December 2006

A Test of the Channel Models of Flow in Internet Context

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ABSTRACT

In this study we investigate the flow experience in Internet context using channel models. Flow is an optimal state of experience with concentration and control. In order for flow to occur, one important requirement is to have a balance between challenge of the activity and the skill we have to carry out the activity. Based on relative levels of challenge and skill, we fall into one of the four categories, i.e., channels. Only in the channel with high challenge and high skill flow experience would occur. We study the model using data collected during web browsing. Results are not in total consistence with the flow theory and further research is needed to study the particularity of Internet activities.

Keywords

Flow, the Internet, the channel model

INTRODUCTION: FLOW AND CHANNEL MODELS

Flow is an optimal state of experience and "is the crucial component of enjoyment" (Csikszentmihalyi 1975)(p. 11). Flow represents a "peculiar dynamic state—the holistic sensation that people feel when they act with total involvement" (p. 36). People feel flow in various leisure and everyday activities. Since the theory developed, it has been used in various fields to examine people's subjective experience in different situations, such as playing chess, composing music, and performing surgery. Since the late 1980s, researchers have used the flow concept to explain the usage of information technology, e.g., spreadsheet software (Webster 1989), email (Trevino and Webster 1992), and the Internet (Agarwal and Karahanna 2000).

In order for flow to occur, the task should have a clear goal (CG) and a quick, unambiguous feedback mechanism (FB). That is why people often experience flow when playing games (e.g., chess and basketball). The third important ingredient leading to flow is the perceived balance of challenge and skill (CS). If challenges exceed skills, people feel overwhelmed and *anxious*; on the other hand, if the activity is too easy, people get *bored*. Empirical data suggested both challenges and skills had to pass a certain threshold for flow to occur; otherwise the person showed *apathy* towards the activity, even when challenges and skills were in balance (Csikszentmihalyi and Csikszentmihalyi 1988). This discovery led to the development of the four-channel model of flow (Figure 1).

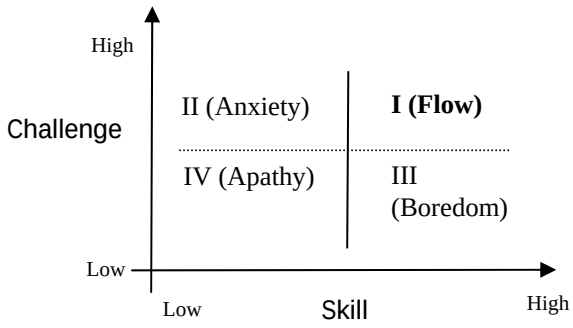

Figure 1. 4-Channel Model of Flow

The dimensions of the flow experience include focused concentration (C), "merging of activity and awareness" (M), perceived control (CON), transformation of time (TT), and "a transcendence of self"(TS) (Csikszentmihalyi 1988). As a result, "consciousness is in harmony and the self – invisible during the flow episode – emerges strengthened" and "the negentropic quality of the flow experience makes it autotelic, or intrinsically rewarding" (AE) (Csikszentmihalyi 1988))(p.

33). The term "negentropic" refers to being in harmony and a lack of chaos, while the term "autotelic" (from Greek auto=self and telos = goal, purpose) means with one's own purposes. Telepresence (T) (Steuer 1992) has been added as another dimension to capture the uniqueness of computer mediated environments (Hoffman and Novak 1996).

THE STUDY

The goal of this study is to determine whether the quality of the experience in Channel I is better than the quality of experience in any other channels in online context. It has been found that the quality of experience (in terms of concentration, affect, potency, creativity, motivation, satisfaction, and so on) is strongly, positively influenced by whether a person is in flow or not, regardless of whether the activity is working or leisure (Csikszentmihalyi and LeFevre 1989). Studies have also found supporting evidence for this using the 4-channel model (Massimini and Carli 1988) and a more detailed 8-channel model (Carli et al. 1988). However, one study used a dual model (in flow vs. not in flow, determined by the difference of challenge and skill ratings) to compare in-flow and non-flow experiences for people surfing the Web, and obtained mixed results (Chen et al. 1998). Thus, it is not obvious that Channel I will guarantee a pleasant experience. Although studies on flow in computer and Internet usage have included perceived challenge and skill as key determinants, they have rarely examined the channel model, except the abovementioned one study. Thus, in the current study, a comparison of the quality of experiences among channels should be useful as the first step. Using the 4-channel model (Figure 1), we tested the following hypothesis and sub-hypotheses:

Hypothesis 1. People in Channel I have a higher quality of experience than those not in flow (namely, in the Channel II, Channel III, and Channel IV).

Hypothesis 1a. Flow score will be highest when challenge and skill are simultaneously at moderate to high levels.

Hypothesis 1b. Flow score will be moderate when either challenge or skill is high and the other is not.

Hypothesis 1c. Flow score will be lowest when challenge and skill are simultaneously at low levels.

Besides using channel model to examine effect of perceived challenge and skill on flow, we also investigated the relationships between perceived challenge and skill and flow experience by testing a nomological network of these constructs. Challenge and skill have been included as key determinants in some previous studies, however, they have often treated as two separate factors and the results are mixed. For instance, studies (Koufaris 2002; Novak et al. 2003; Novak et al. 2000) found both relationships positive, while others (Skadberg and Kimmel 2004) did not find direct effects between skill and flow nor between challenge and flow. On the other hand, according to the theory, the effect of the balance between skill and challenge on flow is one of the key determinants of flow, instead of perceived challenge and perceived skill separately. This balance is also called "fit" (Ghani 1995). In a study of learning software, it was found that the relationship between this "fit" and flow is a curvilinear one. In other words, rather the square of the difference between skill and challenge was hypothesized and found to affect flow. It was explained that skill and challenge both had an effect on flow directly and indirectly, via perceived control. However, the mediating effect of perceived control was inconclusive, since only few studies had supported it. In this study we studied the relationships among balance of challenge and skill, perceive challenge, perceive skill, and flow by testing following alternative hypotheses:

Hypothesis 2a. The balance of challenge and skill has positive effect on flow.

Hypothesis 2b. Perceived challenge has positive effect on flow.

Hypothesis 2c. Perceived skill has positive effect on flow.

A controlled study was conducted to collect data on key flow and experience measures. Subjects were recruited from a major American university with various majors. Upon agreeing to participate in the study, subjects were randomly assigned to one of the eight pre-selected commercial websites. Data were collected via a computer program when subjects were surfing the site. Flow State Scale (Jackson and Marsh 1996) is a validated instrument of flow and was used to measure perceived balance of challenge and skill (CS), concentration (C), control (CON), mergence (M), transformation of time (TT), transcendence of self (TS), and autotelic experience (AE). Majority of the measures consists of previously validated instruments, such as measures for Telepresence (T), Pleasure (P), Arousal (A), Perceived usefulness (PU), and Behavioral

Intentions (BI). Items for Perceived Challenge (PC) and Perceived Skill (PS) were created in consideration of the multi-facet nature of these two (Ellis et al. 1994). For example, for perceived challenge, two sample questions are "Shopping on this site was a challenge for me" and "Using this web site provided a good test of my skills." For perceived skill, two sample questions are "I had enough skills to do what I intended to do" and "I was competent to carry out the shopping activity."

DATA ANALYSIS

A total of 354 subjects participated in the study, including 214 female and 143 male students. No differences in responses due to gender were found. The average age was 21.2 years. All other constructs have acceptable reliability.

Constructs	**# of items**	**Reliability (Conbach's α)**	**Mean**	**Std. Dev.**	**Median**
Perceived challenge (PC)	5 items	.6888	2.89	1.04	2.8
	4 items	.7621	2.63	1.20	2.5
Perceived skills (PS)	5 items	.8277	5.50	1.13	5.8
Perceived balance (CS)	3 items	.6670	5.14	1.18	5.33

Table 1. Descriptive Summary for PC, PS, and CS

We tested the traditional flow models in two ways. First we assigned responses to one of the four channels based on the relationship between PC and PS, as suggested in the traditional four-channel model. An examination the table above and a scatter chart of PC and PS revealed that online shopping activities were not considered as a challenging task and normally people believed they had considerable skills for it. This is a common perception, but using a sample of college students made it more so. We used a median split to segment subjects into channels. If PC or PS exceeded or was equal to its median, it was coded as 1; otherwise it was coded as 0. Results are presented in Table 2.

PC		**PS**		**Channel**	**# of cases**
Value	**Code**	**Value**	**Code**		
>=2.5	1	>=5.8	1	I (Flow)	35
>=2.5	1	<5.8	0	II (Anxiety)	149
<2.5	0	<5.8	0	IV (Apathy)	56
<2.5	0	>=5.8	1	III (Boredom)	114

Table 2. Results of Segmentation

The mean values of flow dimensions and consequences of the cases in four channels are reported in Table 3. The results were not consistent with flow theory in that the Channel I did not have highest score on all flow dimensions and consequences; rather the Channel IV or Channel III had higher scores in some cases. Overall, the worst channel was Channel II (Anxiety Channel) and the best was Channel III (Boredom Channel). The Channel I (the supposed Flow Channel) and Channel II (Apathy Channel) were in between. Thus, Hypothesis 1 was not supported. Neither were its sub-hypotheses. Except for the Transformation of Time and Telepresence dimensions, all other dimensions had significant mean differences among channels (df = 350) using a random effects ANOVA model of channels on dimension scores (averages of items). In Table 3, both F values and significance levels are reported for each flow dimension and other related constructs.

Channel		**C**	**CON**	**AE**	**M**	**TS**	**TT**	**T**	**P**	**A**	**PU**	**BI**
I (Flow)	Mean	5.171	6.007	3.664	5.564	6.179	3.579	3.275	4.548	3.643	4.157	4.193
	Std. Dev	1.429	.7753	1.481	.9632	.9712	1.716	1.416	1.016	.8206	1.308	1.707
II (Anxiety)	Mean	4.515	4.960	3.175	4.403	5.379	3.617	3.056	4.152	3.340	3.737	3.327
	Std. Dev.	1.389	1.227	1.226	1.050	1.253	1.270	1.173	1.087	.8910	1.245	1.605
IV (Apathy)	Mean	5.201	5.688	3.960	5.134	5.719	3.594	3.451	5.024	3.637	4.603	4.621
	Std. Dev.	1.070	1.117	.9986	.9653	1.292	1.181	1.121	.9274	.8979	1.026	1.478

III (Boredom)	Mean	5.700	6.314	4.412	5.715	6.270	3.276	3.411	5.214	3.734	4.702	4.989
	Std. Dev.	1.121	.7995	1.348	.9102	.9658	1.296	1.406	.9848	.8451	1.377	1.625
Total	Mean	5.070	5.614	3.746	5.056	5.799	3.500	3.255	4.671	3.544	4.226	4.153
	Std. Dev.	1.359	1.201	1.367	1.144	1.212	1.319	1.276	1.127	.8852	1.335	1.759
F value		19.25	38.07	21.37	42.09	14.39	1.63	2.24	25.82	4.89	14.51	25.12
p-value		.000	.000	.000	.000	.000	.182	.083	.000	.002	.000	.000

Table 3. Flow Scores for 4-Channel Model

In a second analysis we segmented subjects into two channels (in flow vs. not in flow) based on the score for balance of challenge and skill. The coding rule was that if CS exceeded and equal to median value (5.33), the case was coded as in flow; otherwise it was not in flow. There were 169 non-flow cases and 185 in-flow cases. The mean values of flow dimensions and consequences are in Table 4. In-flow and non-flow experiences were significantly (df = 352, please find F values and significance levels in Table 4 too.) different and the in-flow scores were higher on most dimensions, with the exception of Transformation of Time, Telepresence, and Arousal. This result was consistent with flow theory as traditionally presented. However, it was not consistent with the results of previous study (Chen et al. 1998), which only found mixed support for flow theory. In that study, balance between perceived skill and perceived challenge had a different operationalization. If the difference between perceived skill and perceived challenge was less than 2, the case was coded as in balance, otherwise, not in balance. In that study, flow experience was compared on only two dimensions: enjoyment and attention. Those differences made it difficult to compare the results from the two studies. Thus, this remains an interesting issue for further investigation.

Channel		**C**	**CON**	**AE**	**M**	**TS**	**TT**	**T**	**P**	**A**	**PU**	**BI**
Non-flow	Mean	4.630	5.124	3.410	4.580	5.465	3.611	3.092	4.368	3.435	4.019	3.740
	Std. Dev.	1.377	1.256	1.353	1.094	1.280	1.255	1.168	1.088	.9201	1.338	1.739
In-flow	Mean	5.472	6.062	4.053	5.491	6.104	3.399	3.403	4.948	3.643	4.415	4.530
	Std. Dev.	1.214	.9510	1.309	1.010	1.061	1.370	1.354	1.092	.8422	1.307	1.696
Total	Mean	5.070	5.614	3.746	5.056	5.799	3.500	3.255	4.671	3.544	4.226	4.153
	Std. Dev.	1.359	1.201	1.367	1.144	1.212	1.319	1.276	1.127	.8852	1.335	1.760
F value		37.32	63.37	20.64	66.33	26.36	2.30	5.33	25.00	4.95	7.91	18.71
p-value		.000	.000	.000	.000	.000	.13	.022	.000	.027	.005	.000

Table 4. Flow Scores for Not-in-Flow and In-Flow Cases

Our analyses do not support the 4-channel model of flow. On reflection, however, this does not necessarily imply that the 4-channel model is invalid in general. It may rather be the evidence of the special nature of online activities, such as Web surfing. In these activities, challenge and sensation may not be sought after; rather subjects may be more interested in having an enjoyable experience and finding what they want to purchase online. In this case, having the appropriate skills to find and to purchase what one wants may become a more prominent drive for visitors' flow experiences. This suggestion is consistent with the finding that in the case in which challenge was perceived to be high and skill low, flow scores were lowest. That may suggest that site visitors have a low tolerance of difficulty and easily get frustrated. A correlation test shows that both PC and PS correlate with flow dimensions (Table 5), but not consistent with flow theory. To extend the channel model, it has been proposed that both perceived challenge and perceived skill have positive relationship with flow experiences. However,

in our study the correlations between PC and flow dimensions were mostly negative. PS has positive correlations with flow dimensions. In terms of magnitude, PS has higher correlations with flow dimensions than PC.

	C	**CON**	**E**	**M**	**L**	**TD**	**T**
CS	.336**	.439**	.192**	.382**	.330**	-.107*	.074
PS	.469**	.639**	.370**	.561**	.416**	-.120*	.111**
PC	-.428**	-.575**	-.437**	-.484**	-.233**	.076	-.175

Table 5. Correlations between Flow Dimensions with PC and PS

The results supported the simpler 2-channel model of flow based on perceived balance of challenge and skill. People feeling a balance of challenge and skill had a better experience than those who were not in balance. A simple linear regression analysis on averages of PC and PS on CS showed that PS contributed more to the feeling of balance. Both the coefficients of PC (β=.148, p=.015) and PS (β=.679, p=.000) were significant (df = 351), but the skills coefficient was more substantial, which can be shown using a stepwise regression (Table 6). The adjusted R square is the amount of variance explained by the model. Model 1 with only PS explains 32.9 percent of variance in CS. Adding PC (Model 2) increased adjusted R square, but not by much. This is also consistent with the interpretation that skill is more important than challenge in online activities. Overall, perceived balance seems to be a more effective factor in predicting flow than perceived challenge and skills individually.

Model [a]		Adjusted R square	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			Beta	Std. Error	Beta		
1	(Constant)	.329	1.837	.256		7.186	.000
	PS		.600	.046	.575	13.185	.000
2	(Constant)	.338	.856	.474		1.807	.072
	PS		.709	.063	.679	11.206	.000
	PC		.146	.060	.148	2.450	.015

a Dependent Variable: CS

Table 6. Stepwise Regression Result of PS and PC on CS

CONCLUSION

The four-channel model was not supported in our study, which suggests that the channel segmentation using challenge and skill may not be suitable in understanding Internet activities, here shopping, especially the notion of challenge. Challenge might not even be the best terminology for this case, because challenge bears a negative tone in shopping activities, while in gaming world challenge is not necessarily a bad thing at all. This may suggest a need to develop a new construct, which is the counterpart of challenge, in online searching and shopping activities.

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