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Usability studies: to meet or not to meet intrinsic motivation

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ABSTRACT

Controlling the users' motivation can significantly improve the efficiency and prognostic value of usability studies. The distinction between the extrinsic and intrinsic motivation plays a decisive role in computer-related activities. A well-developed theory of flow experience, introduced by M. Csikszentmihalyi within the school of positive psychology, is intimately related to intrinsic motivation. Researchers intensively explore flow experience in various types of human-computer interaction. The authors' earlier results referring to computer hackers' motivation are discussed, and the model of hackers' motivational development is presented. These findings suggest productive hints on software users' motivational development, and can be applied in usability studies. Longitudinal usability research projects prove to be reliable in acquiring information about long-term use of newly-developed or updated software products. Specifically, longitudinal research projects would benefit, if the Experience Sampling Method is used. Methodology is discussed, aimed at development of software products which facilitate users' flow experience, and possibly long-term use of these products.

Keywords: *usability, software development, motivation, intrinsic motivation, emotion, longitudinal study, flow experience, hackers' motivation, experience sampling method.*

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1. Software Developers and Consumers in Conflict

Creators of competitive software products have at least two main goals: to attract the target group of users, and to “hook” them, i.e. to make them stick to these products. User Experience teams do their best in assisting software developers to achieve these goals. In some cases, while they are successful with the first goal, the second goal is harder to reach. Is it because usability is still “a craft, but not a science” (Spool, 2004) ? Probably not, although usability teams differing in expertise, methodology, the number of participants in usability assessment sessions tend to detect diverse usability problems, and the lists of problems have only few overlaps (Molich, Ede, Kaasgaard, & Karyukina, 2004).

The traditional explanation of such diversity refers to time limits: in many cases the particular user research had to be “done yesterday” (Courage & Baxter, 2005, p. 158). The software market is highly changeable. When a new project is being developed, that means that marketing teams have found a niche for the immediate use of the new product. Marketing and user research is targeted on those who would install and use the product the next day after it was purchased, and the updated versions of a niche product will be set precisely to the interests of a would-be customer. Thus, almost any alpha (beta) version is only tentative, not yet customer-tailored.

We suggest that one of the main causes of usability efforts failure lies in traditional testing procedures which are oriented primarily on cognitive and operational components of target-group users’ behavior, while emotional and motivational aspects of human behavior are underestimated, if not totally misrepresented. The latter is often responsible, we believe, for failures of usability team efforts, even in case of thorough research. Indeed, users are looking for personalized interfaces and software products to do tasks automatically; this is conceptually close to the ideas of universal design and universal usability (Shneiderman, 2000). Having got universal and personalized software products, users would enjoy applying them for a long time and wouldn’t like to face the need to switch to another product in a year or two. Here is a place where a conflict arises between the users’ needs and the results of marketing- and usability-oriented work. We can suggest two likely explanations of the origins of this conflict. The latter one will be extensively discussed in the paper.

2. Usability in Time Perspective

2.1. Wanted: Time Machine

A usability team has not too many chances to learn how a user will be interacting with a new product (feature, gadget, etc.) in the future. The reason of this limitation of usability testing procedure derives from the fact that participants in usability studies are mostly novices, at least novices for this particular software product. Even experienced computer users face the application (or a new feature in a product) for the first time during usability testing. Indeed, trying to address questions to those who are already competent in using this particular software product looks odd. Thus, even when users are already familiar with a company's software products, they are given to test the entirely new features, the ones they have never used before. In usability practice there are almost no procedures tailored for experienced users.

As time goes by, users get more and more familiar with the features and options, and their requirements and expectations change very often, partly due to their experience with some competitors' products. Thus, a conflict arises between the users' needs and the characteristics of software. In a longitudinal study (Kjeldskov, Skov, & Stage, 2005) it was shown that after 15 months of working with the particular software users revealed a significant number of usability problems they could not discover when testing the same product for the first time. The authors suggest to invite both novice users and expert users for usability testing, because such testing helps identify serious usability problems.

"Telescoping" is aimed at getting full knowledge of the ways the product is likely to be applied in the future (Kuniavsky, 2003). The method includes recruiting study participants having various experience with the use of the product, from newbies to long-time experts: "By keeping track of the problems and perspectives that people have based on their experience level, you can deduce the kinds of changes that people are going to go through as they use your product for long periods of time" (Kuniavsky, 2003, p. 393). With a totally new product, however, the "time machine," be it telescoping or an alternative methodology, would not work.

2.2. Motivation Is the Key Issue - but Motivation Related Studies Face Problems

The second reason of usability failures is of motivational nature. In attempts to learn users' motivations, though, usability researchers have to successfully pass traditional traps. As it has been stated in case of focus groups, "participants just lie" (Gross, 2003). Close to this extreme statement, Zaltman wrote in the book *How Customers Think*, that "the correlation between stated intent and actual behavior is usually low and negative" (2003). People often verbalize socially desired statements instead of their actual feelings or perceptions; usability practitioners find that deceptive statements are often culture-influenced: for example, status inequality, gender and age differences, plus an ethnic background determine the readiness of many participants, for example of Eastern origin, to give socially desired replies or give preference to neutral statements (Gould, 2009). It is also well known, that User Research teams have to filter out money-seekers as respondents, since they are known to tell lies, cheat, and pretend to take any position in the imagined continuum of competencies starting from the total lack of competence, and up to being over-competent, depending on the usability team's current needs. For this purpose, user researchers keep databases of people coming to a lab, check their identity, carry out structured phone interviews containing elements of testing, and even practice "face control": candidates sometimes change their names and addresses to participate in a paid study (Courage & Baxter, 2005).

The validity and prediction value of self-reports, given in a lab study setting, is questionable, too. Even if researchers ask the usability study participants, whether they are interested in using a product or a feature, the participants' reports on their "would-be behaviors" might not fully reflex their intentions. There are good chances that the actual behavior will totally differ from the self-reported "would-be attitudes". That is why researchers prefer to complement the user metrics with eye-tracking studies or physiological methods to get more objective data (Bruneau, Sasse, & McCarthy, 2002). Thus, organization of motivation related studies faces human-related problems (Cooper, 1999).

3. Understanding Users' Motivation

3.1 Emotional Design and Users' Motivation

While sometimes criticized (Hollnagel, 2003), principles of emotional design (Norman, 2002; 2004) as well as affective computing (Picard, 2003) is being widely advocated. A promising example seems to be the Emotive Alert, designed by Zeynep Inanoglu and Ron Caneel at the Media Lab, MIT: the new product labels messages according to the caller's tone of voice, and is aimed at helping to identify urgent messages (Biever, 2005). The behavioral role of Emotive Alerts is in a way close to what Minsky (2006) called “alarmers,” or resources “interrupting higher-level processes” of problem solving and information processing due to the need to react immediately (p. 338).

While the status of affects in thinking and semantic processing have been underestimated for long time, nowadays the role of emotions in cognitive processing is widely recognized. Studies of emotional intelligence (Goleman, 1998) represent one of the most promising directions of current psychological research. In accordance with this line of studies, Norman notices that good design is also “emotional”, and our perception of “nice and beautiful” comes from our emotions and past experience: emotions simply “code” and store any information about positive, negative, or neutral elements in the environment (Norman, 2002; 2004).

Emotional aspects of design are not alien to the usability researchers. For example, Weinschenk (2007) insists on using PET methodology, which means measuring (“scanning”) and designing processes such as “persuasion, emotion, and trust”. In recent studies (Lindgaard, Fernandes, Dudek, & Browñ, 2006; Tractinsky, Cokhavi, Kirschenbaum, & Sharfi, 2006) it is shown that users tend to form immediate aesthetic impressions of the web pages they observe quite quickly, namely, in just 50 milliseconds, and these impressions are stable.

At the same time the motivational components of design are not yet widely investigated (Markus & Keil, 1994). Why so? Maybe due to the fact that by “motivation” usability researchers most often mean their own intent for providing the study, but not the investigation of the reasons of users’ interest in certain products and services (Cooper, 1999). Describing the users’ “wants and needs analysis,” the researchers warn that the study participants “don’t always know what they really would like and are not good at estimating how much they will like a single option” (Courage & Baxter, 2005, p. 373). At the moment, the methods of investigating users’ motivation include mostly statistics of web-site hits, and form a part of users’ requirements studies (Fuller & de Graaf, 1996).

This context is, to our mind, long way from current motivational research. Understanding users’ real motivations, i.e. their “drive” to use this or that particular application is among the most important tasks for the new generations of user researchers. As Shneiderman (2002) formulates it, “workers of the old computing … want objective and even automatable metrics. Advocates of the new computing often seek subjective measures and apply ethnographic approaches to conduct evaluations. They observe and interview users while they are doing their work or enjoying their entertainment. The results are not numbers but understanding, not percentages but insights" (p. 238). Motivation seems to be in the crossroad of qualitative and quantitative ways of analysis.

3.1.1 Usability Field Study

In order to investigate prospective users' workflow, tasks, motivations, and problems, User Research gurus highly recommend to conduct field studies (Dumas & Redish, 1999; Nielsen, 1999; Shneiderman, 2002). Conducting field studies might help practitioners understand their users' and customers' behavior patterns: the ones that the users are not able to keep trace of and thus cannot report. Moreover, it is pointed out that field research is prospective in addressing longitudinal issues, while quantitative methods are not (Wixon et al., 2002).

Since field studies are believed to be too expensive and time consuming, whereas in many cases user research had to be "done yesterday" (Courage & Baxter, 2005, p. 158), the usability engineers only rarely have a chance to conduct them. Many companies benefit from logging the users' activities on the websites or other online applications. But not all of them; the ones who need this information the most, often have no access to such data. Another opportunity to conduct a "field" study, not stepping outside one's office is "scraping" the blogosphere content, specifically, Twitter posts. Kuniavsky (2003) recommends, alongside with the log analysis, to collect, organize by coding and tabulating, and analyze comments. Google is exceptional, since it keeps logs of everything the Google users look for (Meyer, 2005). Thus, researchers have full access to very useful data: for example, it was discovered that when as many as two notifications of wrong spelling appear in front of the users' eyes (in the form: did you mean {correct spelling}), 20% of users never notice such notifications and keep complaining that there is no spell checking service in Google (Meyer, 2005).

3.2 Extrinsic and Intrinsic Motivation

There are two major types of motivation: extrinsic motivation depends on bonuses: money rewards, gifts, and positive feedback; intrinsic one depends on human beings' interests and challenges: tasks and trials are taken for their own sake (Deci & Ryan, 1985). The latter one is severely underestimated when new software products are released and tested. While in fact intrinsic motivation is of special interest in the field of human-computer interaction, especially in usability studies (Berkun, 2001; Malhotra &

Galletta, 2004; Voiskounsky, 2008).

Of course, the use of applications and services can be driven by either extrinsic or intrinsic motivation, or their combination. When a person does not use an application, a feature, or a service due to its special value, but appreciates it as a tool for obtaining an outer goal, then the motivation might be called extrinsic. Alternatively, when a person is fond of experiences with a feature, an application, or a service due to his or her particular interests in manipulation with this piece, and/or challenges connected with it, then this case is indicative of an intrinsic motivation.

Inviting study participants to the lab, usability engineers restrict the testing procedures with only one sort of motivation, i.e. extrinsic one: a participating user is encouraged to complete the given task and/or is paid to do so. Since sessions are videotaped, participants feel concerned with “not loosing face”. If they are unable to complete tasks, it is a signal of serious usability problems; the absence of serious problems does not mean easy life: even if participants successfully completed the tasks it does not mean they are going to use this product in the future, not mentioning overcoming small difficulties or cosmetic usability problems. While in most cases user researchers ask participants, if they are likely to use particular features or new software product, the reliability of these self-reports is undefined.

Outside the usability trial sessions, the would-be users of new software products act on their own risk, their needs and drives are not that urgent, losing face is not a problem: to sum up, without any external support the existing level of extrinsic motivation might turn out to be inadequate for overcoming problems connected with the new software product – and the intrinsic motivation has not yet been formed. In this case, if would-be users cannot rely on supporters and help-givers, they may give up using the problematic software. Each trainer and consultant can recall the cases when someone asks them “just tell me, which buttons should I use, and after that I will work on my own”. That means that the extrinsic motivation is too low for fighting against an unknown unfriendly interface without any external help, which is close to losing the slightest interest in completing the task.

We thus state that motivation is crucially important for making choice of software applications for work, communication, entertainment, and education. It is even more important for “hooking” customers to use these particular applications, possibly – for long-time use.

3.3 Flow as a "Hook"

Theories and models of intrinsic motivation are not too numerous; the most well developed ones are the self-determination theory (Deci & Ryan, 1985) and the flow theory (Csikszentmihalyi, 1975). Our research is based on the latter theory, since we believe that the flow theory is elaborated enough and can be widely applied to usability. First we briefly describe the origins and the current status of this theory of intrinsic motivation.

The theory was proposed by M.Csikszentmihalyi (1975). It rests on an observation that many people report the state of flow while engaging in diverse activities like favorite sports or hobbies, doing creative work or just washing dishes and vacuuming the floor. Flow is an experience of deep involvement into a certain activity, with the feeling of being competent: a new action freely follows the previous one, and there is no need to push oneself to keep performing an activity that is too boring or too difficult. Usually, in flow individuals do not notice time passing by. A person experiences flow as "a unified flowing from one moment to the next, in which he is in control of his actions, and in which there is a little distinction between self and environment, between stimulus and response, between past, present, and future" (Csikszentmihalyi, 1975).

The main antecedent of flow is matching of someone's skills and task challenges. If task challenges are too high for ones' skill set, a mismatch leads to the anxiety and negative emotions. If, vice versa, the skills are too high, the consequence is boredom. Flow occurs at the cutting edge of person's skills, and it is a moving target. Increased skills should lead to an increase of challenges, if the precise matching is to be preserved, and the choice of greater challenges demands an update of skills. Feedback, interactivity and the match between one's skills and current challenges are the main characteristics of flow (Novak & Hoffman, 1997; Voiskounsky, 2008).

Feedback and interactivity, inherent to computer-related types of activities, are quite rapid and up-to-date, compared to many other kinds of daily routines. For that reason flow is known to be experienced while playing video/online/computer games (Choi & Kim, 2004; McKenna & Lee, 1995; Voiskounsky, Mitina, & Avetisova, 2004), interacting via instant messaging, e-mailing or chatting (Finneran & Zhang, 2002; Trevino & Webster, 1992), web shopping (Hoffman, Novak, & Duhachek, 2002; Huang, 2006), hacking (Voiskounsky & Smyslova, 2003), web learning (Heidman & Sharafi, 2004; Pace, 2004), and other types of behaviors. Comprehensive reviews have been recently published (Hoffman & Novak, 2009; Voiskounsky, 2008); interested readers may derive the needed references from these sources.

In spite of rapid feedback and high interactivity, computer users do not experience flow all the time. Flow is dependent on special features and characteristics of the interface and the software pieces. Even the best imaginable piece of software enables limited periods of flow experience which are inevitably interrupted by periods of boredom, or anxiety. In our previous study of computer hacking we described a model of hackers' motivational development, based on flow experience paradigm. We discovered that one group of our participants has been "following the flow", i.e. choosing only that projects, which the participants felt could be completed fast and accompanied by flow for much of the work's duration (Voiskounsky & Smyslova, 2003). Let us describe this phenomenon: it might be helpful for understanding the origins and development of intrinsic motivation characterizing the users' behavior while engaging in usability testing.

4. Hackers' Motivation Research

4.1 Description of the Study and its Results

The hypothesis of the study on hackers' motivation was that the likelihood of experiencing flow increases with the increase of hackers' competence in the use of IT products. An online research was administered within the Russian-speaking community of hackers (N=457). The participants of the study were self-selected hackers (peer recommendations were also available for part of the sample, otherwise they were active users of HackZone web-portal). One group in our study consisted of the least competent participants (in more detail, with small number of known programming languages, software products and less IT experience) and reported to experience high level of flow. In a second group highly competent participants (with the high variety of known programming languages and software products, and the highest duration of IT experience) reported, too, high level of flow. Cluster analysis of the research data (Voiskounsky & Smyslova, 2003) revealed the third group: moderately competent participants (in more detail, with moderate variety of known software products and moderate duration of IT use). The members of this group experienced very low level of flow. We can state that the moderately qualified participants reported a gap (a sort of a crisis) in the hackers' flow experience. Thus, the straightforward hypothetic correlation was not confirmed: the relationship between hackers' competence and the flow experience turned out to be more complicated. Our subjects appeared to experience both periods of flow and periods of flow crisis (i.e., no flow: we can suggest that it was either boredom or anxiety feelings), followed again by periods of flow renovation. A model that could explain the observed hackers' motivational development is presented at Figure 1.

The model (shown by solid arrows) is partly supported in our empirical study, and is partly hypothetical (shown by dashed arrows). The model is based on a balance between the level of IT skills and experience (but not specifically hacking skills) and the level of challenges (or task choices) in hacking. Most of the people start at the point of low skills and challenges. Flow, experienced at this stage, can keep hackers interested and drive them to master some skills or try different environments. A hacker can stay at this level of knowledge, or else he can progress in at least three ways. The first is a step-by-step progress both in challenges and skills – first to turn into a moderately, and then into a highly experienced hacker – in such a way that challenges and skills are balanced at every developmental stage (it means keeping flow experience).

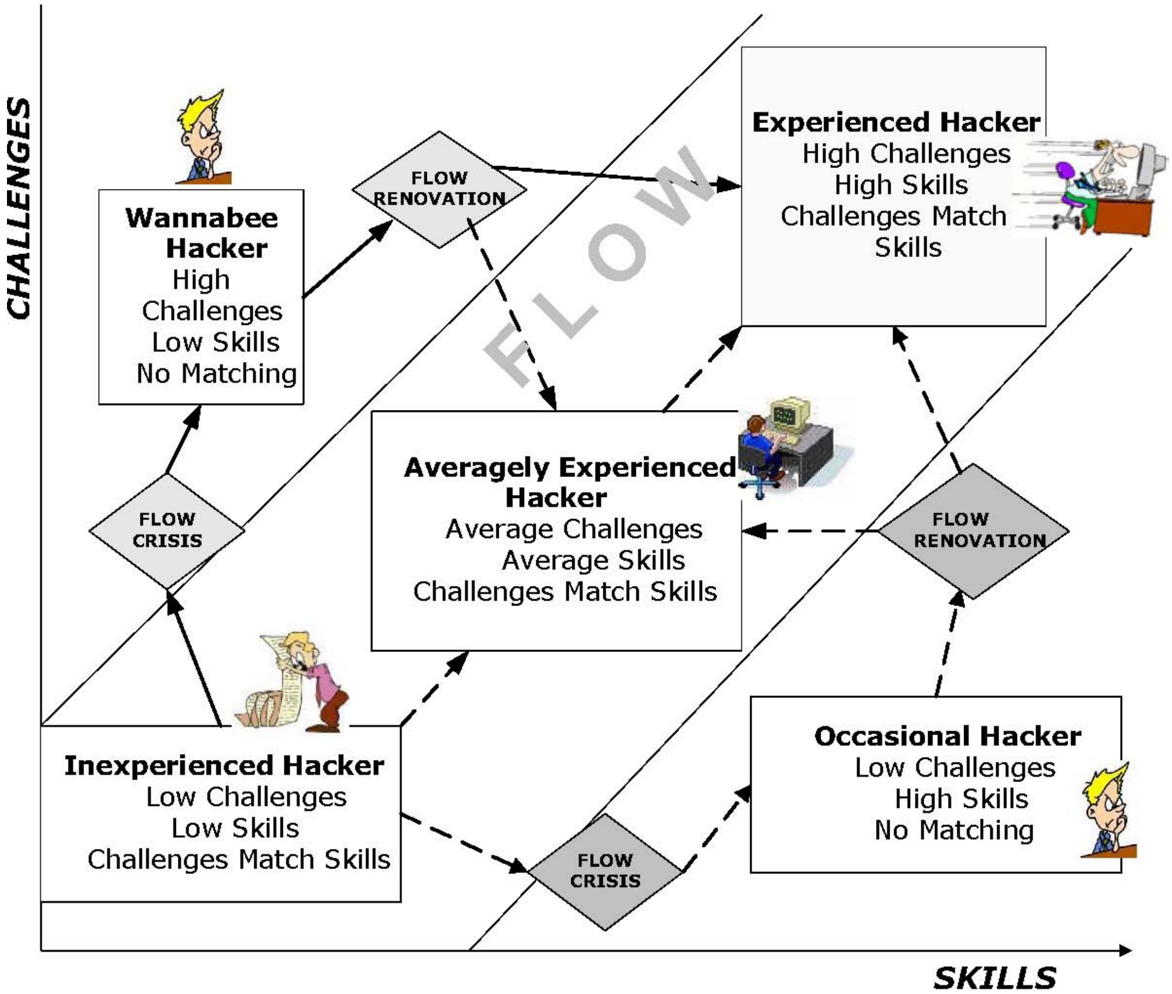

Figure 1: Model of hackers' motivational development (see: Voiskounsky & Smyslova, 2003)

Two other ways of a newbie hacker progress mean, first, that a hacker gains new skills and lacks the correspondence of new skills to non-updated challenges, or, vice versa, forwards or accepts new challenges without adequate skills to balance them. These two ways of a hacker's progress lead to periodical dropouts of the flow range, and the hacker periodically loses the flow experience. At the next stage the hacker might manage fine correspondence of skills and challenges anew and acquire the flow experience at a higher level of his/her progress in hacking.

4.2 Development of Hackers' Motivation

According to the model, the hacker's motivational development might be presented in the following way. Beginners are often heavily using the "how-to" and FAQs; supposedly, they are aware mostly of extrinsic rewards. Some hackers use the advantage to get "live" support via chats or instant messaging, thus forming what might be called online hacking Labs: distant members of these Labs exchange pieces of code and knowledge, help each other and support the advance of numerous individual and group projects (Nuwere & Chanoff, 2002; Yar, 2005). Thus the motivation for hacking can be supported by means of hackers' joint interest in within-group communication.

On a certain step of his/her professional development a beginner (i.e., a newbie hacker) might run into a balanced combination of challenges and get flow experience in hacking-related activity. This point is of crucial importance: flow experience is accompanied by positive emotions, with the feelings of competence and power. Strengthened by this kind of feeling, the flow motivation might become the dominant, desired and welcomed type of motivation. Such a "fixation" on flow while hacking may motivate novice hackers in their future hacking career.

While some hackers might stay at the stage of a beginner for years, others make progress. Their progress might take place in at least three ways, as described in the previous section. The most pleasurable and complicated one is a step-by-step progress both in challenges and in skills, which takes place in such a way that challenges and skills keep matching at every developmental stage. This means that a hacker experiences flow all the time during his or her working sessions. The possibility to keep this delicate balance of skills and challenges seems to be beyond reach, but we can accept it as a hypothetical way of hackers' development. The variety of the available hacking tools, e.g. decompilers, handbooks for beginners, universal standards of programming languages makes a "step-by-step" type of learning truly enjoyable and flow-facilitating. With the appearance of screencasting software, Youtube video tutorials became popular in education (Young, 2008).

4.3 Post-Experimental Data: Differences in Task Choice

Useful results were gained in post-experimental online interviews. Questions were sent out to subjects who were close to the centroids of their respective groups, the outcome being 37 completed replies. We are going to discuss here the participants' replies to only one question, related to the specifics of the task choice. They reported two major mechanisms of task choice while hacking: the step-by-step and the "interests-driven" choice.

First we briefly discuss replies given by reportedly incompetent participants experiencing flow. For example, Sergei wrote: "*Actually, all the problems could be solved. I mean I can see the solution, all steps of it. But sometimes I have not enough experience with the software products I need for the project. If I choose the project to complete I try to estimate the time. Do I have time to learn new programs or not?*"

Or M.G**.** wrote: "*Big projects are not enjoyable for me. On a certain stage it becomes boring, because there is no result… Now I am doing only those projects, which I hope to complete quickly. Some time ago I did not understand why I was so interested in it, why it was so enjoyable to break the copy protection of software products… Later I understood that it was just fast results… It was faster than to complete my own project*".

The task choice mechanism reported by Sergei and M.G. might be called a step-by-step choice. Possibly, this mode of task choice promotes the balance of skills and challenges on every step, and thus the flow experience is maintained. On the contrary, hackers who are reportedly highly competent and experience low level of flow choose their next tasks or projects within the hacking field according to their interests and do not coordinate it with the difficulty of the chosen task.

Here is the reply given by Yuri: "*Everything depends on my temper and weather ;). Today I may want to work on free mail service; tomorrow I may begin to create an accounting service for Linux. And the day after I would not do anything…Everything is up to me. Today it's interesting, tomorrow it's not*".

As we can see from Yuri's words, he chooses the tasks by himself. Projects he mentioned are complicated enough; other programmers or teams have already developed some of them. The projects would take a lot of time and effort to be realized.

Y.K. says the same: "*I always feel lack of knowledge, because I have a lot of ideas about different projects... and for realizing them I need a lot of information and knowledge. I choose only those projects which are interesting for me and don't pay attention to their complexity*".

Two moments need to be emphasized. First, the step-by-step task choice often leads to close correspondence of challenges of the task and of available skills, which is one of the main conditions of flow experience. And second, the task choice is regulated by intrinsic motivation of cognitive nature, which leads to full involvement and engagement with the actual project. But if the task complexity overruns the available skills, the resulting actual motivation might be far from the flow experience.

5. Flow in Usability Testing

5.1 Hints from the Earlier Studies

Strategies of task-choice described in the previous section show that flow might determine the hackers' choices of software products, operating systems, and programming languages. The hackers, who are competent software users, might both keep using the same software products for a long time, or try different operating systems in order to complete their projects effectively.

Some suggestions have been already presented in the literature. For example, Johnson and Wiles (2002) classify particular game design elements which either facilitate flow experience or interfere with it. Not restricting the analysis with the gaming environments, Bederson (2004) and Rettie (2001) report certain factors which inhibit flow experience or, alternatively, facilitate it. In attempts to promote the design of computer interfaces which would keep the users "in the flow" Mistry and Agrawal (2004) explore heuristics targeted to support the flow-oriented design and apply it, under the name "functional metaphoric approach", to the development of an electronic diary service. Two technological characteristics, namely perceived ease of use of a technology and perceived challenge, as well as two psychological characteristics such as skill efficacy and focused attention, are suggested as specific mediators which would impact flow experience, if measured correctly (Phau & Gan, 2000). All the mentioned above suggestions have been referred to in a recent paper (Voiskounsky, 2008), which is not, unlike the current paper, limited to usability studies.

Lazarro, psychologist working in the gaming industry, admits that she uses the flow paradigm in game design and testing (Lazarro, 2005), while Chen (2007) insists that flow experience is an exceptionally important element in game design. In a thorough empirical study, Korean researchers (Choi & Kim, 2004) investigated parameters of online gamers' customer loyalty (a marketing term meaning a customer's tendency to use repeatedly the same product, or a product of the same company). The parameters found include flow (structured as expressions of interest, fun, curiosity, control over the game, high absorption and the absence of distractions while gaming), as well as an ease of social interactions with other players, including a common virtual space with communication media (for example, a chat line or a community bulletin board), and an established feedback (called personal interaction) from the gaming environment, including available artifacts and instruments, adequate responses to gamers' actions, and appropriate goals to be achieved. Resulting on a large-scale survey, the customer loyalty model has been approved; moreover, developers of numerous online games made their proposals aimed at practical realization of certain interaction parameters of the model. The latter include the embodiment of 3D technology and true color graphics, design of artifacts to differ from real entities, and provision of correct information about the gamers' gender and occupation.

Though this study is restricted to online gaming, Choi and Kim (2004) believe its results might be found valuable in e-commerce and in development of cyberspace communities. We tend to think that the basic underlying ideas expressed by the authors are even more universal (Voiskounsky, 2008).

Flow experienced by online gamers or hackers is just an example of a good match between the users' needs and the inner structures of interfaces or programming languages which is likely to match these needs. This sort of matching users' needs and GUI structure should become one of main goals for developers and usability engineers, whenever they work on any new software application. Likeability of flow experience should be a starting point for developing models of human-computer interaction, user scenario, and tasks for usability testing. In the abovementioned studies there are some valuable methodological hints which can be explored and expanded to contribute to the benefit of any usability study.

5.2 A Method of Controlling the Users' Flow Experience

5.2.1 The Need for a Longitudinal Research

Flow is an important factor, which might stimulate any person to use a software product for a long time. Some of the participants described in the previous sections were adolescents, who would reportedly keep switching from one application to another, looking for bugs and exploring features they find interesting. The others would reportedly keep installing and testing operating systems over and over again. They would do so just because this type of behavior enables them to go on experiencing flow.

Any user research team which intends to keep their customers using the same software product for a long enough time (switching from the simplest to the most advanced versions), might think of building the interfaces the way to support the likeability of the would-be users' flow experience. For example, let them undertake a step-by-step tactics, since this tactics is promising for the continuing match of developing skills and increasing challenges. Thinking over the beginners' motivation is supposedly not enough: no less important is to work out effective means that would enable checking whether the users still keep experiencing flow while using the same software product in a one month period, in half a year, and much later.

Thus, the usability practice will inevitably face the problem of trying to check whether users are going to keep experiencing flow in a long perspective. Usability engineers need to have practical means to learn certain details of their customers' work in the future. While no time machine is available, the methodology worked out by Csikszentmihalyi and his collaborators helps researchers to understand some elements of the users' feelings, apart from longitudinal research.

One of the most efficient methods of understanding users' behavior is diary method. When working with diaries, users get short questionnaires to reply every time they use a product, or just write down their own experiences. Sometimes diaries should be filled for several days, sometimes for several weeks or a month. In this case users have a chance to try using software products or new features for a long enough period of time, while researchers have a chance to see how the product usage changes over time. This methodology can give researchers a summary of what users felt during the last 2 or 4 weeks. Thus a usability practitioner collects the much-needed information from the interviews and from the subjects' retrospective self-reports. This information seems to be no less helpful than the logs analysis (Meyer, 2005) which was mentioned in section 2.1.1 as a highly useful but rarely applied in the usability practice methodology, and may be combined (Weinschenk, 2007) with the well-developed and easy-to-use blogging analysis methodology. Along with diaries and/or blogs, video clips may be used in the ESM analytic procedures (Isomursu, Kuutti, & Väinämö, 2004).

5.2.2 Beepers in Usability Research

Csikszentmihalyi suggested a similar methodology to explore flow: among the advantages of this new method is a chance to get constant reports from subjects – these reports being still retrospective, but synchronous and thus more or less "up-to-date". The Experience Sampling Method, or ESM (Larson & Csikszentmihalyi, 1983; Conner, Feldman, Bliss-Moreau, Lebo, & Kaschub, 2003; Hektner, Schmidt, & Csikszentmihalyi, 2007) proved its usefulness for investigating flow in various types of activities; it can possibly contribute greatly to the field of usability research, as well as Chen's (2006) report of a web version substituting the random-time beeper and the activation of pop-ups and the questionnaire items at the monitor screen – more details are presented by Voiskounsky (2008).

While investigating typical life activities, Csikszentmihalyi and his collaborators supplied research participants with pagers, which would beep from time to time, each time signaling that participants are asked to complete an experience sampling form. ESM has an advantage over the traditional self-report methods: it can be used in a field study or in beta-testing, it measures people's self-reported experiences exactly when these experiences occur, or shortly after that.

Experience Sampling Method has been already applied to an increasing number of research projects in diverse fields, including, but not restricted to medicine, social sciences, and communication studies. Beeper studies (another name for ESM) has proved its validity in usability research of handheld devices and other gadgets (Palen & Salzman, 2002; Consolvo & Walker, 2003; Hektner et al., 2007). The abovementioned pioneer work seems promising, and we believe that the new methodology will be included into standard sets and manuals of usability tools. In the IT field, beepers and pagers can be easily substituted with special software which will loudly or visually "beep" randomly, marking the need to report characteristics of flow, or else the absence of these characteristics.

6. Conclusions

On the premise that usability studies of software products are far from 100 per cent satisfying, several promising directions to improve usability research and testing procedures might be named. Most important, usability engineers should pay attention to users' daily routines: the users are sure to prefer the software products which they need and besides, those which are not changing regularly: otherwise the users are likely to switch to a different and probably more stable product. That means, current usability methodology should rely on longitudinal research and on field studies. When a longitudinal fieldwork usability project is being carried out, it is a safe ground to investigate the users' intrinsic motivation which has, undoubtedly, the highest prognostic value. On the contrary, a traditional lab setting is optimal to investigate extrinsic motivation; since intrinsic motivation is unlikely to be revealed while carrying out a traditional type of usability-related work, the importance of motivational research has been largely underestimated.

A promising theoretical and practical approach toward better understanding of specifics of intrinsic motivation is a flow paradigm, introduced by M. Csikszentmihalyi. This paradigm is already being intensely applied, linked to various computer-related activities, including the hackers' and gamers' behavior, investigated by the authors previously. Several practical findings from these studies, which seem to be typical for the conservation and safety of intrinsic motivation, have been extracted. For example, a step-by-step task choice allows an individual to experience flow on every stage of a project fulfillment, by means of the choice of task challenges which match precisely the available skills. The Experience Sampling Method (aka "beeper studies") suggested by Csikszentmihalyi and his collaborators to foster the investigation and control of flow, is already being used in several usability research projects. This method seems to be very promising for carrying out longitudinal fieldwork, including software users' motivational research.

Major factors, contributing to the flow experience, are as follows:

- Good balance between the users' needs and skills, on the one hand, and the inner structure of programming tools, on the other hand; that means, the choice of the "next step" while fulfilling the task needs to match the (possibly) increased skills.
- Availability of a "live help" from others, assumedly more competent colleagues through BBS, Instant Messaging, chat, e-mail, corporate (social) network, blogging, hotline link, etc. Video tutorials, available through corporate and public social networks and uploaded by competent experts, are a popular tool to learn new software products, methods, or crafts.
- Manuals and text-books need to match the interests and needs of every user. The new generation of tutorials should lose any emphasis on descriptiveness and instead contain projects to be done using the actual pieces of program code and include operations which would present more and more complex questions and tasks.

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8. References

Bederson, B. B. (2004). Interfaces for staying in the flow. *Ubiquity, 5*(27). Last retrieved December 1st 2009 from http://www.acm.org/ubiquity/views/v5i27_bederson.html

Berkun, S. (2001). *The role of flow in web design*. Last retrieved December 1st 2009 from http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnhfact/html/hfactor10_1.asp

Biever, C. (2005). Voicemail software recognizes callers' emotions. *New Scientist*. Last retrieved December 1st 2009 from http://www.newscientist.com/article.ns?id=dn6845

Bruneau, D., Sasse, M.A., & McCarthy, J. (2002). The eyes never lie: The use of eye tracking data in HCI research. *Proceedings of the CHI2002 Workshop on Physiological Computing*. Last retrieved December 1st 2009 from http://physiologicalcomputing.net/ CHI2002/chi_papers/Bruneau_The_eyes_never_lie.pdf

Chen, H. (2006). Flow on the net – detecting web users' positive affects and their flow states. *Computers in Human Behavior, 22*, 221-233.

Chen, J. (2007). Flow in Games (and Everything Else). *Communications of the ACM*, *50*(4), 31-34.

Choi, D., & Kim, J. (2004). Why people continue to play online games: in search of critical design factors to increase customer loyalty to online contents. *CyberPsychology & Behavior*, *7*(1), 11-24.

Conner, C.T., Feldman, B.L., Bliss-Moreau, E., Lebo, K., & Kaschub, C. (2003). A practical guide to experience-sampling procedures. *Journal of Happiness Studies*, *4*, 53-78.

Consolvo, S., & Walker, M. (2003). Using the Experience Sampling Method to Evaluate Ubicomp Applications. *IEEE Pervasive Computing*, *2*(2), 24-31.

Cooper, A. (1999). *The Inmates Are Running the Asylum: Why High-Tech Products Drive Us Crazy and How to Restore the Sanity*. Indianapolis, IN: SAMS Publ.

Courage, C., & Baxter, K. (2005). *Understanding Your Users: A Practical Guide to User Requirements Methods, Tools, and Techniques*. San Francisco: Elsevier.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety: The experience of play in work and games*. San Francisco: Jossey-Bass.

Deci, E.L., & Ryan, R.M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. NY: Plenum Press.

Dumas, J.S., & Redish, J. (1999). *A Practical Guide to Usability Testing***.** Portland, OR: Intellect Books.

Finneran, C. M., & Zhang, P. (2002, August). The Challenges of Studying Flow Within a Computer-Mediated Environment. Paper presented at the *Eighth Americas Conference on Information Systems*, Dallas, TX. Last retrieved December 1st 2009 from http://melody.syr.edu/hci/amcis02_minitrack/CR/Finneran.pdf

Fuller, R., & de Graaf, J.J. (1996). *Measuring User Motivation from Server Log Files*. Last retrieved December 1st 2009 from http://www.microsoft.com/usability/webconf/fuller/fuller.htm

Goleman, D. (1998). *Working with Emotional Intelligence*. New York: Bantam Books.

Gould, E.W. (2009). Intercultural Usability Surveys: Do People Always Tell "The Truth"? In N. Aykin (Ed.). *Proceedings of the Third International Conference on Internationalization, Design and Global Development* (pp. 254-258). Berlin: Springer.

Gross, D. (2003). *Lies, Damn Lies, and Focus Groups. Why don't consumers tell the truth about what they want*? Last retrieved December 1st 2009 from http://slate.msn.com/id/2089677/

Hektner, J.M., Schmidt, J.A., & Csikszentmihalyi, M. (2007). *Experience sampling method: Measuring the quality of everyday life*. Thousand Oaks, CA: Sage Publications.

Heidman, L., & Sharafi, P. (2004). Early Use of Internet-Based Educational Resources: Effects on Students' Engagement Modes and Flow Experience. *Behaviour & Information Technology*, *23*(2), 137-146.

Hoffman, D.L., & Novak, T.P. (2009). Flow Online: Lessons Learned and Future Prospects. *Journal of Interactive Marketing*. Last retrieved December 1st 2009 from http://api.ning.com/files/pYYw5J0J5j4RH2Q7Lidpji9aPwpCtw4HXKBauLw5R3wvPx0JISBp4ndA-p51RyGO*2x7jvdaYAn*qaDOv1stkIicEeX3XqnO/HoffmanandNovak2008FlowOnline.pdf

Hoffman, D.L., Novak, T.P., & Duhachek, A. (2002). The Influence of Goal-Directed and Experimental Activities on Online Flow Experiences. *Journal of Consumer Psychology*. *13*(1/2), 3-12.

Hollangel, E. (2003). Is Affective Computing an Oxymoron? *International Journal of Human-Computer Studies*, *59*, 65-70.

Huang, M. H. (2006). Flow, Enduring, and Situational Involvement in the Web Environment: A Tripartite Second-Order Examination. *Psychology and Marketing*, *23*, 383-411.

Isomursu, M, Kuutti, K., & Väinämö, S. (2004, July). Experience Clip: Method for User Participation and Evaluation of Mobile Concepts. *Proceedings, Eighth Biannual Participatory Design Conference* (pp. 83-92*),* Toronto, Canada.

Johnson, D., & Wiles, J. (2002). Effective affective user interface design in games. *Ergonomics*, *46*(13-14), 1332-1345.

Kuniavsky, M. (2003). *Observing the user experience: A practitioner's guide to user research*. San Francisco, CA: Morgan Kaufmann Publishers.

Kjeldskov, J., Skov, M., & Stage, J. (2005, November). Does time heal?: a longitudinal study of usability. *Proceedings of the 17th Australia conference on Computer-Human Interaction: Citizens Online: Considerations for Today and the Future (OZCHI-2005)*, Canberra, Australia.

Larson, R., & Csikszentmihalyi, M. (1983). The experience sampling method. *New Directions for Methodology of Social and Behavioral Science*, *15*, 41-56.

Lazarro, N. (2005). What game design can teach us? Last retrieved December 1st 2009 from http://xeodesign.com/xeodesign_whyweplaygames.pdf

Lindgaard, G., Fernandes, G., Dudek, C, & Browñ, J. (2006). Attention web designers: You have 50 milliseconds to make a good first impression! *Behaviour and Information Technology*, *25*(2), 115-126.

Malhotra, Y., & Galletta, D. F. (2004). Building systems that users want to use. *Communications of the ACM*, *47*(12), 88-94.

Markus, L., & Keil, M. (1994). If we build it, they will come: designing information systems that people want to use. *MIT Sloan Management Review*, *35* (4), 11–25.

McKenna, K., & Lee, S. (1995). *A Love Affair with Muds: Flow and Social Interaction in Multi-User Dungeons*. Last retrieved December 1st 2009 from http://www.fragment.nl/mirror/various/McKenna_et_al.nd.A_love_affair_with_muds.html

Meyer, M. (2005). *The user experience at Google*. Last retrieved December 1st 2009 from http://www.baychi.org/calendar/20050111/

Minsky, M. (2006). *The Emotion Machine. Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind*. New York: Simon and Schuster.

Mistry, P., & Agrawal, G. (2004, November). Functional metaphoric approach to be 'in the flow" with computer interfaces. Presented at the *Indian Human Computer Interaction (IHCI*), Bangalore, India. Last retrieved December 1st 2009 from http://www.dil.iitb.ac.in/docs/Gajendra.pdf

Molich, R., Ede, M.R., Kaasgaard, K., & Karyukina B. (2004). Comparative usability evaluation. *Behaviour & Information Technology*, *23*(1), 65-74.

Nielsen, J. (1999). *Designing Web Usability: The Practice of Simplicity*. Indianapolis, IN: New Riders Publishing.

Norman, D.A. (2002). Emotion and design: Attractive things work better. *Interactions Magazine, 4*, 36-42.

Norman, D. A. (2004). *Emotional Design – Why We Love (or Hate) Everyday Things*. New York: Basic Books.

Novak, T.P., & Hoffman, D.L. (1997). *Measuring the Flow Experience among Web Users.* Last retrieved December 1st 2009 from http://citeseerx.ist.psu.edu/viewdoc/ download?doi=10.1.1.89.1411& rep= rep1&type=pdf

Nuwere, E., & Chanoff, D. (2002). *Hacker Cracker. A Journey from the Mean Streets of Brooklyn to the Frontiers of Cyberspace*. N.Y.: William Morrow.

Pace, S. (2004). A Grounded Theory of the Flow Experiences of Web Users. *International Journal of Human-Computer Studies*, *60*(3), 327-363.

Palen, L., & Salzman, M. (2002). Voice-Mail Diary Studies for Naturalistic Data Capture Under Mobile Conditions. *In Proceedings of the 2002 ACM Conference on Computer Supported Cooperative Work (pp. 87-95).* New York, NY: ACM.

Phau, I., & Gan, J.S. (2000, November-December). Effects of technological and individual characteristics on flow experience. An Agenda of Hypotheses. Presented at *ANZMAC 2000, Visionary marketing for the 21st century: Facing the challenge,* Gold Coast, Australia.

Picard, R. W. (2003). Affective Computing: Challenges. *International Journal of Human-Computer Studies*, *59* (1-2), 55-64.

Rettie, R. (2001). An exploration of flow during Internet use*. Internet Research: Electronic Networking Applications and Policy*, *11*(2), 103-113.

Spool, J. (2004). *The Future Ain't What It Used To Be: The Silent Revolution in Usability Practice.* Last retrieved December 1st 2009 from http://www.baychi.org/calendar/files/flyer200407/flyer200407.pdf

Shneiderman, B. (2000). Universal usability. *Communications of the ACM*, *43*(5), 84-91.

Shneiderman, B. (2002). *Leonardo's Laptop: Human Needs and the New Computing Technologies*. Cambridge, MA: The MIT Press.

Tractinsky, N., Cokhavi, A., Kirschenbaum, M., & Sharfi, T. (2006). Evaluating the consistency of immediate aesthetic perceptions of web pages. *International Journal of Human-Computer Studies*, *64* (Issue 11), 1071-1083.

Trevino, L.K., & Webster, L. (1992). Flow in Computer-Mediated Communication. *Communication Research*, *19*(5), 539-573.

Voiskounsky, A.E. (2008). Flow Experience in Cyberspace: Current Studies and Perspectives. In A. Barak (Ed.), *Psychological Aspects of Cyberspace: Theory, Research, Applications* (pp. 70-101). NY: Cambridge University Press.

Voiskounsky, A.E., Mitina, O.V., & Avetisova, A.A. (2004). Playing Online Games: Flow Experience. *PsychNology Journal*, *2*(3), 259–281. Last retrieved December 1st 2009 from http://www.psychnology.org/PSYCHNOLOGY_JOURNAL_2_3_VOISKOUNSKY.pdf

Voiskounsky, A.E., & Smyslova, O.V. (2003). Flow-based model of computer hackers' motivation. *CyberPsychology and Behavior*, *6* (2), 171-180.

Weinschenk, S. (2007). *Trends in User-Centered Design. What you need to know in 2007 that can help your business.* (White paper). Available from http://www.humanfactors.com/downloads/whitepapersrequest.asp?whitepaper=trends2007

Wixon, D., Ramey, J., Holtzblatt, K., Beyer, H., Hackos, J., Rosenbaum, S., Page, C., Laakso, S., & Laakso, K. (2002). Usability in practice: field methods evolution and revolution. In *CHI '02 Extended Abstracts on Human Factors in Computing Systems* (pp. 880-884). New York, NY: ACM.

Yar, M. (2005). Computer Hacking: Just another Case of Juvenile Delinquency? *The Howard Journal*, *44* (4), 387-399.

Young, J.R. (2008). YouTube Professors Scholars as Online Video Stars. *Education Digest: Essential Readings Condensed for Quick Review*, *73* (9), 14-16.

Zaltman, G. (2003). *How Customers Think: Essential Insights into the Mind of the Market*. Boston: Harvard Business School Publishing.