ELABORATING A MEASUREMENT INSTRUMENT FOR THE FLOW EXPERIENCE DURING ONLINE INFORMATION SEARCH

Lazoc Alina
Dimitrie Cantemir Christian University, Faculty of Management in Tourism and Commerce Timisoara

Luiza Caraivan
Dimitrie Cantemir Christian University, Faculty of Management in Tourism and Commerce Timisoara

Flow is a construct imported in marketing research from social sciences in order to examine consumer behavior in the online medium. The construct describes a state of deep involvement in a challenging activity, most frequently characterized by high levels of enjoyment, control and concentration. Researchers found that the degree to which online experience is challenging can be defined, measured, and related well to important marketing variables. As shown by our extensive literature review, flow measurements include antecedents, dimensions and consequences of flow.
The present paper represents a detailed description of the construct`s operationalization in the context of online information search. In this respect, our main goal is to produce a basic instrument to evaluate the flow experience of online search, in order to capitalize on the premises of an interactive, complex informational medium – the World Wide Web – and on the consequence of an exploratory informational behavior of users. The instrument is conceived to offer a primal possibility to collect data.
The composition, source and significance of the 11 scales used to measure the multiple factors of the flow experience during online search are detailed in this study with the aim to ensure the compliance with scientific rigors and to facilitate correct reports of data related to the reliability and validity of measurements.
For further research, we propose factor analysis to test the resulted instrument and to ensure that the measures employed are psychometrically sound. Factor analysis refers to a wide range of statistic techniques used to represent a set of variables in concordance with a reduced number of hypothetical variables called factors. Factorial analysis is used to solve two types of problems: reducing the number of variables to increase data processing speed and identifying hidden patterns in the existent data relations.
However, we expect our scales to perform different in the context of information search with second generation web tools and suggest further qualitative research concerning web determinants of flow.
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I. Literature review

Novak et al. (1998; 2000) are the first to demonstrate the measurability of flow factors as well as the fact that they all relate to one another in predictable ways. Further studies have operationalized, tested and applied flow in numerous ways. They have adopted alternative operational definitions, often with different terminology of the major dimensions related to the flow construct. Collectively, these operationalizations proposed that any measurement of the construct should include its antecedent conditions, consequences, and dimensions.

Measuring skills and challenges as essential flow preconditions

The original flow theory (Csikszentmihalyi, 1990) cites *balance of skills and challenges* as the most important factor to flow experience. If challenges exceed the skill levels, people feel overwhelmed and anxious; on the other hand, if the activity is too easy, people get bored. Both challenge and skill should be situated on a level above daily average, so that the person may live a compelling experience.

However, as authors like Guo and Poole (2009) or Finneran and Zhang (2005) have noticed, most flow studies (Koufaris, 2002; Skadberg & Kimmel, 2004) analyze skills and challenges as separate constructs, which may represent a distancing from the original flow model imported from social sciences. It is generally accepted that operationalizing the skills/challenges ratio is troublesome.

Moreover, in the reviewed literature there is still a persisting ambiguity of what types of challenges and skills should be measured (those focusing on the medium, or those regarding the underlying activity).While most researchers of online flow relate online skills and challenges to interface usage issues, Skadberg and Kimmel (2004), for example, consider a vision of challenges that are provided by the available information, that is, by *the site content,* and a vision of skills that are given by the *knowledge* on a certain topic.

The multi-dimensional measure of flow itself

Flow dimensions represent indicators of the experience described by construct and they exist on a different level from the flow level (Guo and Poole, 2009; Siekpe, 2005). In other words, each dimension is necessary but not sufficient to define the flow construct. The structural models which propose multi-dimensional flow measurements start from the consideration that there is a certain inter-correlation level of these dimensions, which indicates the effect of a underlying higher-order construct.

The central dimension of the online optimal experience is *enjoyment,* the most common flow measure. The state of mind associated with flow is extremely gratifying and self-motivating (Koufaris., 2002; Huang, 2003; Li and Browne, 2006; Guo and Poole, 2009). Focusing attention on the task also represents a major indicator of the flow state. Koufaris (2002) considers *concentration/attention focus* a flow measure and he studies it in the context of online shopping activities. The attempts to operationalize control as a flow dimension include Koufaris' (2002), Huang`s (2003), Li and Browne`s (2006) and Guo and Poole`s (2009) structural models. Huang (2003:429) speaks about "a sense of control over the computer interaction". Li and Browne (2006) define *control* as the individual's perception of the fact that they have the responsibility of an activity or of an environment.

Operationalizing and measuring design factors of a flow experience

The Web offers a special environment for the flow experience (Chen, 2006; Huang, 2003; Skadberg and Kimmel, 2004; Novak et al., 2000; Koufaris, 2000; Guo and Poole, 2009), as it provides rapid feedback and orientation, which support users` concentration, offer them intrinsic motivation and a feeling of control over their actions.

In flow models, rapid feedback and orientation are operationalized using the constructs of: (1) *interactivity* (Novak et al., 2000; Skadberg and Kimmel, 2004), (2) *value added search mechanisms* (Koufaris, 2000) or (3) a *fast, unambiguous feedback mechanism* (Guo and Poole, 2009). Novak et al. (2000) build upon Steuer's (1993) three-part conceptualization of interactivity: *speed*, *range* and *mapping*. The *speed of interaction* refers to the rate at which input can be assimilated into the environment – a variable which has a maximum value represented by real-time interaction (a common value for broadband Internet today). *The range of interactivity* refers to the number of possibilities of action at a certain moment, and *mapping* refers to natural and intuitive reactions of the system to actions initiated by users. Guo and Poole`s (2009) conceptualization of *a clear feedback mechanism* entails its capacity to show the user his/her progress in achieving an online goal (search goal, shopping goal, etc). For Skadberg and Kimmel

(2004), interactivity is determined by *response speed* (as suggested by Steuer) and *ease of use*. *Ease of use* refers to the navigational characteristics of the web site.
A related concept both to *interactivity* and *ease of use* is *usability*. *Usability* is a concept largely used in information systems and marketing literature, which generally refers to the totality of attributes which make a technology easy to use (Pearson and Pearson, 2008). One of the elements which ensure increased usability is *coherence* – that is applying a unitary pattern of presenting information, instruments and surfing clues and/or a unitary interface for similar tasks. Guo and Poole (2009) study the web site complexity (a concept opposed to that of usability) as one of the important interface design variables that influence flow.
If *navigability* and *usability* refer mainly to those characteristics of the Web that determine or support users' decisional processes, the construct of *telepresence* describes an online state that does not require cognitive involvement of the user, but can resume to a multi-sensorial engagement in the virtual reality. Telepresence is the perception that the virtual environment one is interacting with is more real/dominant than the actual physical environment. Authors like Novak et al. (2000) or Skadberg and Kimmel (2004) tested telepresence as a flow antecedent, while others like Pace (2003) proposed telepresence as one of the flow dimensions.
Proposing and measuring personality factors of flow
Considering that flow is less about predicting behavior and more about predicting a person`s affective state (which may in turn influence behavior), Finnerang and Zhang (2005) suggest that individual differences can yield very different flow experiences from the same activity. The difference among individuals is not merely in their online skills, but also in their underlying attitude towards web technologies. Agarwal and Karahanna (2000) proposed and tested *personal innovativeness* as an important determinant of a flow like experience (*cognitive absorption*).

II. A Measure of Flow during Online Information Search
In order to measure challenges and skills related to them in an online search activity, we have adapted and rephrased the original scales used and tested by Novak et al. (1998; 2000) with positive results (α alpha=0.86 for the skills scale and α alpha=0.87 for the challenge scale). In the context of the present research, both skills and the challenges correlated with them refer to the online search process, ignoring other general informational abilities and offline literacies of users:

- *I am extremely skilled at web search.*
- *I consider myself knowledgeable about effective search techniques on the web.*
- *I know somewhat less than most users about web search. (-)*
- *I know how to find what I'm looking for on the web.*

Beside the user's perception about his/her skills, we have supplementary introduced a second personal factor in our measurement instrument: *innovativeness towards online search applications (tools)*. To be able to measure it, we have adapted Agarwal and Karahanna's (2000) *personal innovativeness* scale, positively tested by the authors in the context of general web use (α alpha=0.87):

- *If I heard about a new online search application, I would seek modalities to test it.*
- *Generally, I hesitate to try out new online search tools. (-)*
- *From all the people I know, I am generally the first to try out new search applications.*
- *I like testing new online search applications.*

In order to evaluate the *navigability* of the web environment, we have rephrased in our study a subscale of interactivity suggested by Novak et al. (1998) using Steuer's (1993) interactivity model. From our point of view, *navigability* represents the adaptability of the information system to users' surfing needs offering them a relevant map to manage the complex, often oppressive, informational space.

- *Surfing the web with the available browsers is natural.*

- *Web interaction is intuitive.*

We have considered *navigability* essential in defining web 2.0 experiences and we have reintroduced it into flow measure, although previous tests did not obtain good results in the context of an incipient stage of web development. In light of this, we recommend further qualitative studies to perfect operational definitions of navigability in the context of exploratory search interfaces.

In order to measure *telepresence*, we have partially used the scale designed by Novak et al. (1998). The original scale (Novak et al., 1998) operationalizes a subjective experience generated by the multi- and hypermedia attributes of the web and it was successfully tested by the authors (α alpha=0.69) in the context of general web usage:

- *During online search I forget about my immediate surroundings.*
- *During online search I feel rather in the online environment than in my immediate surroundings.*
- *During online search I feel that I am in a virtual reality.*

A concept closely related to *navigability* is *usability,* a term that is used especially in information systems research (Pearson and Pearson, 2008; Guo and Poole, 2009), where efficiency of structural web organization is described. Broadly, *usability* comprises aspects related to the utility of web content. Guo and Poole (2009) measure the perceived complexity and speak about the necessary cognitive effort to understand websites. We have taken some items from the *perceived complexity scale* referring to dynamic complexity and we have transformed it, by rephrasing the positive pole, in the expression of web *usability* (that is, approaching it from a structural point of view):

- *The web is a coherent medium.*
- *The web is a logical medium.*
- *The web is a predictable medium.*
- *The web is an organized medium.*

Based on the conceptual multi-dimensional flow definition, we have applied distinct operational measures for each aspect of flow experience (Table 1) and we have used a common measure accomplished as a simple arithmetic mean of the four scales.

Online search requires special skills, providing users special satisfactions, both extrinsic (related to search results) and intrinsic (related to enjoyment of using digital devices and applications). For the present study we have used a scale to measure intrinsic enjoyment of online search, a scale that uses items from Koufaris's (2002) scale (α alpha= 0.81) and from Guo and Poole`s (2009) scale (α alpha= 0.91).

The dimension called *sense of control* is operationalized in a narrow sense, that of the user`s capacity to control online search. In the reviewed literature, conceptions regarding control measurement are extremely varied and they often include both elements describing user characteristics and elements related to the system`s capacity to respond to users' initiatives (or to transfer initiative). To measure the sense of control in the context of online search we have used a variant of Guo and Poole's (2009) scale, tested by them in the context of online shopping (α alpha=0.90).

In marketing literature, the construct of *attention focus* is often a synonym for involvement and it describes the cognitive dimension of active participation in the consumption experience (including media consumption). In our research, we have used Guo and Poole's measure (2009) for *focused attention* (α alpha=0.90) and we have extended it with Huang's items (2003) from his *focused attention* scale (α alpha=0.82). We named the resulted scale *attention focus*.

The measure of *time distortion* entirely uses Guo and Pool`s scale called *transformation of time*, that has proven consistent reliability (α alpha=0.92) in the context of online shopping.

Table 1
Describing scales used in flow dimensions measurement

Construct measured	Significance	Scale items
Sense of control	It measures the level of trust in one`s own capacity to control the evolution of an online search session.	*- I feel in total control of the search process.* *- I feel like I could control the search process.*
Attention focus	It evaluates the degree of focusing attention exclusively on the online search process.	*- My attention is focused entirely on the search process.* *- It is no effort to keep my mind on what is happening.* *- I have total concentration.* *- I think about other things. (-)* *- I am aware of factors that distract attention from the search. (-)*
Intrinsic pleasure	It evaluates the degree to which a search activity is enjoyed for its own sake, irrespective of attaining one`s initial search goals.	*- Search is generally interesting.* *- Search is generally fun.* *- Search is generally exciting.* *- Search is generally enjoyable.* *- I really enjoy the online search experience* *- I love the feeling experienced by online search and I want to capture it again.* *- The online search experience leaves me feeling great.* *- I find the online search experience extremely rewarding.*
Time distortion	It measures the degree to which the user sets free from time pressure.	*- Time appears to go by very quickly when I`m searching online.* *- Time flows when I`m searching online.* *- I`m losing track of time when I`m searching online.*

Source: developed by the author

To measure exploratory behavior as a result of online search experience, we have used a three-item scale adapted after Novak et al. (2000). The exploratory behavior scale measures the degree to which the user is open to experiments and innovation in his information search behavior:

- I like experimenting during information search.
- I enjoy exploring the web just to see what information it offers.
- I like to click on a link just because it seems interesting.

III. Future research agenda: data collection and data analysis strategy

The plan that we have conceived to collect data includes the creation of a survey which has questions referring to the six antecedents of the flow experience (skills, challenges, innovativeness, interactivity, usability, telepresence), to its four dimensions (pleasure, sense of control, attention focus and time distortion) and to exploratory behavior as flow consequence. The eleven flow related constructs are going to be operationalized with five-point rating scales (scale values from strongly disagree to strongly agree). The survey will be an online form, based on a web application specially designed and developed for our future research.

Using PHP and HTML, the online application will be adapted to the type of collected data and will ensure the possibility to select the questions and variants for answers from the data base, as

well as that of posting them on the user interface. Security and efficiency of stocking questions and answers will be ensured by the data base engine MySQL, especially due to the large variety data that it can stock.

Moreover, MySQL will offer enhanced flexibility in manipulating data during research, allowing a real-time intervention and the possibility to improve the research instrument based on incipient feedback from respondents.

After collecting data, we will test reliability and validity of the scales using factor analysis. First we will apply an exploratory factor analysis to confirm the constructs` unidimensionality. In the second stage we will use a confirmatory factor analysis to test the construct`s validity, by identifying which items load on a particular factor and establishing a factor loading threshold. We will also test the reliability of each scale using Chronbach`s coefficient alpha.

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