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Abstract

Despite strong interest in various research disciplines over two decades, adapting the 'flow' theory of Csikszentmihalyi to understand user behavior in information systems, existing literature shows high inconsistencies on both the conceptual and the methodological side. This paper addresses these inconsistencies by considering flow from the perspective of the conceptual and methodological status quo of research in psychology. Based on qualitative and quantitative data of 216 respondents, a consistent conceptualization and measurement of flow via the Flow Short Scale (FSS), which is utilized for the first time in the context of the web, is demonstrated and validated in a nomological network regarding website usage continuance intentions. Building upon this, a cross-section of activities on the web, whereat flow is experienced (flow activities), is collected and categorized by means of qualitative content analysis. Furthermore, the intensity of different aspects of the flow experience and potential for their improvement are disclosed. Looking ahead to the explanation of user behavior and implications for web design, the study makes suggestions for relevant further research.

Keywords: Flow theory, flow measurement, human-computer interaction, web design.

1 Introduction

For over two decades, researchers in the field of human-computer interaction emphasize the point that information systems' use can be a source of pleasure (e.g., Carroll and Thomas, 1988; Lindgaard, 1999; Van der Heijden, 2004). While enjoyment in computer usage addresses "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al., 1992), the theory of flow has been proposed by various authors as an useful framework to explain user behavior (e.g., Csikszentmihalyi, 1990; Ghani, 1995; Ghani and Deshpande, 1994; Ghani et al., 1991; Hoffman and Novak, 1996; Webster et al., 1993). Flow describes the state of "self reflection-free immersion in a continual activity that one still has under control in spite of high stress levels" (Rheinberg, 2008a). Time and place, as well as an original external aim of the activity that has been present, are forgotten and the individual is totally absorbed by the activity (Csikszentmihalyi, 1975; Rheinberg and Vollmeyer, 2003). The practical implications of examining the flow experience that accompanies the use of websites are promising. Between 40%-50% of surveyed web users report that they already had a distinct flow experience while using the web (Chen et al., 1999; Novak et al., 2000; Rettie, 2001). If users surf the web in a flow state, numerous positive side-effects result, particularly for website operators. Despite the strong interest of adapting the flow concept to IS in different research disciplines over two decades, existing literature shows high inconsistencies on the conceptual as well as on the methodological side (Finneran and Zhang, 2005; Hoffman and Novak, 2007). A wide variety of constructs is used to measure flow. Novak et al. (2000) list 13 different constructs in their review. Moreover, the measurement of flow can be seen as incomplete, since the used constructs overlap only partially with the original constructs proposed in the field of psychology (Csikszentmihalyi, 1975; Rheinberg, 2008b). Conceptually, inconsistencies are expressed, for example, by contrarily hypothesized relations of the used constructs. Therefore, the authors pose the research question:

How can flow experience on the web be consistently conceptualized and measured?

Additionally, the last identification and systematical description of a current status of flow activities on the Internet, was done by Chen et al. (2000; 1999) a decade ago. Within this period, the Internet itself has changed and developed radically. Therefore, the authors strive to answer the research question:

What are the main flow activities on the web and
what different aspects of flow can we identify with regard to these activities?

For that reason, firstly, a general introduction to the concept of flow experience is given in Section 2. Following the relevance of flow-experience on the web, the state of the literature addressing flow experience on the web and the research gap are presented. To address the high inconsistencies of prior research, the measurement of flow in the context of the web is re-examined in Section 3 from the perspective of the conceptual and methodological status quo of research in psychology. Subsequently, the utilized methodology of data collection and analysis is introduced. Section 4 serves to depict the results. Closing the article, Section 5 discusses the results, gives hints for further research and shows limitations.

2 Theoretical Foundation

2.1 Flow experience

The flow state was first described by Csikszentmihalyi (1975) on the basis of qualitative research. Csikszentmihalyi conducted interviews with people who performed activities that do not directly lead to extrinsic rewards (e.g., money, reputation). Firstly, he studied the behavior of painters, who worked with excessive commitment and feverishly towards the completion of a painting. However, once the painting was finished, it was usually disregarded and placed in a far corner of the studio next to other paintings. Subsequently, a new painting was begun (Csikszentmihalyi and Csikszentmihalyi, 1988). Therefore, activities were examined that have a

self-purpose, which means that the experience of enacting is the reason for the action itself (so-called autotelic activities). During a large number of interviews, Csikszentmihalyi repeatedly found a state of mind which he called flow experience. Based on interviews, he captured experience and conditional components that constitute the flow state. According to Csikszentmihalyi, the occurrence of flow is not exclusive to some unique types of activities but rather it is a general phenomenon. Humans can experience flow when carrying out virtually any activity. Next to creative activities (e.g., composing music, painting and sports activities like rock climbing, basketball, rock dance (Csikszentmihalyi, 1975)), every-day activities were examined (such as university lectures (Engeser and Rheinberg, 2008), computer games (Abuhamdeh and Csikszentmihalyi, 2009), and Internet usage (Novak et al., 2003; Novak et al., 2000)). The experience of flow is hereby not limited to mere intrinsically motivated activities. Csikszentmihalyi and LeFevre (1989) found flow in work-related contexts even more often than they did during leisure time. Examining over three decades of qualitative and quantitative flow research in psychology, the single components of flow have proved to be remarkably stable and consistent. Based on the findings of Csikszentmihalyi, Rheinberg (2008b) differentiates six conclusive components of the flow experience (see Table 1).

Components of flow
Balance between perception of skills and task demands.
Clear, unambiguous demands and feedback of action.
Activity seems to be guided by an inner logic.
High degree of concentration on the activity due to undivided attention to a limited stimulus field.
Change in one's experience of time.
Self and the activity are not separated, loss of self-consciousness.

Table 1. Components of flow (Rheinberg (2008b) based on Csikszentmihalyi (1975))

According to these components, the flow state is characterized by deep concentration when optimally challenged, while also being in control of the action. If this experience is described in its components, respondents almost invariably indicate that they know this state (e.g., stable 90% within an annual representative survey in Germany (AWA, 2000) or 87% in the context of American flow research (Csikszentmihalyi, 1994)). In this regard, the flow state is mostly related to pleasant activities and is experienced as very enjoyable (Csikszentmihalyi, 1975; Massimini and Carli, 1991). Csikszentmihalyi and LeFevre (1989) even call it "optimal experience".

2.2 Rigor and relevance of flow experience on the web

The flow concept has received particular attention with regard to understanding usage behavior of information systems (e.g. Csikszentmihalyi, 1990; Ghani, 1995; Ghani and Deshpande, 1994; Ghani et al., 1991; Hoffman and Novak, 1996; Webster et al., 1993). The adaption of the flow concept to information systems' usage proved to be helpful, especially for research disciplines in the fields of IS, marketing and education. On the web, the experience of flow is positively related to the attitude towards websites (Novak et al., 1997; Sanchez-Franco, 2006), the evaluation of websites (Nel et al., 1999) and the satisfaction with websites (Deng et al., 2010; Lin et al., 2005). Flow is associated with the usefulness and ease of use of websites (Agarwal and Karahanna, 2000; Huang, 2003), as well as the intention to use websites (Sanchez-Franco, 2006). Hoffman und Novak (1996) postulate flow as "the 'glue' holding the consumer in the hypermedia Computer Mediated Environment". In addition, the flow concept has been applied to explain loyalty to websites (Hoffman and Novak, 1997; Koufaris, 2002; Lin et al., 2005). Moreover, learning success in the context of e-learning (Guru and Nah, 2001) can be explained via flow experience. Between 40%-50% of respondents report, based on descriptions of strong flow-experiences (statements taken from a composer, a rock climber, a dancer, description of an athlete), that they already had similar experiences on the web (Chen et al., 1999; Novak et al., 2000; Rettie, 2001). Therefore, the practical implications of flow experience on the web are promising.

Existing literature shows high inconsistencies on the conceptual as well as on the methodological side (Finneran and Zhang, 2005; Hoffman and Novak, 2007). The low reliability of the flow constructs that are used in IS research is shown by Novak et al. (2000). The authors list a variety of 13 different flow constructs in their review. On average only four of these are considered per study. Moreover, even the use of all these constructs overlaps only partially with the proposed constructs in the field of psychology (Csikszentmihalyi, 1975; Rheinberg, 2008b). Conceptually, the inconsistencies are not limited to the constructs, but also concern their hypothesized relations. For example, Ghani (1995; 1994; 1991) regards the constructs concentration and enjoyment as describing the flow experience itself, while other authors think of concentration as an antecedent of flow and enjoyment as its consequence (e.g. Chen et al., 1999; Novak et al., 2000). In some studies that are "based on flow theory", the measurement of flow is bypassed altogether by measuring related constructs, but not flow itself. In addition to the measurement of flow by means of constructs that are supposed to constitute single components of flow, holistic narrative measures, based on narrative descriptions of flow experiences, are utilized. A short text designed by Novak et al. (2000) or its modifications are mainly used (e.g. Choi et al., 2007; Novak et al., 2003). However, this text focuses strongly on the experience of absorption, while being in a flow state. It is questionable that fluency (Rheinberg, 2008b), as a distinct component of flow, is sufficiently reflected by this measure (see Chapter 3.1). Choi, Kim und Kim (2007) express the situation of flow research in the context of IS like this: "The construct of flow is, however, too broad and ill-defined due to the numerous ways it has been operationalized, tested, and applied". An overview of the diversity of flow concepts in IS research is given by Hoffmann and Novak (2007).

To address the inconsistencies that are demonstrated above, it seems sensible to step backwards and to contemplate flow experience in the context of IS once again from the perspective of psychology. Therefore, to reach a profound understanding of flow experience on the web, the following questions, incrementally emerge: "How can flow-experience on the web be consistently conceptualized and measured?" and "What are the main flow activities on the web and what different aspects of flow can we identify regarding these activities?"

3 Research Methodology

3.1 Flow measurement

From psychology's viewpoint as well, the measurement of flow is by no means trivial. Initially, flow was operationally defined by Csikszentmihalyi as balance between subjective "skills" and "challenges" (Csikszentmihalyi, 1975). Owing to theoretically inconsistent results, the additional prerequisite was added that both skills and challenges have to be at a high level (Csikszentmihalyi and Csikszentmihalyi, 1988). However, this equation of the multifaceted flow experience and a single theoretical triggering condition is not unproblematic (Rheinberg, 2008a; Rheinberg et al., 2003). Especially regarding the condition of balance between skills and demands extreme inter- and intra-individual differences are expected. Achievement-related, challenging conditions can lead to hope of success as well as to fear of failure (Atkinson, 1957). In this regard, increasing fear of failure does not lead to flow, but to higher worry scores (Engeser and Rheinberg, 2008; Rheinberg et al., 2003). An additional problem also apparent in the IS research that has adopted Csikszentmihaly's concepts (e.g., Novak et al., 2000), is the synonymous usage of the terms "demand" (task difficulties) and "challenge" (e.g., Moneta and Csikszentmihalyi, 1996). From a motivation theoretical perspective, a challenge is experienced when the demands of an activity are compatible with the skills of the person performing it. Challenge is thus the result of a skill/demand balance. To diagnose flow, Csikszentmihalyi relates challenge again to the skills of an activity. Rheinberg et al. (2003) assume that this definitional fuzziness profoundly affects the explanatory power of the related empirical results. Equally, the frequent inclusion of the concept of intrinsic motivation to measure flow (e.g. Jackson and Eklund, 2002) can be regarded as unhelpful. On the one hand, there are rarely solely intrinsically motivated activities; on the other hand, flow can occur just as well conducting predominantly extrinsically motivated tasks, e.g., while working (Csikszentmihalyi and LeFevre, 1989; Engeser and Rheinberg, 2008). The Flow Short Scale (FSS) developed by Rheinberg et al.

(Engeser and Rheinberg, 2008; Rheinberg et al., 2003) is a scale to measure flow in any domain which has internalized the issues mentioned above. It is a further development of the flow scale by Rheinberg (1987) and includes the whole spectrum of flow components derived from qualitative data (see Chapter 2.1), that are measured via 10 items (7-point Likert scales ranging from 1 (not at all) to 7 (very much)). The experience of optimal challenge is modeled as one component (besides others) and intrinsic motivation is excluded from the flow measure. The scale can be interpreted via two factors, the *fluency* of the examined activity and the *absorption* while conducting the activity (Rheinberg et al., 2003) (see Table 2).

F 1: Fluency
My thoughts/activities ran fluidly and smoothly. I had no difficulty concentrating. My mind was completely clear. The right thoughts/movements occurred of their own accord. I knew what I had to do each step of the way. I felt that I had everything under control.
F 2: Absorption
I felt just the right amount of challenge. I didn't notice time passing. I was totally absorbed in what I was doing. I was completely lost in thought.

Table 2. Flow factors of the Flow Short Scale (Rheinberg et al., 2003)

The Flow Short Scale has been applied and could be validated in a broad variety of contexts (Engeser and Rheinberg, 2008). FSS flow measures proved to be a performance predictor of statistical education (Engeser et al., 2005), computer games (Rheinberg and Vollmeyer, 2003; Vollmeyer and Rheinberg, 2003; Wendland et al., 2003) and the inbox task (Rheinberg et al., 2003). Furthermore, reference values for different activities are available (e.g., high values of flow during sexual intercourse/intimacy M = 63.00, low values for musing/ennui M = 36.10 (Rheinberg, 2008a). For these reasons, characteristics and intensity of flow are measured in this study via the FSS as described above. To test the validity of the FSS in the context of the web, two additional scales of a related domain are requested: enjoyment (3 items, 9-point Likert scales ranging from 1 (not at all) to 9 (very much)) (Abuhamdeh and Csikszentmihalyi, 2009) and continuance intention (3 items, 7-point Likert scales ranging from 1 (not at all) to 7 (very much)) (adapted from Bhattacherjee, 2001) (see Table 4).

3.2 Data collection

Up to now, a wide variety of qualitative and quantitative methods has been applied in studying the experience of flow. Three criteria in particular received attention in selecting the method for data collection in this study. There should be a minimal time delay between the experience to be examined and data collection (see Pearce et al., 2005; Rettie, 2001), it should be possible to capture gradual flow experiences and the method should be applicable from the viewpoint of economically efficient research to survey an approximately representative cross-section of flow activities. Taking these constraints into account, a retrospective online survey is chosen. The utilized questionnaire consists of several open and closed questions. Contrary to former studies, no primary introduction to the flow concept is given to the respondents, to minimize social desirability and common method bias. To improve the efficiency of the survey a flow filter question is used in the beginning. Respondents are asked to describe an activity they conducted on the web during the last thirty days, where as many as possible but at least one item of the FSS (see Table 4) was applicable. The activity itself should be described in an open question, as well as naming the URL of the visited webpage(s). In the course of the survey, characteristics and intensity of flow are measured, referring back to the stated activity via the FSS, as well as enjoyment and continuance intention for validity checks. The online questionnaire was distributed via email to 3868 students and employees of two large public universities in Germany. A total of 456 respondents (11.8%) answered, and 223 respondents completed the questionnaire. 7 of these responses, however, had to be excluded because they described several or ambiguous activities,

resulting in a final sample size of n = 216. 59.6% of the respondents are female. Ages range from 17 to 67 years (mean age 26.6). The reported level of education is very high (59.6% undergraduates, 34.1% graduates) and participants use the Internet for about 3 hours per day (median).

3.3 Qualitative data analysis

The conventional (or inductive) content analysis does not revert to a previously defined coding scheme, but uses the method of open coding (Gibbs, 2007; Mayring, 2002). Here categories are identified directly from data. This type of content analysis is recommended, particularly if there is no preliminary work available, or if the work is not applicable as is the case here, regarding the preliminary work of Chen et al. (2000; 1999). To build the content analytical coding scheme, every record's content is analyzed within its specific context (Morgan, 1993). The descriptions of web activities, as well as the website(s) visited by the respondents (which were also visited by the coders) are considered during data analysis. The inherent information of every record is examined for key elements. Homogeneous elements are combined and labeled (Gibbs, 2007; Mayring, 2002). Subsequently the labels are summarized in categories (Coffey and Atkinson, 1996). During this process, four activities are excluded which occurred only once in the sample and therefore do not fit into any of the existing labels (exam registration, installation of a password security tool, online banking, administration of a "Dawanda" shop). The remaining data (n = 212) is coded by two of this article's authors (a1, a2) and a student assistant (s). The intercoder reliabilities based on the congruence between the coders (Holsti, 1969) are 0.94 (a1:a2), 0.90 (a1:s) and 0.85 (a2:s). The calculation of Cohen's kappa shows slightly lower intercoder reliabilities (0.94; 0.89; 0.83). Based on data of 216 respondents the following content analytical scheme was yielded (see Table 3).

Category/Activity	Examples
Problem solving/learning	
Information search (specific problem)	"searching for commands and code examples while programming", "translating subtitles", "job search", "searching for internships ", "searching of information for semester abroad"
Information aggregation/ research	"research for bachelor's thesis", "literature review on neurocognition", "research – history of the town Bamberg ", "research during my work as a (music)editor"
Learning/improving/testing knowledge	"I watched lectures online", "solving exams", "vocabulary training via moodle", "learning via Internet using Casus cases and the learning platform of the Medical Faculty"
Transaction	
Shopping	"Amazon.de", "search for a digital camera, comparison of test reports, search for the best price, experiences in forums", "search for an appropriate hotel or hostel in London"
Creation	
Creating/maintaining websites	"created websites", "programming of PHP (modification of a PHPBB3 forum)", "maintenance of our institute's website"
Entertainment	
Playing games	"World of Warcraft", "configured a football team on kicker.de, to take part in the virtual German Bundes League", "Online Flash Game", "kongregate.com"
Watching videos	"watching videos on You Tube, mainly music and VODs", "continuously watching several video series that were published on YouTube", "www.interviewproject.de"
Reading	"reading news magazines online", "SZ, Spiegel, NZZ", "www.bild.de", "mainly reading news and receiving sports novelties", "reading webcomics"
Communication	
Communication (1:1, synchronous)	"Facebook chat", "MSN chat", "I was chatting and had a conversation with a friend", "chat over the social network", "chatting/writing via PC or smartphone"
Communication (1:1, asynchronous)	"reading/writing e-mail", "picking up and writing messages on Facebook", "checking e-mails"
Communication (1:n, asynchronous)	"reading, writing/answering forum articles", "blogging", "social networking", "Facebook", "communication in the social network"

Table 3. Content analytical coding scheme

4 Results

4.1 Validation of the flow measurement in the web context

Construct validity is the key property of any measurement method. The Flow Short Scale has been validated in various applications ranging from experimental studies (e.g. Rheinberg and Vollmeyer, 2003; Vollmeyer and Rheinberg, 2003; Wendland et al., 2003) to the experience sampling method (Rheinberg et al., 2007). However, in the following analyses the applicability of the Flow Short Scale in the context of web activities is tested for the first time. The items of the Flow Short Scale (Engeser and Rheinberg, 2008), as well as items of scales in a related domain, enjoyment (Abuhamdeh and Csikszentmihalyi, 2009) and continuance intention (Bhattacherjee, 2001) were pooled and factor-analyzed to assess their convergent and discriminant validity. The reflective measurement models were validated using standard procedures from the current literature (Chin, 1998). Using a Principal Axis Factor (PAF) with a varimax (orthogonal) rotation, an investigation of the scree plot and the application of the K1 method indicated a four-factor solution (eigenvalues: 4.06, 2.77, 1.84, 1.14, 0.99) with items for flow, enjoyment and continuance intention (CI) falling on separate factors (Table 4).

	Component			
	Fluency (F1)	**Absorption (F2)**	**Enjoyment (F3)**	**CI (F4)**
My thoughts/activities ran fluidly and smoothly.	,835	-,019	,064	,004
I had no difficulty concentrating.	,685	,013	-,025	-,016
My mind was completely clear.	,817	,018	,017	,093
The right thoughts/movements occurred of their own accord.	,713	,068	-,026	,179
I knew what I had to do each step of the way.	,791	-,143	,093	,092
I felt that I had everything under control.	,672	-,124	,066	,081
I felt just the right amount of challenge.	,283	,466	-,060	,220
I didn't notice time passing.	-,174	,708	,240	-,111
I was totally absorbed in what I was doing.	,051	,777	,125	-,010
I was completely lost in thought.	-,331	,652	,182	-,121
The activity was interesting.	,100	,231	,778	,309
The activity was exciting.	-,048	,170	,810	-,070
The activity was fun.	,109	,060	,804	,154
I intend to continue using the visited website(s) rather than discontinue the use.	,082	-,177	,231	,798
My intentions are to continue using the visited website(s) in the future, at least as active as today.	,140	-,138	,146	,842
If I could, I would like to discontinue my use of the visited website(s) (reverse coded).	-,054	-,181	,033	-,661

Table 4. Rotated component matrix: Four-factor solution

Conducting a Harman's one-factor test (Podsakoff and Organ, 1986), the most variance explained by one factor is 21.75 percent, indicating that common method biases are not likely contaminant of our results. Furthermore, the partial least squares (PLS) data analysis technique is used to validate the measurement model. SmartPLS 2.0 M3 (Ringle et al., 2005) is chosen because of its robustness with regard to assumptions and requirements for data analysis. Convergent validity is achieved when measurement items exhibit significant loadings on their respective latent constructs. The t-values are estimated using a non-parametric bootstrapping procedure and the results show that all items have significant loadings ($\alpha = 0.01$), thus suggesting convergent validity (Bagozzi et al., 1991). However, the single item "I felt just the right amount of challenge", assigned to the factor absorption, shows a loading of 0.400, which is below the proposed threshold in the literature. Eventually, the word "challenge" is likely to be misinterpreted in the context of internet-usage. This result would be consistent with a prior qualitative study by Rettie (2001) where the respondents saw the concept of challenge as misleading, because Internet skills are more like learning to drive or to ride a bicycle and not on a linear scale. After removing this single item, construct reliability is evaluated by calculating composite reliability and Cronbach's alpha for each construct. All constructs have a composite reliability significantly above the cut-off value of 0.707, and Cronbach's alpha values are greater than 0.7

(Hair et al., 1998). All constructs also met the threshold value for the average variance extracted (AVE>0.50) (see Table 5).

Constructs	# of Indicators	Factor Loadings*	Composite Reliability	AVE	Cronbach's Alpha
Fluency	6	0.608 – 0.846	0.891	0.579	0.856
Absorption	3	0.745 – 0.859	0.834	0.628	0.701
Enjoyment	3	0.740 – 0.908	0.869	0.689	0.782
CI	3	0.839 – 0.873	0.889	0.727	0.814
* All factor loadings are significant at least at the p<0.01 level					

Table 5. Factor loadings and quality criteria

With regard to discriminant validity, the square roots of AVEs exceeded the inter-construct correlations among the independent constructs. To demonstrate nomological validity, the flow measure is tested in a nomological network. In the theoretical literature, flow is strongly linked to the experience of enjoyment (e.g. Csikszentmihalyi, 1975; Massimini and Carli, 1991; Rheinberg, 2004). Therefore, nomological validity in the context of web activities is tested by examining the relation between the experience of flow while using websites and the enjoyment of these websites. Figure 1 illustrates the path coefficients and the R^2 values of the structural model based on the survey sample. As expected, both factors of flow, fluency ($\beta=0.203$; $p<0.01$) and absorption ($\beta=0.350$; $p<0.01$) are significantly positive related to the enjoyment of a website, thus providing support for nomological validity of the flow measurement. The results show, additionally, that enjoyment of websites induced by flow-experience leads to higher continuance intention ($\beta=0364$; $p<0.01$).

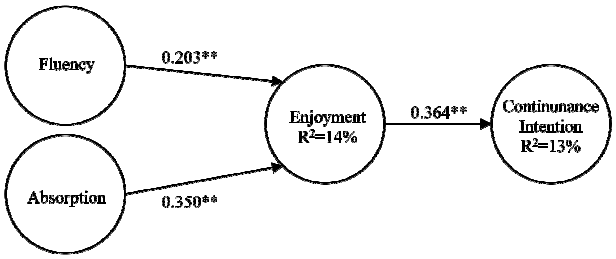

*Figure 1. Demonstration of nomological validity via structural model (** p<0.01)*

4.2 Flow activities on the web

To identify those activities, where practice coincides with flow experience, with precursors of flow or where no flow is experienced, we utilize existent reference values of the Flow Short Scale. The summed up values of the FSS during the day of students are around M = 50,00 (SD 12,00) (Rheinberg, 2004). Assuming equal weight of the single items of the FSS, a pronounced fluency (factor F1, 6 items) of the activity is expressed at a value of F1 > 30. Analogous to this, absorption (factor F2, 4 items) is manifest at a value F2 > 20. Therefore, a sufficient condition for a marked flow experience (FSS > 50) is given if both factors F1 and F2 are above threshold values. A high prevalence of merely one factor can be seen as a precursor of flow. Based on this data, clusters of flow activities on the web can be built (see Figure 2).

Maximum expression of flow experience is attained in conjunction with activities that are simultaneously equally providing fluency (e.g., "The right thoughts/movements occurred of their own accord", "I had no difficulty concentrating") and a high level of absorption (e.g., "I was totally absorbed in what I was doing"). This is intuitively, as well as being based on the data, associated with creative activities (cluster *Creation*: creating/maintaining websites, n = 5). The cluster *Entertainment* (n = 35) shows high values of flow when playing games (n = 12) and while reading for entertainment purposes (n = 11). Furthermore, 45% of readers do not reach fluency of the activity, but have difficulties in concentrating. Reasons for low fluency may be related to distractions by advertising (see Rettie, 2001) or insufficient usability of the visited websites (see Pace, 2004). Watching videos for entertainment (n = 12) can induce flow, but mainly the sample experiences fluency and only marginal absorption. This may be explained by the low cognitive demands of this receptive activity, tending to passivity.

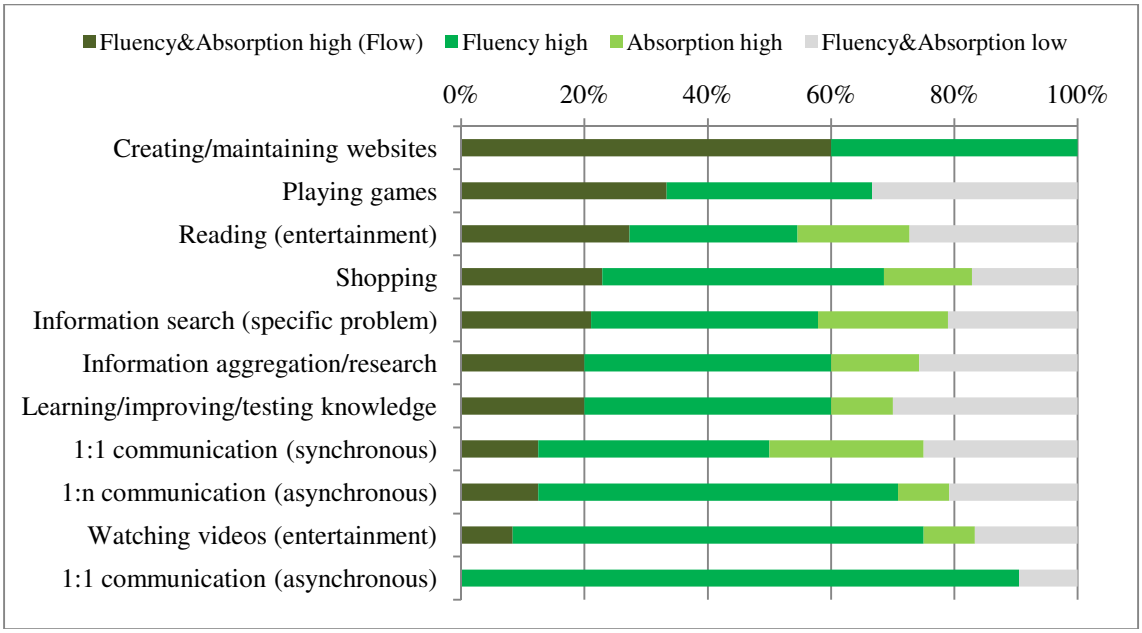

Figure 2. Flow activities on the web (n=212)

Additionally, the cluster *Information* is identified. All of the aggregated categories contain activities where information is searched and received. The purpose of information acquisition varies depending on the considered category (Shopping (n = 35), Learning/improving/testing knowledge (n = 30), Information aggregation/research (n = 35), Information search (specific problem) (n = 19)). The consolidated information activities manifest high flow values. If flow is not experienced, this is primarily caused by low absorption. In particular, the information-seeking process while shopping does not seems to be sufficiently (cognitively) demanding to experience flow for 63% of the shoppers in our sample. Besides that, similar to reading for entertainment purposes, 42% of the respondents who searched information regarding a specific problem did not experience fluency. As in the context of reading, distractions on the website may be the cause. Moreover, lack of progress towards the information-seeking goal may lead to frustration (Pace, 2004) and a lowered sense of control (Chen et al., 1999) instead of flow. The remaining activities can be assigned to the cluster *Communication*. It is noticeable that regarding all respondents who reported asynchronous 1:1 communication (n = 21, e.g., e-mail), the absorption was too low to experience flow. However, if a 1:1 communication is running synchronously (n = 8, e.g., chat), it seems to be demanding enough to induce flow, but it is likely to result in a diminished feeling of control as an inhibiting element. The asynchronous 1:n communication (n = 24, e.g. social networks) shows high fluency in the sample (see Chen et al., 1999), which is eventually a result of higher control over the communication process due to asynchrony. Demands (cognitive) seem, however, to play a minor part while using these websites, thus preventing flow. Considered jointly, communication activities seem to be the least likely to coincide with flow experience.

5 Discussion, Further Research and Limitations

One aim of the present study is to address the inconsistencies of prior flow research in the IS discipline by demonstrating and validating a conceptualization and measurement of flow that is consistent and in line with the status quo of research in psychology. The Flow Short Scale incorporates the whole spectrum of relevant flow components, consciously excluding intrinsic motivation. The FSS, which is utilized for the first time to measure flow experience on the web, can be validated in a nomological network. FSS measures are able to explain the enjoyment of websites, positively related to the intention of continuing use of these sites. Building on this, the second aim of the study is an identification and systematic description of flow activities on the web, regarding the different aspects of flow. Based on qualitative and quantitative data of 216 respondents, a cross-section of flow activities on the web is gathered and categorized by means of content analysis. In line with Csikszentmihalyi, also on the Internet, flow can be regarded as

a general phenomenon, which can be observed within various activities. The clusters: Creation, Entertainment, Information and Communication can be built, wherein different aspects of flow are disclosed. Both questions that this study answers can be seen as a first step to a more profound understanding of flow experience on the web. Looking ahead to a final aim of explaining user behavior and giving implications for web design, the practical implications of this study lie in the hints for relevant further research. The authors propose the FSS for future studies examining flow experience on the web. To give practical implications on how to improve flow experience on the web, a next step is to examine antecedents of flow in the web context. This should be achieved by considering activities that seem to have a high potential for improvement. This study identifies several cases where one factor of flow is depauperate, but there are no proven causal reasons for these facts. While information-seeking regarding a specific problem and reading for entertainment purposes, almost half the respondents did not experience fluency. Can there be flow if distractions like advertisements are out of gear? Can watching videos or shopping activities coincide with flow frequently if (cognitive) absorption is increased? Communication activities do not seem to be very prone to flow, but there are differences regarding their forms. What is specific about 1:n or synchronous communication that is resulting in higher flow values? Besides addressing these questions, it seems reasonable to further examine influences of flow, measured via the FSS, on practical relevant variables like continuance intention, satisfaction with a website or usage time of a website.

There are a number of limitations to this study that should be noted. Firstly, the empirical part of our study is not representative of the basic population of Internet users, due to the sample size of 216 and surveying students. Secondly, a flow filter question was used in the beginning of the questionnaire to increase research efficiency. Therefore the reported activities are representative for flow-affinity activities – those likely to experience flow – but not for the whole series of activities conducted by the respondents. Thirdly, considering diverging usage behavior in other countries, this survey and its results are limited to users in Germany. Nonetheless, the examined section of reality can be considered as indicative. Therefore, we hope that our results provide a substantial base motivating for further research of flow experience on the web.

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