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Flow Online: Lessons Learned and Future Prospects

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Abstract

Although the flow construct has been widely studied over the past decade in marketing and related fields, it has proven to be an elusive construct to measure and model. In this paper, we examine two of the most important themes in flow research in the last decade: the conceptualization and measurement of flow in online environments and the marketing outcomes of flow. In addition, while the unique characteristics of the Internet contributed to our belief that flow was an important construct for understanding consumer use of the Web in 1996, the environment of the Web itself has changed radically over the past decade. Thus, we consider the current context of the Internet, including virtual worlds, for the role and application of the flow construct, as well as important related constructs that will be useful for understanding compelling experiences in the contemporary online environment.

Keywords: Internet marketing; Online consumer behavior; User experience

Introduction

Over the past decade, marketers have been quite effective at developing an understanding of Web usage and the market potential of the Web. However, although marketers are beginning to gain an understanding of strategies to attract visitors to the wide range of commercial Web sites, less is known about the factors that make using the Web a compelling experience for its users, and of the key consumer behavior outcomes of this compelling experience.

A little over ten years ago, we proposed that commercial Web sites would benefit by facilitating what has been called the experience of “flow” (Hoffman and Novak 1996) and offered one way for marketers to think about how consumers experience this new environment. We argued that the marketing objective during trial and usage of an online environment should be directed to providing “flow opportunities” where the consumer is completely engaged with his or her interaction with the computer. We also argued that the Internet was going to be an important marketing and communications phenomenon and was unique compared to traditional media. It is interesting to note that in 1996, our proposal that the Internet should be thought of as something special – more than “just another marketing channel” – was met with a good deal of skepticism. Even five years later, for example, Coltman et al. (2001) argued that “the promises of Internet-driven growth may actually be more hyperbole than substance.” Yet, despite some initial skepticism, it is clear that the Internet has become indispensable to many individuals in their daily lives (Hoffman, Novak, and Venkatesh 2004) and Internet commerce has become an important source of growth for many firms. U.S. retail e-commerce sales, excluding travel, are expected to reach $146 billion in 2008, representing a 14.3% growth rate from the previous year, as compared to a 3.5% increase in total U.S. retail sales (eMarketer 2008).

Our research has emphasized flow in human–computer interaction, specifically interaction with the Web, and we observe that some people are more likely to reach a state of flow than others (Novak, Hoffman, and Yung, 2000). Originally, flow was characterized by Csikszentmihalyi (1997) as an integration of the constructs of a clear goal, feedback, challenges matching skills, concentration, focus, control, loss of self-consciousness, transformation of time, and the autotelic nature of an activity. People report experiencing flow in a wide variety of activities in daily life, including sports and games, shopping, dancing, performing surgery and playing computer games.

Verbatim descriptions of the online flow experience from Novak, Hoffman, and Duhachek (2003) illustrate many of these

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characteristics for online activities. Here is an example of "experiential flow" reported by a user of Comic Chat:

> *I was chatting with people from around the world, but also just lurking. No serious discussions. And not with a special person that I cared about. More like 'where are you from?' 'what are you studying?' Not much deeper than that.*
>
> *I couldn't stop and go home. It became very late and still I couldn't make myself shut down the computer. I said to myself only a few more minutes, but the minutes became hours. I felt what was going on in the chat was very important even though nothing special really happened. I didn't want that world to disappear as it would if I had shut off the computer. All my other obligations like writing a paper didn't seem important. I didn't want it to be quiet.*
>
> *The feeling of being together with other people, a feeling of connection. Like it is a different world and the fear of not knowing what is going on when I was gone. Like in the way I do not want to leave early from a party, in fear of not knowing who will come and what will happen.*

An additional example, again from data collected by Novak, Hoffman, and Duhachek (2003), was from a consumer who experienced flow while searching for a book at Amazon.com. In this example, the activity began as goal-directed, but as is often the case online, shifted into an experiential activity:

> *I was looking for a book that I could not remember the name of.*
>
> *I became totally lost. I forgot my original purpose multiple times and found myself just looking for books that sounded interesting.*
>
> *The easy links from one topic to another. The natural way in which the interface guided me to other areas of interest. It kept me going because it knew what I was interested in.*

Underlying the idea of facilitating flow experiences online, we argued that "customer experience" is very important in the Internet environment, and that focusing on the nature of what is special about the Internet would likely drive much of the innovative work in this area. One such special characteristic is that online consumer behavior is grounded in both goal-directed and non-directed motivations, and that both need to be studied and modeled for the fullest account.

Many researchers built upon this conceptual model of online flow experiences introduced in Hoffman and Novak (1996), and the companion empirical paper by Novak, Hoffman, and Yung (2000). Yet, although the flow construct as we conceptualized it has been the subject of considerable research for over 10 years,[1] it has proven to be an elusive construct to define and use in practice. In this paper, we will review some of the highlights of this research stream and offer our thoughts on where the research is – and should – be going.

Our aims in this paper are twofold. First, we provide a brief and selective review that illuminates two of the most important themes in flow research in the last decade. These themes include a) clarifications of the conceptual definition and scope of flow and b) identification of the marketing outcomes of flow. Second, while the unique characteristics of the Internet contributed to our belief that flow was an important construct for understanding consumer use of the Web in 1996, the environment of the Web itself has changed radically over the past decade. We thus consider the role and application of the flow construct in the context of the current evolution of the Internet, as well as important related constructs that we believe will be useful for understanding compelling experiences in the contemporary online environment.

A selective literature review

Conceptual model, validation, and empirical extensions

In a series of three papers (Hoffman and Novak 1996; Novak, Hoffman, and Yung 2000; and Novak, Hoffman, and Duhachek 2003) we introduced and validated a conceptual model of flow, and considered the flow construct from the perspective of both goal-directed as well as experiential activities. The key insight from Hoffman and Novak (1996) is a comprehensive conceptual model of the network navigation process for Web users. Central to this model is the concept of flow — the complete engagement with and immersion in an activity. This model provides insight into 1) what creates compelling online experiences (i.e., congruence of skill and challenge, interactivity, vividness, and motivation); 2) the nature of a compelling flow experience (i.e., involvement, attention, telepresence, and flow), and 3) outcomes of this experience (i.e., increased learning, perceived behavioral control, exploratory mindset, and positive subjective experience).

Novak, Hoffman, and Yung (2000) tested this theoretical model and produced a revised empirical model validating most of the relationships in Hoffman and Novak (1996). They demonstrated that the various constructs underlying the conceptual model could be measured and that the constructs related to each other in predicted ways. The authors also discovered that the various constructs changed in importance over time. Not surprisingly, skill and importance increased with Web experience. However, attention, challenge, telepresence, flow and exploratory behavior decreased. As consumers use the web longer and longer, they use it for skill-based, goal-directed purposes.

The distinction between goal-directed and experiential Web use was explored in more depth in Novak, Hoffman, and Duhachek (2003). In the paper, the distinction was noted between goal-directed and experiential shopping behaviors, and it was demonstrated that flow occurs for both goal-directed and experiential activities. However, contrary to expectations, it was

[1] Stremersch, Verniers, and Verhoef (2007) identified Hoffman and Novak (1996) as the most cited paper between 1990 and 2002, corrected for time, and Novak, Hoffman, and Yung (2000) as the fourteenth most cited paper during that same period.

found that reported flow experiences were actually more prevalent among those who use the Web for goal-directed activities, rather than just for fun.

Subsequent research has expanded on these findings. Figure 1 provides an empirically based integrative conceptual model of flow. The shaded boxes and solid arrows identify the original model presented in Hoffman and Novak (1996) and Novak, Hoffman, and Yung (2000). Empirical results from 10 subsequent structural modeling studies by other researchers are integrated in Figure 1, and extensions beyond Hoffman and Novak (1996) are identified by the unshaded boxes and dashed arrows. The number in the legend for each of the 12 referenced studies in Figure 1 links to those constructs which were investigated and which relationships were found significant in each study. To keep the complexity of Figure 1 to a manageable level, only the key relationships from the 12 referenced studies are identified.

Figure 1 shows that subsequent research has validated the four consequences of flow proposed by Hoffman and Novak (1996): learning, control, exploratory behavior, and positive subjective experience. Further, three studies (Huang 2003; Skadberg and Kimmell 2004; and Choi, Kim, and Kim 2007) have validated the link from interactivity to flow. Most subsequent research, however, has focused on extensions beyond Hoffman and Novak's original conceptual model. For example, a number of studies (Korzaan 2003; Hsu and Lu 2003; Skadberg and Kimmel 2004; Sanchez-Franco 2006) have established the role of flow in predicting purchase and other behavioral intentions. Still other researches (Agarwal and Karahanna 2000; Hsu and Lu 2003; and Sanchez-Franco

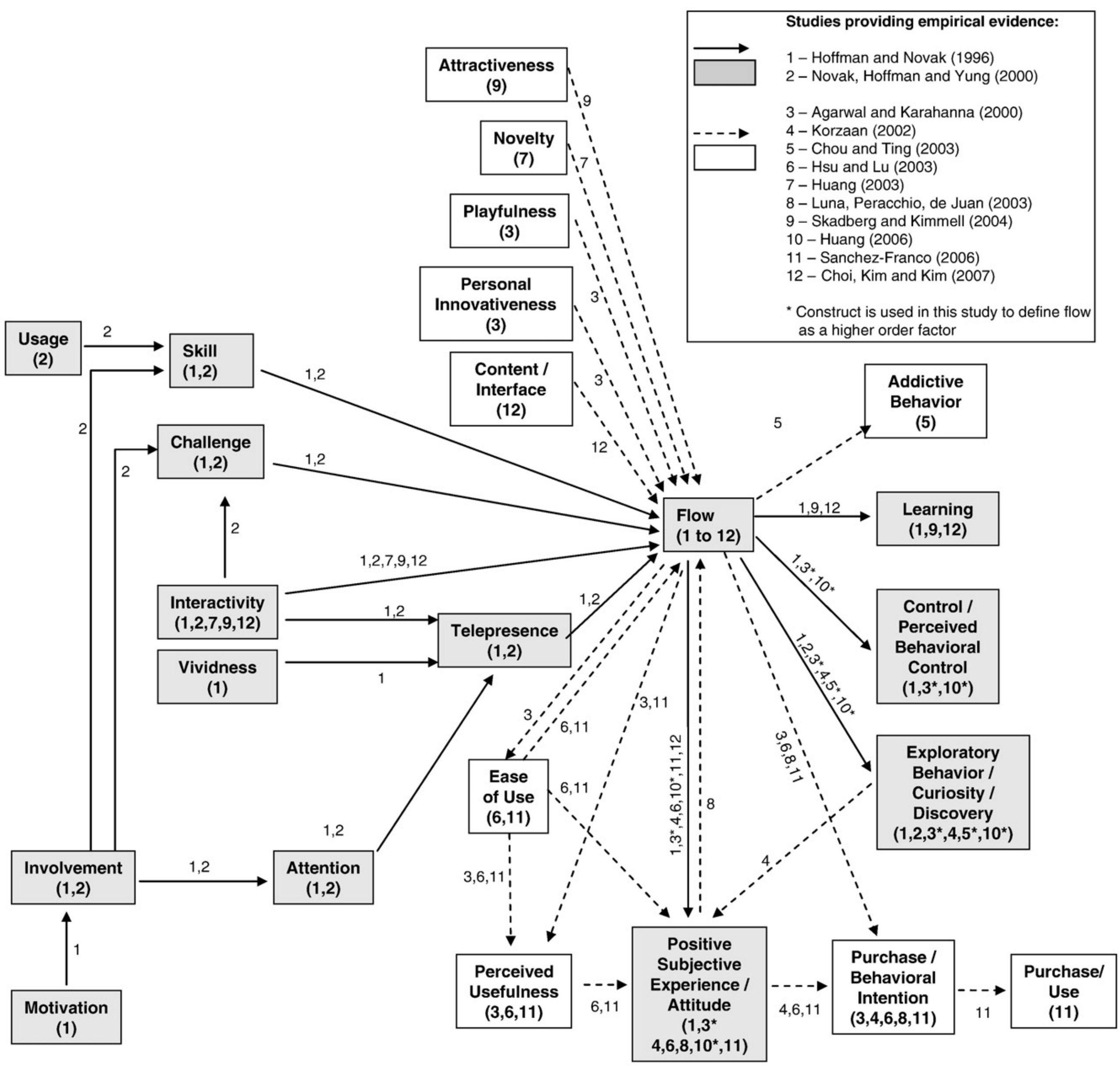

Fig. 1. Integrative conceptual model of flow derived from multiple empirical studies.

2006) have incorporated constructs of ease of use and perceived usefulness from the Technology Acceptance Model (TAM) (Davis 1989). Last, we note that some studies (Agarwal and Karahanna 2000; Huang 2003; Skadberg and Kimmel 2004; Choi, Kim, and Kim 2007) have identified further antecedents of flow, including attractiveness, novelty, playfulness, personal innovativeness, and content/interface factors. We discuss these extensions, as well as others, in the following sections.

The flow concept remains murky

On the positive side, researchers generally agree on the conceptual definition of flow as presented by Csikszentmihalyi (1997). Flow is something most individuals have experienced in various contexts, and so researchers (and respondents) have an intuitive and experience-based understanding of the flow construct. However, translating this intuitive understanding into a consistent operational definition has proven to be challenging. It is an understatement to suggest that there is some lack of consistency in operational definitions of flow used by different researchers. This has been noted by Choi, Kim, and Kim (2007), who stated “the construct of flow is, however, too broad and ill-defined due to the numerous ways it has been operationalized, tested and applied.” Such a wide range of operational definitions and measures may have the unfortunate consequence of hindering the systematic progression of empirical research on flow.

Approaches to measuring flow can be broadly characterized as unidimensional or multidimensional. We review both approaches, along with the different tactics for measuring flow adopted within the unidimensional and multidimensional approaches. We conclude this section with recommendations for flow measurement.

Unidimensional measures of flow

Novak, Hoffman, and Yung (2000) and Novak, Hoffman, and Duhachek (2003) measure flow with a simple direct report three-item instrument, prefaced by a narrative description of flow. A number of researchers have employed this instrument or its modification (e.g., Choi, Kim, and Kim 2007; Hsu and Lu 2003; Luna, Peracchio, and de Juan 2002, 2003; Korzaan 2003; Sicilia, Ruiz, and Munuera 2005). Researchers working in this approach view flow as a unidimensional construct with a set of ancillary constructs that serve as antecedents and consequences of flow.

In contrast to *direct* unidimensional measures of flow, some researchers have employed *derived* unidimensional measures of flow that aggregate constituent constructs related to flow into an overall measure. One such derived measure is based upon the four-channel flow model defined by skill and challenge. In the four-channel model, flow is entirely determined by the congruence of skill and challenge. Along these lines, Mathwick and Rigdon (2004) use cluster analysis to identify a “flow cluster” comprised of individuals with high Internet search skill and high navigational challenge of the search task. Alternatively, Shin (2006) and Pearce, Ainley, and Howard (2005) define flow as a difference measure between skill and challenge.

Other derived measures of flow are employed by researchers who construct summed scales to measure flow, where the items in the summed scales correspond to constructs that are related to flow. In constructing a derived measure, Skadberg and Kimmel (2004) define flow in terms of time distortion and enjoyment, while Senecal, Gharbi, and Nantel (2002) define flow as comprised of concentration, control, challenge and enjoyment. Jiang and Benbasat (2005) use an 11-item summed scale developed by Webster, Trevino, and Ryan (1993), aggregating items measuring control, attention and enjoyment. Choi, Kim, and Kim (2000) use a six-item scale for measuring flow while playing online games, comprised of two questions for intrinsic interest, two for curiosity, one for control and one for attention focus.

Advantages of direct self-report measures of flow are ease of administration and the ability to correlate self-reports of flow experience with a set of ancillary constructs that serve as antecedents and consequences of flow. Subjects presented with a scenario or vignettes describing the flow experience are assumed to be able to understand the flow concept intuitively and holistically, and reports of this understanding can then be correlated with specific hypothesized antecedents and consequences of flow. Disadvantages of the direct approach include the possibility that different subjects interpret flow in different ways, creating measurement error, and also requires the assumption that antecedents of flow, such as concentration, control, enjoyment, and challenge, are separable from flow itself.

The derived approach shares advantages of relative ease of administration. By providing concrete items for subjects to respond, the derived approach increases the likelihood that all subjects interpret instructions in the same way. A serious disadvantage of the derived approach is that it blurs the distinction between the antecedents and consequences of flow, creating a major definitional problem of which constructs and items should be included in the summed scale. This definitional problem can be observed in the inconsistent sets of items used by different researchers in constructing summed scales to measure flow. Thus, while we can assume different subjects will interpret the scale items in the same way in a given study, we cannot assume different researchers will define flow in the same way across different studies.

Multidimensional measures of flow

Multidimensional measures of flow offer a solution to some of the problems of derived unidimensional measures of flow. Rather than aggregating measures such as control, concentration, enjoyment and challenge into a single construct that is assumed to be unidimensional, some researchers measure each of the constituent constructs individually, and employ structural models to test whether these constituent constructs reliably define a higher-order factor that can be interpreted as flow.

We first note that some researchers have studied flow simply by measuring a set of constructs related to flow. For example, Koufaris (2002) bypasses measuring flow altogether, instead measures a set of five constructs related to flow (control, enjoyment, concentration, perceived usefulness and perceived ease of use). Richard and Chandra (2005) test a model “based on the theory of flow" and measure interactivity, skill, challenge, involvement, and exploratory behavior — but not flow. Bridges and Florsheim (2008) employ a similar approach, defining "flow elements" consisting of telepresence, time distortion, skill, interactive speed, and importance. These flow elements are not directly modeled, but used individually to predict outcome measures. These studies make no assumptions about the nature of flow, and instead focus on interrelationships among a set of constructs assumed to be relevant to the flow experience. While such studies can shed some insight into constructs related to flow, most researchers adopting a multi-dimensional approach to flow take the additional step of testing whether a higher-order construct interpretable as flow is statistically defensible.

Conceptual and qualitative research can be very helpful in defining constituent constructs that can be subsequently tested as a higher-order flow factor. An excellent example is Pace's (2003) grounded theory of the flow experiences of Web users which focuses on building rather than testing flow theory. Using semi-structured in-depth interviews, respondents were asked to discuss their flow experiences when using the Web in the context of information-seeking activities; next, categories in the data were identified and systematically coded, and relationships among these categories determined. The resulting concept map shows close agreement with the model proposed by Hoffman and Novak (1996). Pace (2003) views flow as a multi-dimensional construct comprised of the joy of discovery, reduced awareness of surroundings, time distortion, merging of action and awareness, a sense of control, mental alertness, and telepresence. Some of these constructs are considered by Hoffman and Novak (1996) to be antecedents of flow (i.e., control, telepresence, and time distortion), while others are considered to be consequences (i.e., joy of discovery). However, Pace's qualitative methodology is not able to address the question of causality within the set of multi-dimensional constructs identified as comprising flow.

As an example of structural modeling used to identify a higher-order flow factor, we consider Agarwal and Karahanna's (2000) analysis of flow in the broader context of cognitive absorption. Five dimensions, including temporal dissociation, focused immersion, heightened enjoyment, control and curiosity, were identified based upon overlap of definitions from a range of studies that have looked at flow. In their theoretical model, flow, conceptualized as cognitive absorption, leads to greater usefulness and perceived ease of use, which leads to behavioral intention to use. Their model incorporates the familiar Technology Acceptance Model (TAM) (Davis 1989), widely used to predict technology adoption. In the context of this model, cognitive absorption (flow) is a precursor of both perceived usefulness and perceived ease of use, two key components of the TAM.

Additional researchers have viewed flow as a second-order construct comprised of a series of first-order constructs. Perhaps the most ambitious is the approach taken by Huang (2006) who viewed flow, situational involvement, and enduring involvement as three second-order constructs variously related to eight first-order constructs. Of the first-order constructs, control, curiosity, enjoyment and interest were found to relate to flow, with enjoyment and interest also overlapping with enduring involvement, and curiosity and interest overlapping with situational involvement. Similarly, Chou and Ting (2003) conceptualize flow as a higher-order construct in a structural model, comprised of an empathy factor (concentration and time distortion) and a discovery factor (playfulness and exploratory behavior). Huang (2003) also employs a structural model including four separate constructs for the flow experience — control, attention, curiosity, and interest. Sanchez-Franco (2006) uses a higher-order factor composed of enjoyment and concentration.

One advantage of the multidimensional approach to flow measurement using structural models is that it allows statistical tests of whether the constituent constructs should be viewed as part of a higher-order factor measuring flow, or as antecedents or consequences of this factor. The multidimensional approach, by identifying statistically valid higher-order construct measuring flow, also provides a rational basis for selecting items for a derived unidimensional summed scale measure of flow. Disadvantages of the multidimensional approach are the increased complexity of data collection, and the dependence of the resulting structural model on the specific constructs that were collected.

In addition, when flow is defined as a higher-order construct, there is some ambiguity in that the constituent constructs can, from a statistical viewpoint, alternatively be considered to be consequences of flow. This is reflected in Figure 1, where paths with an asterisk (*) indicate studies where a construct was used to define flow as a higher-order construct (for example, control was used by Agarwal and Karahanna (2000) and Huang (2006) in defining a higher-order construct of flow). While these paths are consistent with the view of control as part of a higher-order flow construct, they are also consistent with the view of control as an outcome of flow.[2]

Recommendations for flow measurement

As noted, unidimensional measures of flow are characterized by ease of administration. In some situations, a summed scale or other straightforward measure of flow may be all that is feasible to collect in the context of a broader research study. Simple unidimensional measures of flow may also be necessary to reduce the data collection burden in repeated measures designs such as the Experience Sampling Method (e.g. Csikszentmihalyi and Csikszentmihalyi 1988; Csikszentmihalyi and LeFevre 1989) where respondents are intercepted at random intervals throughout the day and asked to complete a self-report form

[2] One example is Figure 3 in Agarwal and Karahanna (2000), which shows a higher-order factor of cognitive absorption (interpreted as flow), with arrows leading to curiosity, control, temporal dissociation, focused immersion, and heightened enjoyment, all five of which define the higher-order factor. At the same time, three additional arrows lead to perceived usefulness, ease-of-use, and behavioral intention, all of which are all considered to be outcomes. Mathematically, there is arbitrariness in this interpretation, in that the fit of the model would not change if we considered, for example, that control should be interpreted as an outcome of the higher-order cognitive absorption factor, rather than as part of its definition.

Table 1
Summary of conceptual and structural models of flow

Authors	Antecedents	Flow	Consequences
Agarwal and Karahanna (2000) *Structural model*	Playfulness, personal innovativeness	Higher-order construct of "cognitive absorption" (curiosity, control, temporal dissociation, focused immersion, heightened enjoyment)	Perceived usefulness, perceived ease-of-use, behavioral intention
Bridges and Florsheim (2008) *Empirical model*	Telepresence, time distortion, arousal, challenge, skill, control, interactivity, importance.	Not directly measured.	Pathological Internet use (PIU), online buying.
Choi, Kim, and Kim (2007) *Structural model*	Learner interface, interaction, instructor attitude toward students, instructor technical competence, content	Unidimenisonal flow	Attitude toward e-learning, learning outcomes
Chou and Ting (2003) *Structural model*	Repetitive behavior	Higher-order construct (empathy, discovery)	Addictive behavior, self-control disorder, obsession, goal confusion
Dailey (2004) *Conceptual model*	Navigational control	Unidimenisonal flow	Attitude, Website approach/ avoidance behavior
Finneran and Zhang (2003) *Conceptual model*	Artifact, person (trait, state), task	Multi-dimensional construct (dimensions not specified)	None specified
Hoffman and Novak (1996) *Conceptual model*	Skill, challenge, interactivity, vividness, involvement, telepresence, focused attention	Unidimensional flow	Increased learning, perceived behavioral control, exploratory mindset, positive subjective experience
Hsu and Lu (2003) *Structural model*	Perceived ease of use	Unidimensional flow	Attitude toward playing online game, intention to play online game
Huang (2003) *Structural model*	Complexity, interactivity, novelty	Multi-dimensional construct (control, attention, curiosity, and interest)	Utilitarian and hedonic web performance
Huang (2006) *Structural model*	None specified	Three higher-order constructs: 1) Flow (control, curiosity, enjoyment, interest); 2) Situational Involvement (curiosity, interest, risk, attention focus, personal relevance); 3) Enduring Involvement (enjoyment, interest, personal relevance, self-relevance	None specified
Korzaan (2003) *Structural model*	None specified	Unidimensional flow	Exploratory behavior, attitude, intention to purchase
Koufaris (2002) *Structural model* *only these constructs had significant relationships	Product involvement*, skill*, search mechanisms*, challenge*	Not directly measured. Instead used control, shopping enjoyment*, concentration, perceived usefulness*, ease of use	Unplanned purchases, intention to return*
Luna, Perrachio, and de Juan (2002) *Conceptual model*	Content characteristics, skill, challenge, perceived control, unambiguous demands, focused attention, attitude toward site	Unidimensional flow	Revisit intention, purchase intention, purchase
Luna, Perrachio, and de Juan (2003) *Structural model*	Attention, challenge, interactivity, attitude toward site	Unidimensional flow	Purchase intention, revisit intention
Novak, Hoffman, and Yung (2000) *Structural model*	Online tenure, skill, control, interactivity, challenge, arousal, importance, focused attention, telepresence, time distortion	Unidimensional flow	Exploratory behavior (via telepresence)
Pace (2003) *Conceptual model*	Curiosity, time urgency, goal, usability, skill, challenge, distractions, content interest, progress toward goal, attention focus.	Multi-dimensional construct (joy of discovery and learning, reduced awareness of surroundings, time distortion, merging of action and awareness, sense of control, mental alertness, telepresence)	None specified
Richard and Chandra (2005) *Structural model*	Reasons to visit, OSL, skill, challenge, interactivity, navigational cues, need for cognition, site involvement	Not directly measured	Exploratory behavior, attitude, prepurchase intention
Sanchez-Franco (2006) *Structural model*	Usefulness, ease of use	Higher-order construct (enjoyment and concentration)	Attitude, intention, usage
Shin (2006) *Conceptual model*	Skill, challenge, concentration, goal, gender	Higher-order construct (enjoyment, telepresence, focused attention, engagement, time distortion)	Achievement, satisfaction

Table 1 (*continued*)

Authors	Antecedents	Flow	Consequences
Skadberg and Kimmel (2004) *Structural model*	Ease of use, speed, attractiveness, interactivity, skill, challenge	Higher-order construct (time distortion, enjoyment)	Learning about a place, change of attitude and behavior
Smith and Sivakumar (2004) *Conceptual model*	None specified	Flow characterized in terms of intensity and duration	Browsing, one-time purchase, repeat purchase (all moderated by risk, willingness to buy, self confidence, product characteristics, purchase occasion)
Woszczynski, Roth, and Segars (2002) *Conceptual model*	Openness to experience, OSL, cognitive spontaneity, emotional stability, computer anxiety	Flow state (internal) Playful behaviors (external)	User satisfaction, computer proficiency, personal innovativeness in IT

describing their flow experience. On the other hand, multi-dimensional measures of flow used to identify a higher-order factor provide a more holistic definition of flow that can be tested for statistical fit in a structural model. Multidimensional measures of flow also permit the higher-order factor to be broken down into two or more constituent constructs depending upon theory and empirical measures of fit.

Our recommendation, given the wide disparities across researchers we have noted in flow measurement, is that multiple measures of flow should be used whenever possible. A comprehensive set of measures would include a direct unidimensional measures of flow, such as Novak, Hoffman, and Yung's (2000) three-item global self report measure, as well as multi-item scales measuring a range of constructs such as those identified by Hoffman and Novak (1996), Agarwal and Karahanna (2000), or Pace (2004). The clever researcher could ensure that the items collected in the multi-item scales could also be used to form previously used derived unidimensional measures such as those used by Webster, Trevino, and Ryan (1993). Armed with multiple measurement approaches to flow, the researcher would be in a position to analyze the data in multiple ways, observe consistencies or inconsistencies, and most importantly, to compare their results with researchers who used different approaches to measuring flow. It is only through such multi-modal approaches to measuring flow that consistent approaches to flow measurement are likely to emerge.

Marketing outcomes of flow

Figure 1 provides an overview of key findings of 10 empirical studies that used structural models to build upon results presented in Hoffman and Novak (1996) and Novak, Hoffman, and Yung (2000). This empirically based integrative conceptual model of flow shows a wide range of antecedents and consequences of flow. Choi, Kim, and Kim (2007) note that when studying flow in computer-mediated environments, "a framework of three stages including flow antecedents, flow experience, and flow consequences is generally agreed upon." We believe this framework of building conceptual or empirical models of antecedents and consequences of flow can be very helpful in understanding the marketing implications of flow. Table 1 summarizes 22 articles presenting either conceptual or empirical models of flow, from the perspective of antecedents, flow experience, and consequences.

We may expect that given the considerable inconsistency we observed with flow measurement, there are also inconsistencies in how flow is modeled. What one researcher considers an antecedent of flow, another considers a consequence of flow, or perhaps a part of flow itself. For example, Agarwal and Karahanna's (2000) model specifies ease of use as a consequence of flow, while other models, such as Hsu and Lu (2003) and Sanchez-Franco (2006), specify flow as a consequence of ease of use.

Despite these inconsistencies, it is nevertheless possible to draw some consistent conclusions about the marketing consequences of the online flow experience. Hoffman and Novak (1996) originally conceptualized that flow would lead to positive marketing-relevant outcomes such as increased learning, perceived behavioral control, exploratory mindset and positive subjective experience. Subsequent work has confirmed these hypotheses, and has further revealed that flow impacts the key consumer behavior sequence of attitudes, behavioral intentions, and behaviors. We summarize relevant conceptual and empirical work relevant to these outcome variables below.

Attitudes, behavioral intentions, and behavior

From a marketing perspective, the most important extensions of Hoffman and Novak's (1996) conceptual model have focused on the role of flow in influencing attitudes, and subsequent behavioral intentions and behavior. Flow has been found to influence attitude toward purchasing online (Korzaan 2003), Web and brand attitudes (Mathwick and Rigdon 2004; Sanchez-Franco 2006), attitude toward e-learning (Choi, Kim, and Kim 2007) and attitude toward playing online games (Hsu and Lu 2003). Both the hedonic and utilitarian components of Web site performance are impacted by flow experiences (Huang 2003), and flow has been found to influence the hedonic value of online shopping experiences (Senecal, Gharbi, and Nantel 2002). We note that Luna, Peracchio, and de Juan (2003) modeled a reverse causal sequence and found that attitude toward a Web site influenced flow (however, these authors did not compare the fit of their model with a competing model reversing the causal sequence of flow and attitude).

Flow has also been found to influence behavioral intentions. Researchers have provided empirical support for predictions that flow directly influences online purchase intentions (Luna, Peracchio, and de Juan 2002, 2003; Richard and Chandra

2005), revisit intent (Koufaris 2002; Luna, Peracchio, and de Juan 2002, 2003), intention to use the Web (Agarwal and Karahanna 2000; Sanchez-Franco 2006), and intention to play an online game (Hsu and Lu 2003). Indirect influence of flow, through attitude, has been found on purchase intention (Korzaan 2003), intention to use the Web (Sanchez-Franco 2006) and intention to play an online game (Hsu and Lu 2003). Behavioral outcomes have also been tested, with flow found to influence online purchase (Bridges and Florsheim 2008) and Web usage (Sanchez-Franco 2006).

Learning

Hoffman and Novak (1996) hypothesized that consumers who experienced flow during Web usage are more likely to retain more of what they perceive, with implications for the effectiveness of marketing communications, e.g., Bolton and Saxena-lyer (this issue). Skadberg and Kimmel (2004) found that flow was the most important factor contributing to increased learning, and that this learning, along with Website attractiveness, was the most important factor affecting change of attitude and behavior. Likewise, Choi, Kim, and Kim (2007) found that flow experience was positively related to learning outcomes among participants in a Web-based enterprise resource planning training program.

Control

Previous researchers (e.g. Webster, Trevino, and Ryan 1993) found that flow correlates with perceived control. Hoffman and Novak (1996) proposed that increased perceived behavioral control was an outcome of flow. Agarwal and Karahanna (2000) and Huang (2006) considered control as contributing to a higher-order flow construct. As noted earlier, from the perspective of a structural model, these results are also consistent with considering control as an outcome of flow.

Exploratory behavior

While Hoffman and Novak (1996) hypothesized that flow would increase exploratory behavior Novak, Hoffman, and Yung (2000) found that telepresence and time distortion, rather than flow, increased reported exploratory behavior. However, other researchers have found evidence of a relationship of flow to exploratory behavior and related constructs. Korzaan (2003) found a direct relationship of flow to exploratory behavior, and found that both in turn predicted attitude. Further, in defining flow as a higher-order factor, Agarwal and Karahanna (2000) and Huang (2006) found that curiosity contributed to flow, while Chou and Ting (2003) found that discovery contributed to flow.

Recent developments

More recently, researchers have begun to turn their attention to the impact of simulated shopping experiences on flow and its outcomes (see, for example, Bhatt 2004). We believe that investigating how marketers may enhance consumer experience of virtual products may be particularly fruitful, considering the widespread deployment of broadband and the dramatic growth in online shopping in the last five years. Jiang and Benbasat (2005) find that virtual control of products online (through visual and functional control) enhances the perceived diagnosticity of products which in turn enhances online flow experiences. Virtual reality simulations of physical products have been shown in to create telepresence, a component of flow that can enhance product knowledge, attitudes and intentions and decrease perceptions of risk (Suh and Chang 2006).

Flow in virtual worlds

In 1996, the commercial Web was new, and the potential for consumers to experience flow in this emerging environment, different in many ways from the physical world, captivated early Internet researchers. While Hoffman and Novak (1996), Novak, Hoffman, and Yung (2000), Pace (2004) and Richard and Chandra (2005) examined online flow in the broad context of general Web use, other researchers have argued for looking at online flow in more situation-specific conditions. Bridges and Florsheim (2008), Korzaan (2003) and Smith and Sivakumar (2004), for example, investigated flow during the process of online shopping. At a finer level, flow has been examined during specific Web activities (Chen, Wigand, and Nilan 1999; Novak, Hoffman, and Duhachek 2003), during online games (Chou and Ting 2003; Hsu and Lu 2003; Rau, Peng, and Yang 2006), Wan and Chiou 2006), in online chat rooms (Shoman 2004), in electronic learning systems (Choi, Kim, and Kim 2007; Pearce, Ainley, and Howard 2004), and while visiting specific Web sites (Luna, Peracchio, and de Juan 2002, 2003; Sicilia, Ruiz, and Munuera 2005; Skadberg and Kimmel 2004) or online stores (Jiang and Benbasat 2005; Koufaris 2002).

An important question for the study of flow in the context of specific Web sites is which Web sites are best for such inquiry? MacManus (2006) notes that 10 domains accounted for 40% of all Internet page-views in November 2006. MySpace alone accounted for 16% of all page-views. Web sites on this top ten list (including MySpace, Yahoo, eBay, Facebook, and Craigslist) would be excellent candidates for the study of flow due to the extensive amount of time consumers spend at these sites.

However, researchers interested in studying flow may wish to divert their attention beyond traditional Web sites toward a variety of new emerging areas in online human–computer interaction. A recent paper by Takatalo, Nyman, and Laaksonen (2008) looks at flow in virtual environments, using an immersive environment where users were surrounded by screens measuring 3 by 3 m onto which stereoscopic images were projected and viewed through stereo glasses. While this sort of scenario is quite a number of years away from widespread adoption, the rapid explosion of Web-based virtual worlds (e.g. Second Life, There.com, Active Worlds, The Sims Online) presents an exciting and accessible fertile environment for the study of flow. In fact, if we were beginning our study of Web-based flow today, in 2008, we expect that we would have chosen virtual worlds rather than Web browser navigation as the application for our conceptual model.

Virtual worlds have been proposed as a promising environment for fielding academic research studies (Bainbridge 2007; Bloomfield 2007; Miller 2007; Novak 2007) and they possess a number of unique features that make them a particularly compelling environment for the study of flow. We expect that as compared to visits to Web sites and online stores, flow will occur with much greater regularity, predictability, intensity, and for extended duration in virtual worlds, facilitating its study. Consider Second Life (http://secondlife.com), arguably the best current exemplar of a virtual world due to the complexity and sophistication of its virtual social and economic environment. In examining flow in virtual worlds such as Second Life, there are a number of ways in which our original conceptual model (Hoffman and Novak 1996) could be augmented. Based upon the discussion that follows, we expect that flow in virtual worlds is qualitatively different from Web browser-based environments, in that while flow is a relatively atypical and somewhat infrequent experience during the course of normal Web browsing, flow would be expected to be a fairly typical aspect of the user experience in virtual worlds.

First, there is a social context to virtual worlds (e.g. Bargh, McKenna, and Fitzsimons 2002; McKenna, Green, and Gleason 2002; Yee 2007; Yee et al, 2007) which is not incorporated in current conceptual models of flow during Web usage. While Web-based stores have been described as a "warehouse" where other people are missing, there are currently upwards of 60,000 simultaneous users in Second Life at any given time, and social shopping for virtual products in virtual stores is a popular activity. The social context goes well beyond virtual worlds as a chat environment. Yee (2007) has identified three dimensions of user motivations to play in massively multiplayer online games like virtual worlds: immersion, social and achievement. Immersion relates to curiosity and escapism, social to behaving altruistically by helping others, and achievement to the desire to gain power and for the accumulation of wealth symbols and status (Yee 2007). Given these compelling user motivations, virtual worlds provide environments in which complex social systems can develop. The flow model in Figure 1 can be expanded further by incorporating immersion, social and achievement motivations to virtual worlds, and by explicitly incorporating interpersonal interaction.

Second, the extent and variety of interactivity in virtual worlds is well beyond that of consumer interaction with commercial Web sites. Besides social interaction with others, there is interaction with one's own avatar to define one's physical form, interaction with virtual objects (e.g., clothing, pets, furniture, and buildings), navigational interaction through realistic 3D environments, and interaction through constructing the world itself. The various forms of interaction often occur simultaneously. The range of options for user interaction in virtual worlds should significantly impact the flow experience. For additional recent perspectives on interactivity, please see Ratchford (this issue).

Third, the virtual representation of physical places provides a powerful and often affectively-laden background context to user interactions. Consequently, the construct of sense of place (e.g. Manzo 2005; Sherry 2000) could appropriately be incorporated as an antecedent of flow. The nature of virtual spaces themselves may also impact flow. For example, Meyers-Levy and Zhu (2007) found that ceiling height of rooms in the physical world influenced information processing, impacting the experience of freedom vs. confinement, abstract vs. concrete thinking, and relational vs. item specific processing. We suspect these results may well transfer to virtual worlds, so that the nature of virtual spaces themselves can contribute to the flow experience.

Fourth, given the constant need to manipulate virtual objects, the need for touch construct (Peck and Childers 2003a, 2003b) would be expected to be an important antecedent of flow in virtual worlds. It may be that this need can be satisfied by some of the object-interactive aspects of virtual worlds.

Finally, we note that there is a significant learning curve to Second Life which accentuates the role of skill and challenge. Skill acquisition and the seeking out of new challenges is a dynamic process which evolves over long periods of time in developing mastery in a virtual world, and the feedback role of flow in motivating the consumer to develop greater skills and seek greater challenges is a particularly important topic of study. In traditional Web use, experiential usage has been found to shift to goal-directed usage over time (e.g. Novak, Hoffman, and Yung 2000). In virtual worlds, the experiential "ramp-up" period will be highly extended, offering a longer time frame to study the impact of flow on consumer learning in computer-mediated environments. In addition, the opportunity for ever-increasing challenges in virtual worlds should increase the experience of flow.

Research questions: flow and virtual worlds

Given the above discussion, virtual worlds present a rich environment for the study of flow, and it is useful to consider some examples of research questions that could be addressed. As one example, virtual worlds like Second Life are notorious for a high new user drop out rate due in part to the steep learning curve in acquiring skills necessary for navigating the environment. An important research question is whether an early experience of flow in a virtual world can reduce the drop out rate for new users. As noted, a second research question is how virtual worlds themselves can be designed to increase the likelihood of a flow experience. A third research question is how the experience of flow impacts learning in virtual environments. Massara and Novak (2008) have hypothesized that recall accuracy for recognition tasks employing visual or text stimuli will depend upon whether the task is administered in a virtual world or a Web-browser environment, and whether encoding or processing is dominant. Does the experience of flow increase recall accuracy for such recognition tasks, are visual or text stimuli more affected by flow, and does the flow experience impact initial encoding of the stimulus or subsequent processing?

A final example of a research question addresses the co-existence in virtual worlds of skill-based habits of use (Murray and Häubl 2007) with the experience of flow. Murray and Häubl (2007) find that the acquisition of skill specific to an online activity, through repeated experience with that activity, reduces effort and increases preference for that activity, resulting in cognitive lock-in (Johnson, Bellman, and Lohse 2003). Flow theory, on the other hand, focuses on the balance of skill with the challenge of the activity, generally in contexts where skill and challenge are dynamic. Flow is maximized when skill and challenge levels are congruent, keeping in mind that skill and challenge can both be dynamic (i.e. challenge is not necessarily fixed). Presumably, preference would also be high when skill and challenge are congruent. The skill/habit perspective (Murray and Häubl 2007) suggests that preference would also be high, but for different reasons, when skill is high but challenge is low.

The level of challenge for most Web browser-based activities such as those investigated by Murray and Häubl (2007) and Johnson, Bellman, and Lohse (2003) is static, while skill is dynamic and increasing over time. On the other hand, the level of skill and challenge in virtual worlds are both dynamic. At first glance, challenge in virtual worlds may appear to be static. In Second Life, developing the skill necessarily to master the art of navigating one's avatar through the virtual world environment would be expected to result in reduced effort, increased preference, and cognitive lock-in to Second Life as a virtual world platform. The level of navigational challenge in Second Life, while quite high, is ultimately bounded and static, and eventually one's level of skill allows habitual use of the navigational interface. However, navigational challenge is only one of a wide range of challenges offered by Second Life. Virtual worlds involve more than mere navigation, and the wide range of potential activities makes challenge dynamic.

Once a Second Life user masters the fundamentals of navigation, they can turn to other challenges – mastering the economic system for buying and selling goods in Second Life, using tools for creating virtual objects that exist in Second Life, learning scripting techniques for programming virtual objects, or becoming involved in the complex social system of Social Life. Second Life thus offers the opportunity to participate in many new challenges that require the mastery of new skills. These activities, for example creating virtual objects, can be performed at a relatively unsophisticated (i.e., low skill, low challenge) or sophisticated (i.e., high skill, high challenge) level over an extended period of time. This means that environments like Second Life facilitate the experience of flow over an extended period of time through dynamic levels of challenge. Cognitive lock-in also plays an important role in these environments, because once one has developed the skill, for example, to build basic virtual objects in Second Life, effort is reduced and preference is increased for using Second Life to build these basic objects. An unexplored research question is the manner in which cognitive lock-in and the experience of flow, as functions of dynamic levels of skill and challenge, work together to increase loyalty for a virtual world platform.

Concluding observations from the virtual field

In a little over a decade, the consumer Internet has evolved from a few directories and online storefronts into a vast, sophisticated network of information stores that millions of people interact with on a regular basis. As the Internet matures, it has moved from a static, rigid mechanism for data access into an operating system that seamlessly connects applications – and people – across the global network. The basic infrastructure for online commerce was originally in the form of static sites which has only recently evolved to include limited dynamic content and interactivity.

Huang's (2003) analysis of the impact of Web attributes and flow experience on consumer's perceptions of Website performance shows that interactivity is a key aspect of improving consumer's evaluations of a Web site. Huang suggests that interactivity can be increased by designing Web sites that are "active, responsive, interactive, participatory, dynamic and demonstrable" and form an "online community." Although as recently as two years ago, it was difficult to find Web sites that met this definition of interactivity, the recent advent of so-called Web 2.0 applications such as RSS, Flash, Ajax, and the various widgets consumers can install to enhance their Web experiences are moving the Web – and individual sites – much closer to this kind of true interactivity.

The Web is currently evolving very rapidly into an operating system that facilitates sharing and participation, as the popularity of social networking and social shopping sites illustrates. The seamless connection of Web 2.0 applications (i.e., geographic mapping) and services (i.e., photo-sharing) has been referred to as the "mash-up" or the "Lego phase" with parts that connect (Markoff 2006).

What is important from the marketing perspective is that in this phase of the evolution of the Internet, consumers control the applications that make up the core of Web 2.0 sites. If in the early Web, "Web 1.0," consumers were required to follow relatively inflexible paths and existing navigational structures, the key feature of the new Web, "Web 2.0," is that consumers control their online navigational experiences and have much more freedom to do the things they are interested in doing. The Web is becoming less about individual Web sites and more about Web-based applications and environments that can be installed by consumers and used wherever – and whenever – they see fit. As the examples below suggest, the role of the flow construct in creating compelling Web 2.0 experiences may need careful and close examination.

As social networks give rise to "social marketplaces," social influence will be a powerful contributing factor to purchase decisions. These processes are worthy of careful examination by consumer behavior researchers. Individual consumers, particularly younger ones, may be expected to rely on a kind of "collective wisdom" to help them find what they are looking for and may give more weight to these kinds of consensus recommendations than expert advice or manufacturer testimonials. This kind of user-generated content is important, and deserves careful examination, because social networks can be expected to elevate word-of-mouth when consumers in those networks have known reputations and are trusted.

Marketing scholars may also fruitfully explore how user-generated content will impact brands, especially through activities like "videopinions" and co-creation activities. Web 2.0 technologies are supporting the emergence of online brand ambassadors that share their brand experiences with the friends in their social networks and help spread the word about their favorite (and disliked) brands. This is leading to a phenomenon where content exists and has meaning only when it is linked to other content.

We also see two types of tailored marketing competing — a “do it for me” personalization Murray and Häubl (accepted for publication) and Montgomery and Smith (accepted for publication) in which content is tailored to a particular consumer based on her previous online behavior and a “I'll do it for myself” customization where consumers modify the content to suit their own tastes Bolton and Saxena-lyer (this issue). The presumptive advantage of personalization is reduced customer effort, but this comes at the cost of restricting consumers' options. Customization has the advantage of being easier for marketers to implement and benefits consumer control motives, but personalization may play a strong role in the future as information increasingly taxes consumers' abilities to process and integrate it in meaningful ways.

Déjà vu all over again

Almost as it was nearly a decade ago, we are again in the midst of exponential growth trends in technology that are resulting in new digital applications on an ongoing basis. These applications are having a profound effect on computer-mediated environments and are opening the door to a host of exciting new research opportunities for marketing and consumer behavior scholars. We believe that the online experience is a consumption event in and of itself and, for many consumers, may be much more interesting than traditional company Web sites. Web shopping today generates flow under only the most limited of conditions. It seems clear that the challenges the Web presents need to be increased for the flow-prone. Existing empirical results support the idea that those who experience flow seek, at a minimum, ease of use in Web shopping. It may be the case that for some consumers under some conditions a compelling online experience may offer an alternative to seeking the lowest price. Research has established that flow produces positive attitudes and leads to numerous positive marketing outcomes, but much remains unaddressed. We hope this paper may offer some small stimulation on where to look next.

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