ich kenne 130 von 1753 Troubleshoots.

Caroline Schumacher kennt 213 Troubleshoots

Xeng Guo kennt 132 Troubleshoots

Helena Ballack kennt 130 Troubleshoots

Anonymus kennt 119 Troubleshoots

Robert Clever kennt 95 Troubleshoots

Figure 4: Pattern enhanced Excalibur.

The following functionalities from social domains were implemented in the application:

Profile. This is a virtual representation of the agents that was seen by other employees on their new homepage. This pattern is related to the human need for popularity, because it helps the user to show his characteristics to the group and defines his position in the social net [57].

Microblogging. This pattern allows the call agents to publish short messages on a kind of personal web-site and to satisfy their communication need in this way [12].

Collection. The call agents observe the number of different Troubleshoots used. This number is a coherent metric of their own performance. This collection need is explained by Steven Reiss (2000) as a basic desire that drives our existence [54].

Ranking. With this pattern a call agent compares his own performance to that of other agents. The agents compare their own quantity of different Troubleshoots with the quantity of their colleagues. This pattern is used in the context of games because it offers a basis for competition [6].

In addition, three work-related functionalities were implemented in the software:

Top-hitter. This widget shows the Troubleshoots used most often during the last few hours.

Excalibur update. This is a list on the homepage of the software with the new and updated Troubleshoots in Excalibur.

Problem ticker. This is a list recommending a specific Troubleshoot for a current problem.

3.1.2 Evaluation

The case study took place in a real environment at a call-center of a German telephone company. Three groups of call agents participated. Group 1 (G1) consisted of seven participants who were extensively informed about the new functionalities. Group 2 (G2) also had seven agents, but they only got the new functionalities without any further explanation. The third group (CG) was the control group, which did not receive any of the new functionalities. The five agents of this team continued working with the old application.

Several studies present results about the first impression that a user has with a new system [28], but in our case we wanted to examine the effect of the new version of Excalibur for a longer period of time. Because of this, the call-agents were observed during a 10-week period and answered weekly surveys about their experience with the software. The employees did not receive any kind of compensation for their participation in the study.

Four exploratory questions provided directions for the data collection and analysis. The first interesting issue was to know whether the new functionalities could fulfill the users’ needs, and in this way positively affect their emotional state during work. For this purpose, we utilized two instruments, an adaption from Hassenzahl (2008) of the Needs questionnaire by Sheldon et al. (2001) and the Self Assessment Manikin (SAM) by Bradley and Lang (1994).

With the Needs questionnaire, the users were asked about the fulfillment of five needs (competence, popularity, relatedness, stimulation, and autonomy). Each need had three items and a five-level Likert scale (from "not at all" to "very much"). The questionnaire's factor structure has been confirmed in three different studies (Sheldon et al. 2001), even though data about the reliability and validity of the scales is not available [58]. The users' emotional state was recorded by Bradley and Lang's SAM. The instrument presents two dimensions of emotion, valence and arousal. These are measured by pictograms, similar to a human figure, in combination with a nine-point rating scale. The valence scale consists of pictograms that show a happy/proud person on the one end and a sad/unsatisfied person on the other end. The other dimension, arousal, is represented by a calm and relaxed figure on the one end and an excited and tense human shape on the other end [8].

Our second question dealt with the perception of the product qualities. We wanted to know how strong the new functionalities influence user perception in terms of the quality of joyfulness. For this, we applied the questionnaire AMUSE, which focuses on recording the perceived quality of product aspects, namely effectiveness, productivity, joy of use, trust, and competence [19]. AMUSE presents for each dimension four items and a seven-level Likert scale (from "strongly disagree" to "strongly agree"). For our study, we used only the scale joy of use, because of its relevance in terms of the users' goals.

From the business goal point of view, two issues were important and built our third and fourth exploratory questions. Assuming that the new functionalities had a positive effect on the call agents' mood and their working habits, we expected an influence on the customers' satisfaction with the employees on the one hand, and, on the other hand, an improvement in the documentation quality of the calls.

To record the information regarding customer satisfaction, during the 10 weeks a randomized sample of customers was asked after their calls how satisfied they were with the call agents. Satisfaction was estimated in percentages (between 0% and 100%). Moreover, as objective measurement, the use of Troubleshoots was recorded by log data integrated into the system for the whole period of time.

At the beginning, in the middle, and at the end of the 10-week period, the participants had to answer all questionnaires (Needs, SAM, and AMUSE). In the meantime, a condensed version was handed out, resulting in a total of seven measuring points (Needs with two items for relatedness, stimulation, and self-actualization; SAM Valence). The condensed version was necessary due to economic reasons (e.g., time consumed by answering the questionnaires). All questionnaires were available in German.

3.1.3 Results

19 call agents participated in the study, 11 females and 8 males, with an average age of 33.9 years (Min=22, Max=50, SD=8.5).

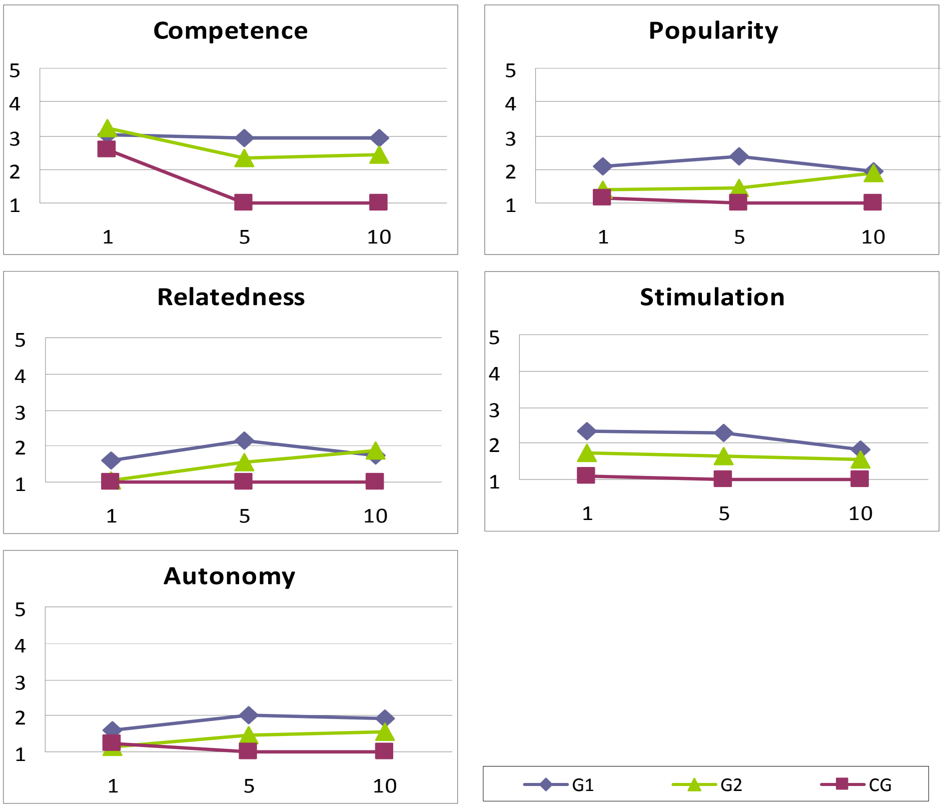


Figure 5: Perceived fulfillment of human needs
Observations: Graph shows mean of measurement during the 1st, 5th and 10th week.
Scale 1= not at all to 5= very much.

One part of our first question examined the fulfillment of user needs when the released Excalibur was used. The development during the study period is shown in Figure 5. Competence was the need people evaluated highest during the work with Excalibur. But it was apparent that in G1 and G2 the competence need was more satisfied than in CG. Another experiment with a similar condition, or usage mode, also showed that resolving a task addresses the human need for competence [35]. These results serve as evidence for the prediction by Hassenzahl (2003). He argues that the usage mode impacts the user's experience with an interactive product and his retrospective judgment [26], meaning in our case that the task-oriented context strongly influences the fulfillment of the human need for competence.

The other needs were rated substantially lower with values around 2 (“a little”) and 1 (“not at all”). It is clear that G1 rated the fulfillment of needs higher than the other two groups for all five needs; however, the statistical analysis (ANOVA) conducted showed no significant result, neither in comparing the groups nor over time.

The visually observable constant increase in the perceived fulfillment of the two needs popularity and relatedness in G2 is also interesting. G2 did not receive detailed information about the released Excalibur. This may indicate that the call agents had to take more time to explore the new functionalities and consequently felt the positive effect of their use more than the users of G1.

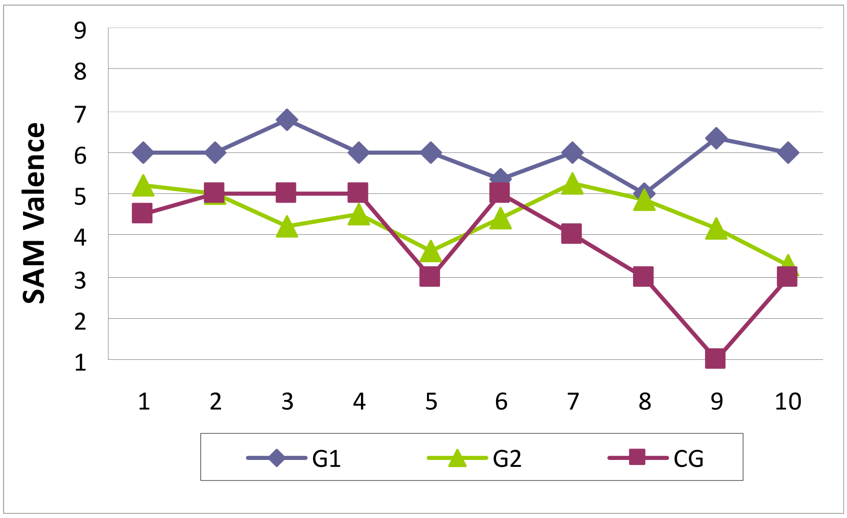


Figure 6: SAM Valence during the 10 weeks
Observations: Scale 1=sad/unsatisfied to 9=happy/proud.

Regarding the emotional state of the user, the results showed that G1 had a more positive mood during the ten weeks of the study with less variation (see Figure 6). In the other groups, the variation was greater and the call agents were in a worse mood than the agents of G1. While a t-Test shows no significant difference between G1 and G2 in the first week (t=-1.41; df=4; p=.23), a significant difference between these two groups in the fifth week (t=-7.00; df=4; p<.01) and also in the tenth week (t=-3.32; df=4; p=.03) can be reported. G1 showed over the course of time no explicit positive or negative trend (see figure 3), but rather relatively constant data, whereas G2 had an ambiguous time-series. The visually recognizable slight negative trend of CG could not be verified by the Neumann’s trend test.

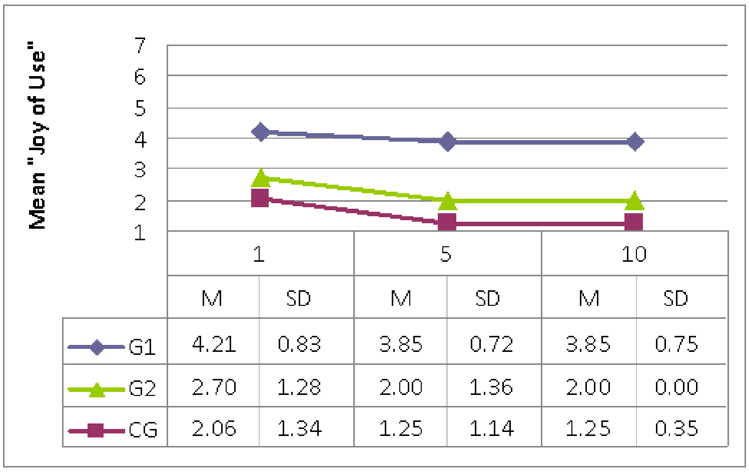
Adding the SAM arousal scale to the interpretation of the data, it was observed that during the first week, the call agents were rather calm than tense in all groups. In the fifth week G1 was a bit more excited (valence: M=6.00, SD=1.00; arousal: M=5.00, SD=1.63) compared to the first week (valence: M=6.00, SD=1.41; arousal: M=3.57, SD=1.13), whereas CG was more unsatisfied and tense (valence: M=3.00, SD=0.00; arousal: M= 5.00, SD=0.00). G2 was also more unsatisfied; unlike CG, however, the participants were unexcited (valence: M=3.60, SD=1.67; arousal: M=3.00, SD=2.00). Admittedly, these differences between the three groups for the three measuring points were too slight to generate any significant difference (ANOVA).

A bivariate correlation analysis was used to evaluate the association between the two groups of variables. Table 2 shows the correlation between SAM Valence (positive and negative emotion) and the five human needs. There is a tendency towards a moderate correlation between the fulfillment of needs and the emotional state of the call agents. The different measuring points show that during the course of time, different needs were more correlated with the emotional state of the users than others. This could be evidence that in distinct situations, our needs are satisfied differently and hence influence our mood positively or negatively.

Need		SAM Valence		
		1st Week	5th Week	10th Week
Competence	1st Week	-.16		
	5th Week		.58	
	10th Week			.56
Popularity	1st Week	.27		
	5th Week		.48	
	10th Week			.35
Relatedness	1st Week	.53*		
	5th Week		.29	
	10th Week			.24
Stimulation	1st Week	.22		
	5th Week		.45	
	10th Week			.45
Autonomy	1st Week	.01		
	5th Week		.30	
	10th Week			.32

Table 2: Bivariate correlation between Needs and Valence
*Observations: Table shows correlation between measurements during the 1st, 5th and 10th week; * p < .05.*

The call agents using Excalibur with the new functionalities and with the additional detailed information about the new advantages of the software (G1) evaluated the software as considerably more joyful than the other two groups (see Figure 7). It was also observed that in this group, the effect was lengthy and remained stable throughout the evaluation period. In G2 and CG, the perception of the quality "joy of use" sharply decreased during the fifth week. Moreover, an ANOVA showed that all three groups differ significantly from each other (F=33.61; df=2; p<.01).



	1		5		10	
	M	SD	M	SD	M	SD
G1	4.21	0.83	3.85	0.72	3.85	0.75
G2	2.70	1.28	2.00	1.36	2.00	0.00
CG	2.06	1.34	1.25	1.14	1.25	0.35

Figure 7: Joy of Use
Observations: M, Mean - SD, Standard Deviation. Scale 1=strongly disagree to 7=strongly agree.

The averages of the 10-week study show that customers, attended by call agents from G1, were more satisfied than customers attended by agents from the other two groups. G1 had a customer satisfaction index of 65%, while G2 and CG had 60% and 57%, respectively. Furthermore, the customers were significantly more satisfied with the support when the call agents use the new system in comparison to the support of the call agents using the former version of Excalibur (t=1.95; df=25; p=.03).

Considering the use of different Troubleshoots, G2 had the best average during the ten weeks. The call agents in G2 had an average – rounded to the nearest full number – of 67 different Troubleshoots per week, while G1 had 63 and CG 47 Troubleshoots per week. In Figure 8, the development of the variation of Troubleshoots from the first until the ninth week can be observed. Although a slight negative trend for G1 and CG could be visually noticed, only for CG does the Neumann's trend test showed statistical significance (test statistic=.82, critical value=1.02 for p=.95). One reason for the greater use of Troubleshoots by G2 compared to G1 might be a strong concentration of the participants on the Ranking Pattern; this pattern is characterized by inciting competition and thus making the participants use a higher number of Troubleshoots.

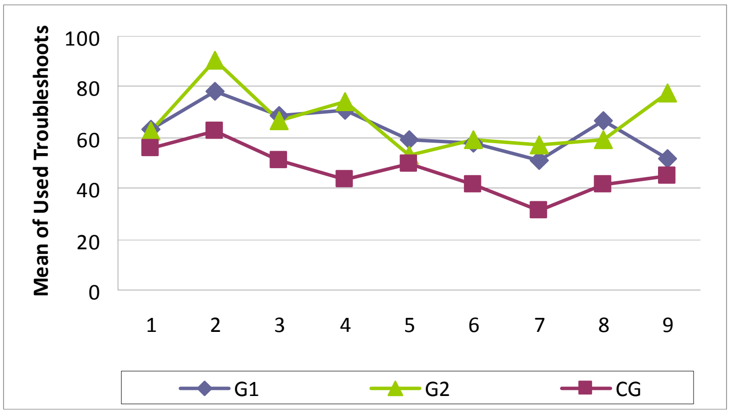


Figure 8: Mean of Troubleshoots used per week per group

3.2 Technical Client Support

We conducted KREA-FUN also with a client who has developed an in-house ticketing system to distribute clients' support requests (= tickets) among the employees (also called agents). The system basically looks like an inbox of a generic email program. This application also allows the employees to track their working time live, i.e. as soon as they start working on a ticket they should start tracking their time for that ticket, which they do not do according to the well known in-house rules. Usability, motivational, and attitudinal reasons were identified as being the cause. Hence, during KREA-FUN, we focused on triggers to "engage" and triggers to "induce" in order to change the employees' motivation and attitude towards tracking their time live according to the rules.

Five people participated in the workshop, including two agents, one manager and two user experience experts.

The first step of the workshop was to explore and define the user and business goals that are to be achieved by the implementation of new interaction concepts in the software (preparation). In this case, the following goals were selected and refined from an initial list of aims:

> **User goal**: The employees wanted to have less tedious tasks and more fun during the working day.
>
> **Business Goal**: The Company wanted to have a better control of the billing. If the agents did not use the ticketing system correctly, the company could not be sure about the amount of hours spent in the support for its customers. The company wanted that the employees use the ticketing system according to the rules in order to have a better control of its billing.

Inspired in these goals, 40 interaction ideas were generated in the exploration and transformation phase of KREA-FUN. After screening and prioritization the resulting ideas (evaluation), the interaction idea “Veto” has been agreed upon due to implementation feasibility, business utility, and academic innovation.

3.2.1 Implementation

Veto gives employees the right to object tasks they dislike. Veto is based on the principle of reciprocity, i.e., a user only earns a Veto in return of a specific performance s/he is expected to do. Typically, Veto can be used if an employee should complete tasks that are in general unwillingly done. What a user receives a Veto for, depends on the performance the company expects of its employees. Here, employees needed to track their time live for a minimum of three days in a row with a rate over 85%.

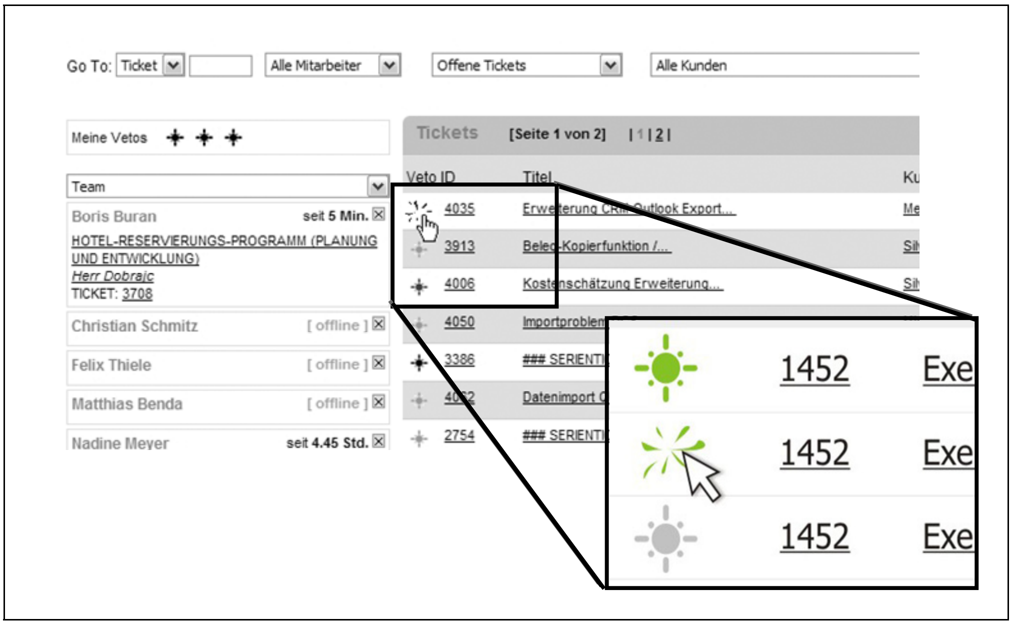

Go To:
Ticket
Alle Mitarbeiter
Offene Tickets
Alle Kunden
Meine Vetos
Team
Boris Buran
seit 5 Min.
HOTEL-RESERVIERUNGS-PROGRAMM (PLANUNG UND ENTWICKLUNG)
Herr Dobrajc
TICKET: 3708
Christian Schmitz
[offline]
Felix Thiele
[offline]
Matthias Benda
[offline]
Nadine Meyer
seit 4.45 Std.
Tickets
[Seite 1 von 2]
| 1 | 2 |
Veto ID
Titel
4035
3913
Beleg-Kopierfunktion /...
4006
4050
Importproblem
3386
### SERIENTI
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Figure 9: Veto integrated into the ticketing system

Veto was prototyped for the employees’ profile: male users under 45 years of age. The visualization of the Veto is found in front of each task and looks like a bomb icon added to each task’s subject and explodes once the user clicks on it (see Figure 9:).

3.2.2 Evaluation

The evaluation was conducted in a field study, whereby each employee used different versions of the software for certain period of time. The field study was realized in four stages during 11 months (see Figure 10) with real employees of the company. All participants were male with an average age of 31 years (Min=17, Max=45), they had a technical background and a large experience in the domain.

We explored two research questions in this study, on the one hand we wanted to verify if the user acceptance increase and on the other hand we wanted to observe if there was a changing in the behaviour of the employees.

User acceptance: We hypothesize that participants using the version with the new interaction idea change their attitude towards the application and to their work task in a positive direction.

To assess user acceptance, usability and hedonic quality was measured using the ISONORM questionnaire [53], and the AttrakDiff [30] respectively.

Behavior in working context: We hypothesize that participants using the version with Veto would adapt their behavior more towards the business goal than when using the original version.

Behavior in the working context was assessed by logging the users' time tracking behavior.

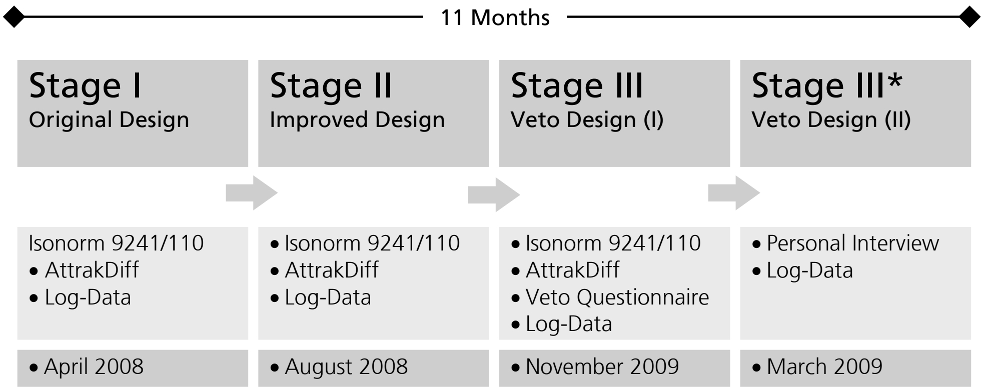
11 Months
Stage I
Original Design
Stage II
Improved Design
Stage III
Veto Design (I)
Stage III*
Veto Design (II)
Isonorm 9241/110
• AttrakDiff
• Log-Data
• Isonorm 9241/110
• AttrakDiff
• Log-Data
• Isonorm 9241/110
• AttrakDiff
• Veto Questionnaire
• Log-Data
• Personal Interview
• Log-Data
• April 2008
• August 2008
• November 2009
• March 2009

Figure 10: Course of time in the field study

The evaluation consisted of 3 stages within 11 months. During the first stage, the employees used the "original" software version and the above mentioned measurements were assessed. For the second stage, the usability of the original software version was improved, as there were usability deficits in the original version – usability is a key prerequisite for enhanced user experience and the addition of new interaction ideas. After the employees worked with the usability-improved software for two months, the above mentioned measurements were assessed. For the third stage, the usability-improved software was augmented by Veto; the same measurements were assessed.

After the third stage we decide to realize an interview with the employees in order to clarify some questions that appeared during the initial analyses of the previous captured data. Because of these, we included the Stage III*. In this last part of our study, in addition to the personal interview, the behaviour of the participants was also observed.

3.2.3 Results

Analysis of the subjective measurements of the user acceptance shows no big differences between the software versions. Users judge the version with Veto as slightly more stimulating, more beautiful, and more attractive as the other two versions. Table 3 shows the average of the four scales of the questionnaire AtrakDiff, namely pragmatic quality, hedonic quality identification, hedonic quality stimulation and attractiveness, as well as the average of the questionnaire ISO 91410-110.

		Stage I Original Design	**Stage II** Improved Design	**Stage III** Veto Design (I)
AttrakDiff	Pragmatic quality	4,71	4,90	5,11
	Hedonic quality-identification	4,82	4,78	5,04
	Hedonic quality-stimulation	4,23	4,01	4,57
	Attractiveness	4,50	4,14	4,93
ISO 9241-110	Controllability	3,6	4,7	5,0
	Suitability for individualization	3,0	3,2	5,2
	Suitability for learning	5,3	5,5	6,0

Table 3: Averages of questionnaires AttrakDiff and ISO 9241-110 during the three stages of the study
Observations: Scale 1=very low to 7=very high

In relation to the perceived usability, only three scales presented a considerable change during the experiment, to be precise controllability, suitability for individualization, and suitability for learning (see Table 3). The other four scales presented the same values in the three measuring times. The most noticeable difference is presented by the scale "suitability for individualization" with a variance of 2 points between the first and last measuring point – from 3,2 to 5,2 (scale 1=very low to 7=very high).

However, the behavior analysis shows a strong improvement of the employees' attitude towards the time tracking. In Figure 11, the results present an improvement in 30% from Stage I, with the original software, to Stage III*, with the new application and the Veto. Furthermore, we could observe a homogenization in the whole behaviour of the employees. In Stage III*, each employee tracks his time live on a similarly high standard in comparison with Stage I, see Figure 12.

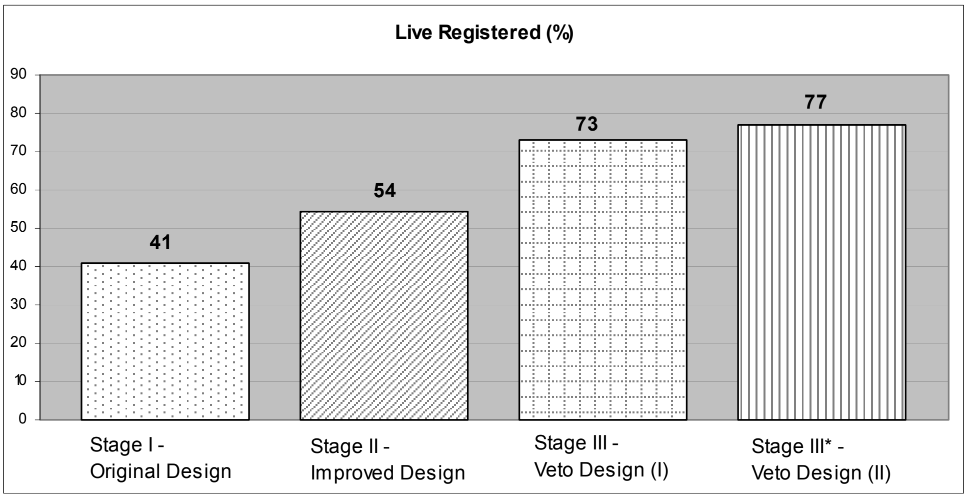

Figure 11: Improved time tracking behavior with Veto

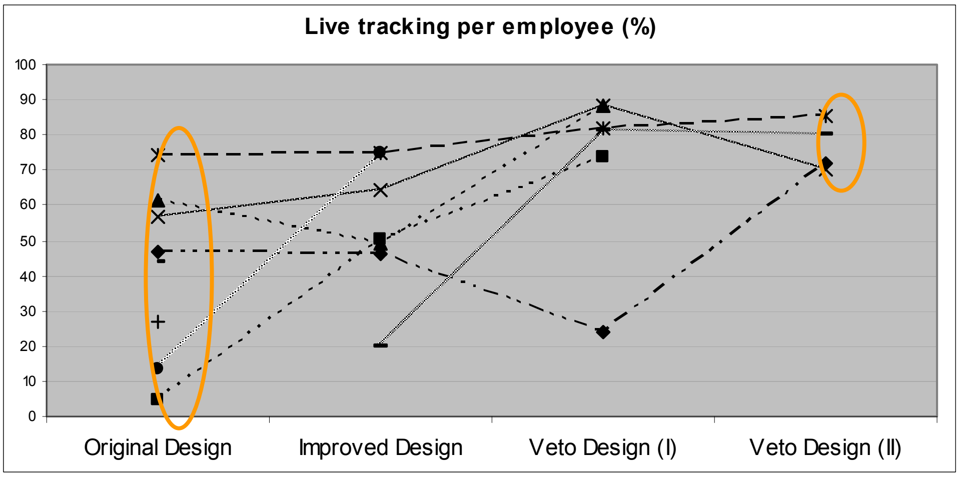

Figure 12: Comparison of the employees' behavior of the related to the live tracking – from very heterogenic in Stage I to very homogenous in Stage III*

The log-data indicates also that the employees did not use their Vetos during the whole study period. They collected Vetos, but did not eliminate any task of their list. This ambiguity in the behaviour of the agents was discussed in an interview in the Stage III*. In this interview the employees reported following reasons for the no use of Vetos:

- The team is very loyal. The use of a veto implicated that another colleague would get this unwished task.

- The team experiences a culture of mutual help and an agent would prefer to take off a task of a colleague rather than give them one.
- The employees developed an own organizational system of task specialization, to realize the tasks faster. Because of this assignment a lot of tasks became not apt for Veto.

We also asked the employees about the reasons for their behaviour change; we wanted to know the reasons for the use of the ticketing system according to the rules. They mentioned following reasons in sequence:

1. The entire field study raised the awareness of the employees to use the ticketing system regularly.
2. The usability improvement of the software made possible for the agents to use the software more quickly and efficiently than before.
3. They felt the possibility of deletion of tasks (Veto) as very helpful and positive.
4. They noted the positive effect of the live registering of tasks and time instead of post-actualization of this information for hours with uncertain data.

Although the employees did not apply Veto during the experiment, they do not want abdicate the functionality. They said that it was good to know that they could use the Veto, if they needed.

The new versions of the software were not rated much better, because of the technical background of the employees. They were conscious about the potential for improvement of the software.

4 Lessons learned

The following accounts of experience should give an overview of what we have learned during the preparation, during the sessions of explorations and transformations, and during the evaluation.

When a company holds such a workshop for the first time, one can usually expect that the participants use the opportunity to unload all their ideas they once had to improve some aspect of the software. The workshop is an opportunity for all members of the organization to step back from their usual work, flee the tread-mill and create new ideas or reactivate old ones. This should be made clear to the organization so that it can send the right people.

When the workshop is conducted with people not familiar with the format of creativity workshops, it might seem unusual to them and they might feel uneasy. The unstructured thinking is unusual for those who have been trained during their whole work life to think in a very structured way. It often happens in technical environments like the premium target group of this workshop format: software development companies. This is why the workshop should be conducted in a structured way, to give participants a feeling of control. It is about the outer structure, not the content of the session. They should know what is going on and why, what is expected from them and that they can rely on the moderators and their help. The role of the moderators should be pointed out: they are support and guide the party through the workshop, but only in exceptional cases they should provide input. The rational is that the participants should attribute the findings and results to themselves and not to the moderators in the end.

It is essential to the result of the workshop that hierarchies are left at the door. Otherwise people will feel observed by their superiors and might think that their performance is monitored. This belief contradicts the idea of freeing your mind and producing even unpopular or “crazy” ideas. The moderator has to make clear that he does not accept any kind of hierarchy in the room, accept from the fact that he has the right to guide the interaction between the participants. He should refrain from presenting himself as judging entity. To control his behavior and to level the workload of the workshop (e.g. documenting the ideas uttered) it is advised to conduct the workshop with at least two moderators.

From the experience, we can tell that there should be no discussion if any subjective statement is relevant or not. Discussion will eliminate exploration and divergent thinking. If some disruption should occur (like discussion), the moderators can use the techniques prepared to direct the conversation back on track (e.g. with "Six-Hats" to limit the discussion).

For a successful workshop, it is essential that domain experts come to the workshop. In the conducted workshops, the participants were users, developers, software engineers, managers, support personnel and training personnel. Best is if users of the software are involved and present their impressions right away. They are the premium target for questions for enhancements in handling the software. If there are no real users, there should be at least people who know how the software is used by them (from training or support), what people regard as essential pros and cons of the current version, what difficulties occurs in training, what the marketing and management of the organization regard as unique selling point, and others. Most of the issues named by the people can be regarded as usual usability issues. For sure, these need to be addressed too, but they are not focus of this workshop format. To handle this input, it should not be rejected but noted down and used for later usability improvements.

Generally, there will be little original ideas among the ideas stated in the beginning. Later on when the minds have unloaded and participants got a feeling for the essence of a truly original idea, there will be fewer ideas but more original ones (see Figure 4).

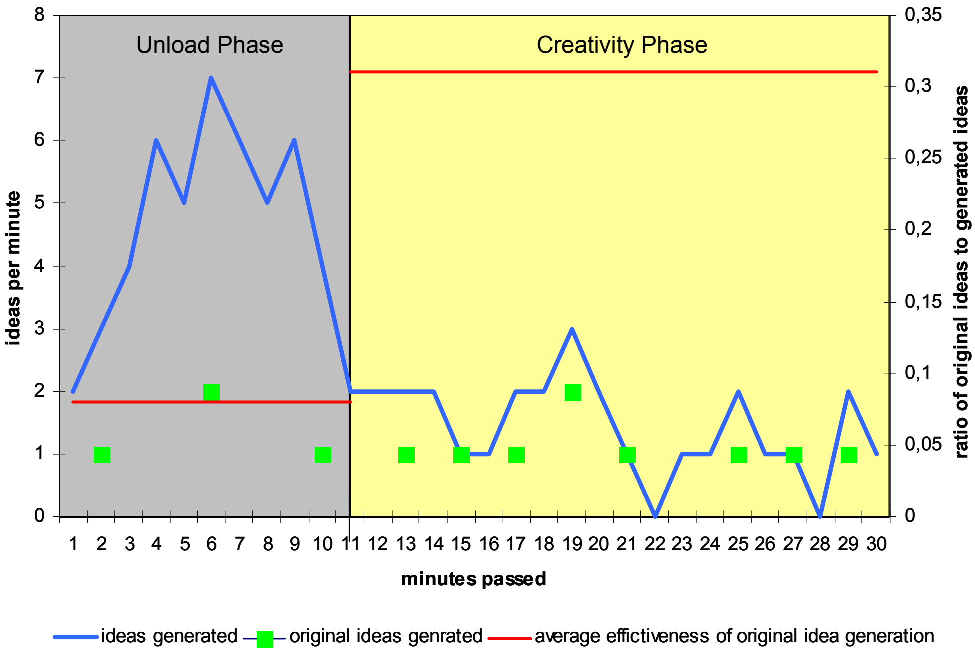

Figure 4: The unload phase and the creativity phase during a typical creativity workshop. In the creativity phase there are less ideas but more of them can be regarded as original. (The data behind this figure is fictious but reflecting the trends.)

Up to now, we have conducted the KREA-FUN workshop successfully several times with project partners. During these workshops, full size business applications (not prototypes or mock-ups) had to be enhanced with innovative ideas for joyful interaction. The feedback from the workshops was very positive. Many participants mentioned that the experience in the workshop was joyful itself and that the workshop format created an engaging atmosphere.

There is one limitation of the workshop format: We could experience that engineering joy-of-use into a product that lacks a basic usability is almost impossible. Actually, this is not a failure of the workshop but more of the product submitted to the workshop for enhancement. The inappropriateness has two reasons. First, it is doubtful if later user will be influenced by the joy-of-use means if there are strong usability flaws at the same time. The strong negative effect of poor usability will level the subtle positive effect of joy-of-use. Secondly, it is very hard to direct the participants' thinking away from revolving around usability flaws and how to improve them during the workshop. Thus the best time to improve a product through fun-of-use is when it is equipped with at least basic usability, such that the users can do what they want to do without being obstructed. Best would be if usability is already good. Joy-of-use can then add to it to create an advantage for the users and a unique selling point for the business.

5 Acknowledgments

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