Optimal Flow Experience in Web Navigation

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FLOW AS AN OPTIMAL EXPERIENCE

Flow is the process of optimal experience [1]. The concept of flow has been used to describe a perceived optimal experience when people are engaged in an activity with high involvement, concentration and enjoyment, and experience an intrinsic interest and the sense of time distortion. As Csikszentmihalyi [2] points out, the flow state is achieved when all levels of consciousness are in harmony with each other. When in the flow state, people become absorbed in their activities, while irrelevant thoughts and perceptions are screened out. Under the flow state, the inner experience is occupied with the sense of discovery. It includes the excitement and the enjoyment of finding out new ability about oneself and the potential possibility of interacting with the activity itself [3]. Because he flow state is so enjoyable, people will attempt to replicate it whenever possible. Chess players, rock climbers, surgeons, composers, dancers and painters are those persons who frequently experience the flow state during their working process.

Usually, reaching the flow state requires a balance between the challenges perceived in a given situation and the skills a person brings to it [2]. Situations in which challenges and skills are perceived to be equivalent are thought to facilitate the emergence of indicators of flow. The challenges are those potential opportunities or obstacles existing inside an activity; the skills are those potential abilities an individual possesses to face the challenges. If the challenges in an activity are too high and beyond an individual's skill level, they may simply produce anxiety rather than flow. If it is not challenging enough at an individual's skill level, boredom, not flow, may be the result of this activity. If both challenges and skills are balanced but do not exceed a specific level of complexity and difficulty, it may simply produce apathy rather than flow. Only when the challenges and the skills reach a balance and exceed the level that is typical for the day to day experiences of the individual does the state of flow emerge [4]. According to Csikszentmihalyi [4], an equilibrium of challenges and skills often occurs in an activity having relatively clear goals and providing rather quick and unambiguous feedback.

The flow experience provides a key for understanding the strivings of each individual to reach a harmonious mode in his/her consciousness level [2]. While experiences of the flow state appear as a positive affect, high level of arousal and intrinsic motivation, studying this optimal flow experience becomes important because it can help us better understand about "which institutions increase order and which produce disorder in consciousness, and hence gives us a clue to the direction of sociocultural evolution [2]. "

FLOW DIMENSIONS OF WEB ACTIVITIES

In this study we suggest that the flow construct can also be a useful and practical tool to understand users' perceived experience during their Web navigation. We consider that the Web is an environment which can facilitate the sequences of action that Csikszentmihalyi [2] calls "flow activities" that enable people to achieve optimal experience. Because the flow state is a time- and space- specific subjective perception, users vary in their ability to achieve this optimal experience during their Web navigation. To date, we know relatively little about Web users' subjective experience in their perception of the interaction with the Web environment. We also know little about how users reach the state of flow through their Web navigation. As stated by Hoffman and Novak [5], "If we can determine the variables that relate to a consumer's propensity to enter the flow state and how these variables interact with each other, we can then develop a strategy to maximize the chances of the consumer entering the flow state on the Web pages."

Csikszentmihalyi [1] proposes that there are four dimensions comprising the flow construct: control, attention focus, curiosity and intrinsic interest. He argues that these four dimensions are linked and interdependent. Csikszentmihalyi [3] further describes nine main elements of characteristic dimensions of the flow experience as:

1. *Clear goals and immediate feedback;*
2. *Personal skills are well suited to given challenges;*
3. *Action and awareness merge; one-pointedness of mind;*
4. *Concentration on the task at hand; irrelevant stimuli disappear;*
5. *A sense of potential control;*
6. *Loss of self-consciousness;*
7. *Altered sense of time;*
8. *Experience becomes autotelic, an experience requires no goals or rewards to the self ;*

Our research studied users' optimal flow experience during Web navigation by exploring the relationships among some of characteristic dimensions listed above. According to flow theory, flow can occur when an activity challenges an individual enough to encourage playful, exploratory behaviors without the activity being beyond the individual’s reach. This concept indicates that to locate the flow experience in the Web environment we should first find out the challenges in which Web users perceive and the skills Web users possess. The perceived challenges to Web users can be interpreted as those barriers which hinder users from navigating Web pages or opportunities which provoke users to further explore Web pages. The perceived skills can be the Web users' confidence to overcome those barriers and capture those opportunities. Once a Web user's navigation can be "characterized by a seamless sequence of response facilitated by machine interactivity" and "accompanied by a loss of self-consciousness,"[5] we assume that this user is in the flow state.

DIAGNOSES OF FLOW STATE

The concept of optimal experiences applied to a Web navigation process refers to a Web user’s overall subjective feelings of high involvement, concentration, enjoyment and intrinsic interest. On the one hand, this perspective is an acute state that only occurs at certain times and in certain situations. This implies that the situational context is critical in determining the extent and type of personal relevance experienced by a user [6]. On the other hand, the

subjective experience of interactivity presents users' perception of the interaction with the external Web environment. This implies that the interactivity is important between each individual and each Web page.

Interviewing has been a useful tool in the social science research when a researcher tries to diagnose a subjective dimension of experience through integrated self-reports. Subjects are normally asked to describe the broad outlines of a sequence of events with their memory. By reconstructing the events and consciousness, subjects are sometimes not able to put themselves into the same situational context where the events actually occurred. Indeed, it becomes difficult for subjects to separate between the actual event as it occurred in a situational context and the personal wishes or social expectancy that may influence its retelling [4]. Besides, interviews are solely based on the subjects' memory and subjects' ability to articulate or reflect the events. To those events happened between events or to those phenomena occurred at the consciousness level, interviews are not likely to be a valid tool to diagnose the user's experience [4].

Since flow theory emphasizes an individual's subjective experience and this experience is usually bounded at a specific time in a specific place, it is important to focus on the user's inner experience at a given moment during the process of Web navigation. With these constraints, we propose that traditional approaches of interviewing, which study objective, external concepts, or demographic variables from subjects, might not be appropriate [4]. We need a better observation tool which would allow us to see how users construct their personal optimal experience in a situational context and how they build their pictures of reality during their Web navigating process. We need to study users' "microphenomena" [1, 8], not users' "macrophenomena," during their navigation.

METHOD

To solve the problem of interviewing, the Experience Sampling Method (ESM) was created and has been used for several years in studying subjects' situational and subjective experience [9]. Its purpose is to capture the main dimensions of consciousness. The original format of ESM consists in providing respondents with an electronic pager and a questionnaire booklet. The researchers randomly activate the pagers several times a day. When receiving a signal on his/her pager activated by the researcher, the respondent fills out one sheet of the booklet. By the end of the study, usually lasting for one to several weeks, the booklet will contain a systematic description of the person's life in different situational contexts at different given moments, including external parameters and subjective experiences. The external parameters may include the activities performed, the places visited, the people encountered at given moments. The personal subjective experiences may include dimensions of consciousness when the signal activated, such as affect, the cognitive efficiency, motivational states, challenges encountered and skills brought to it.

In order to observe users' optimal experience during their Web navigation, we need a tool like ESM, allowing us to capture users' dimensions of consciousness at given moments. To do this, we integrate the technique of ESM into the Web environment by building an application with an auto-ask scheme. The application, once activated, will automatically record users' navigation activities, such as time of the movement between Web pages, title of Web pages and URL of visited pages. This information allows us to track how the interactivity in the Web environment

help users reach the flow state. Like ESM, the application will activate a questionnaire according to a random schedule with an interval from five to seven minutes, popping up on the computer screen on the top of users' Web browsers. Each time the questionnaire is activated, the respondent answers the survey questions. The questionnaire asks some characteristics dimensions of flow experience with open-ended items (“What make you feel this?”), as well as numerical scales (11-point Likert scales) that indicate the intensity of characteristic dimensions (“Where would you place yourself on the following scale for the Web page you were just looking at?”). This allows us to capture users' dimensions of consciousness at a given moment in a situational context of one or more Web pages. We call this questionnaire popping up at random intervals a "loop." The information collected from several loops during users' Web navigation will help us understand users' perceived and subjective experience during their navigation process.

DATA COLLECTION AND ANALYSIS

The data were collected from 100 individuals in a northeastern university who were using the Web as part of their day-to-day experience. Subjects who were browsing on the Web in the computer clusters during the research period were asked to participate this study. With subjects' consent, the auto-ask ESM software was installed into subjects' computer and executed. Subjects then continued their navigation behavior as usual. With a random schedule ranging from 5 to 7 minutes the questionnaire popped up computer screens, subjects were asked to answer those questions regarding their situational experiences at that specific moment. After three loops, subjects could press a button to quit their participation and send the data to researchers through the Internet automatically. A total of 201 loops (n=201) were collected for this study. Based on the 11-point Likert scales, we determined the subject is in the flow state if the differences between challenges and skills are less than 2 and both of them are above 5. Other flow elements of characteristics dimensions, such as clear goals, enjoyment, attention paid to Web pages were measured by 11-point Likert scales. Subjects' sense of time distortion is measured by three categories as "too long," "O.K." and "too short."

Table 1. Flow experience for characteristic dimensions

Dimensions	In Flow State (n=55)	Not in Flow State (n=146)	*t*	p
Challenge	5.78	3.39	5.40	<.001
Skill	6.16	7.28	2.51	<.01
Clear goal	5.87	7.05	2.60	<.01
Enjoyment	6.51	7.19	1.79	n.s.
Attention	6.89	7.45	1.46	n.s.

Note:2-tailed test

Differences among flow states (flow state and non-flow state) and other characteristic dimensions were tested with two-tailed *t*-test (Table 1). Associations of characteristic dimensions themselves were measured two-tailed by using the Pearson correlation (Table 2). Sense of time distortion was tested against the flow state by using Chi-Square tests (Table 3). All statistically significant levels were set at 5%.

Table 2. Correlation (Pearson *r*) among flow characteristic dimensions

Characteristics Dimensions (N=201)	Challenge	Skills	Clear goal	Enjoyment	Attention
Challenge	-				
Skill	-.58*	-			
Clear goal	-.49*	.73*	-		
Enjoyment	-.39*	.58*	.60*	-	
Attention	-.23*	.53*	.51*	.66*	-

Note: 2-tailed test * = p < .0001

Based on the results of the data analysis in Table 1, it appears that Web users in the flow state (mean=5.87) were less likely to have a clearer goal than those not in the flow state (mean=7.05) during their Web navigation (p<.01). Even though the differences are not statistically significant at the .05 level, it appears that flow users enjoyed less and paid less attention to Web pages than non-flow users. In terms of association (Table 2), the correlation among flow characteristic dimensions appears statistically significant at the p< .0001 level when tested with Pearson Correlation coefficient (*r*) The intensity of challenge level moves in opposite directions against skill, clear goal, enjoyment and attention with a relatively strong (-.23 > *r* >-.58) relationship. The intensity of skill is strongly correlated (.53 < *r* < .73) with clear goal, enjoyment and attention. If Web users know where to go next with a clear goal, it appears that they have higher enjoyment (*r* = .60) and pay more attention to Web pages. The intense level of enjoyment moves in the positive direction (*r* = .66) with the amount of attention paid to Web pages. The test of Chi-Square (Table 3) between flow states and sense of time distortion is statistically significant (p < .05). Users in the flow state experienced some sense of distortion and felt the fast pace of time.

Table 3. Relation between flow states and sense of time distortion (N=201)

	Too Long	Just Right	Too Short	
Not In Flow	38 (26%)	84 (57.5%)	24 (16.4%)	146
In Flow	5 (9.1%)	38 (69.1%)	12 (21,8%)	55
	43	122	36	201

Note: 2 tailed Chi-Square (6.8) test, p<.05

DISCUSSION

The results of this study support our hypotheses that flow is an optimal experience in Web navigation and the flow construct is a useful and practical tool to understand users' perceived experience. It appears that this flow study provided a key for us to deeply explore each individual's subjective inner experience at a conscious level. During our study, about 25% of Web users' loops (microphenomena) reported the flow state. This confirms our hypothesis that the sequences of action in Web navigation make it easy for people to achieve optimal experience.

One unexpected finding in this study was that users in the flow state were less likely to have a clearer goal than those not in the flow state. It moves in the opposite direction from what one of the flow dimensions suggests: the

immediate feedback and clear goals should help users approach the flow state. An inspection of the open-ended item indicated that the contradiction may be caused by the special characteristic of "immediate feedback" and the concept of "clear goals" in the Web environment. If an individual knows where to go next and experiences the results she/he expected after executing the step, the challenge level should become lower and the skill level should become higher. Therefore, the match between challenges and skills level becomes less likely when an individual has a "clear goal" and an "immediate feedback" in the Web environment.

As expected from flow theory, subjects in this study reported significantly higher levels of correlation to those characteristics dimensions of flow theory. It suggests that these dimensions are good predictors of Web users' perceived optimal experience when engaging in the Web environment. However, another unexpected finding is that the level of challenge forces other factors (skill, clear goal, enjoyment and attention) to move in the opposite direction while the level of skill moves to the same direction with these factors. This suggests that higher challenges in the Web environment may distract users' attention from the content of Web pages and decrease users' enjoyment whereas higher skill levels may enhance these two dimensions. The third unexpected finding, even thought it is statistically significant at the .05 level, is that users in the flow state concentrate less on Web pages and obtained less enjoyment from their navigation. It is in contradiction to flow theory.

The primary purposes of this study were to empirically test the validity and the possibility of applying flow theory to the Web environment and to investigate the relationships between characteristic dimensions and flow states in the Web environment. Some of our preliminary findings are important and exciting while some results contradict fundamental elements of flow theory. Further empirical studies of flow theory with ESM technique in the Web environment are needed, especially to re-examine the applicability of those characteristic dimensions of the flow construct.

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