106 博士班資格考
科目：管理計量方法
時間：4 小時 (Closed book)
作答時，請注意各題之比例配分，並清楚標示題號

Part I (50%)

1. Please explain the differences and similarities of multiple regression, conjoint analysis, and structure equation modelling 10%
2. What is statistical power? How to increase statistical power? 10%
3. What is conjoint analysis? Please give an example to explain utility, factors, levels, and profiles for conjoint analysis 10%
4. Please write out the differences between exploratory factor analysis and confirmatory factor analysis for structure equation model. And How do you decide if confirmatory factor analysis is successful?10%
5. Explain the concept of odds and why it is used in the predicting probability in a logistic regression procedure.10%

Part II (50%)

6. Please read the attached journal paper (Title: Optimal experience of flow enhanced by telepresence: Evidence from social media use**)** and answer the questions.
   (a) In Table 1, please write the reasons why flow positively influences brand equity, e-commerce, motivation, emotion, attitudes, intentions, and behaviors. 10%
   (b) In Fig. 1., Do you think that the proposed model has any question? Please write out your viewpoint. 10%
   (c) In Table 3, why the negative direct effect is outweighed by the positive indirect effect? Please give a reasonable explanation. 10%
   (d) After reading the paper, have you found some problems? Please write the problems and improvement. 10%
   (e) Please describe the motivation, objective, and research results for this paper. 10%

Information & Management 54 (2017) 115–128

Contents lists available at ScienceDirect

Information & Management

journal homepage: www.elsevier.com/locate/im

Optimal experience of flow enhanced by telepresence: Evidence from social media use

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ARTICLE INFO

Article history:
Received 18 July 2015
Received in revised form 12 April 2016
Accepted 2 May 2016
Available online 7 May 2016

Keywords:
Social media
Flow experience
Time distortion
Telepresence

ABSTRACT

Flow has been proposed as an essential component for understanding online behavior and defining the stimulating nature of online experiences. In this research, we examine the impact of flow specifically within the context of social media use. The findings indicate that telepresence positively affects the five dimensions of flow: enjoyment, concentration, challenge, control, and curiosity. These dimensions (except control) are positively related to overall flow, which enhances time distortion and frequency of social media use. In addition, we extend the nomological network on flow theory by developing a model to illustrate the complex relationship between flow, telepresence, time distortion, and frequency of social media use. This study highlights the idea that overall flow can uniquely affect social media users in a flow experience, and it presents interesting results about behavioral intentions during social media use. Theoretical and practical implications of these findings are discussed.

1. Introduction

Social media platforms such as Facebook, Twitter, Google+, or LinkedIn have become an important part of the social and professional lives of millions of people. They offer opportunities to network and experience marketing in new channels [1]. In September 2015, Facebook had 1007 million daily active users [2]. In Europe alone, there were 282 million active Facebook accounts [2]. On average, users in the United States accessed social media for approximately 2.7 h per day [3].

The competition to engage and excite social media users is fierce. Therefore, social media service providers must understand the factors that attract visitors to a site and the key behavioral outcomes of this compelling experience. The germane questions for social media service providers are as follows: (1) How can a competitive advantage be created? and (2) How can social networks most effectively manage members' perceptions? Flow – an intrinsically optimal state during which an individual is intensely engaged in an activity to the exclusion of all other thoughts – has been established as a critical determinant of online experiences such as web browsing and shopping [4]. Flow can occur while carrying out virtually any daily activity (e.g., reading, talking on the telephone, etc.) [5]. Millennials spend 17 h on average per day on social media. The Y and Z generations use mobile devices to comparison-shop, read product reviews, and purchase products [6]. This would lead us to believe that flow may be an essential aspect of web-based business models [7]. An investigation of the role of psychological states, such as the experience of flow [8,9], may provide answers to these questions.

The present research investigates the role of flow in social media usage. Our proposition is that social media use produces a compelling emotional and cognitive experience that people appreciate and attempt to replicate. Following Hoffman and Novak [4], we argue that the objective of social media providers should be to facilitate "flow opportunities" in which consumers are completely engaged during social media use.

Besides the flow concept, we analyze one of its key constructs, telepresence. Telepresence is a perceptual illusion of non-mediation [10]. It is a sense of "being there" in the phenomenal environment created by a medium [11]. In telepresence, the user considers the objects in the mediated environment as unmediated and reacts directly to the items as if they are physically present objects [12]. Telepresence is of interest in our context because of the inherent realistic nature of the social media environment that makes it unique from other environments.

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http://dx.doi.org/10.1016/j.im.2016.05.001
0378-7206/

Therefore, the objective of this study is to determine whether the flow experience enhances behavioral outcomes associated with social media use and to analyze the role of telepresence in achieving a state of flow while browsing social media.

We build on a priori findings by practitioners and academics who have recognized telepresence and flow as key attributes of the user experience with new media [13–16]. This research involves the evaluation of the relationships among (1) telepresence, (2) flow experience, and (3) user behavior during social media use. A model that hypothesizes these relationships was tested with primary data collected through an online survey.

This research aids site developers and marketers in understanding users' perceptions of the social media experience. In addition, the results of this study can help social media managers develop strategies that engage users and enhance the total online experience. Outcomes may include extended time on the site, increased site visits, and increased site activity.

In this paper, we begin by describing the concepts of social media, flow, and telepresence. Next, we present our research model and provide supporting literature to specify a range of testable hypotheses involving the relationship of model constructs. We present the methodology, discuss the results, and provide theoretical/managerial implications. Finally, we conclude with a description of the research limitations and suggestions for future research.

2. Overview of conceptual framework

Social media has been defined as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content" [17,61][17,p. 61]. Social media includes networks (e.g., Facebook), wikis (e.g., Wikipedia), multimedia sharing sites (e.g., YouTube), bookmarking sites (e.g., Del.icio.us), virtual worlds (e.g., Second Life), and rating sites (e.g., Yelp) [18]. It is an important source of information as it gives users immediate and easy access to data. Beyond simply uploading pictures and posting statuses, social media gives users access to thought leaders (e.g., LinkedIn), employment opportunities (e.g., Viadeo), and fosters long-distance relationships (Facebook). Through technology and social media channels, users have constant access to communities and networks. Given its collaborative and communal characteristics, social media has the potential to create a sense of immersion, control, and instant feedback making it open to flow experiences [4,19].

According to Csikszentmihalyi [8], flow is a psychological state characterized as an intrinsically enjoyable optimal experience. It results in intense engagement, distorted sense of time, loss of self-consciousness, and heightened motivation. It is "a psychological state in which the person feels simultaneously cognitively efficient, motivated, and happy" [20,p. 277]. In this state, people are fully absorbed in what they are doing. Time may seem to stand still while one is engaged in a consumption event [21]. The user is intrinsically motivated to repeat an activity continually [8,9,22]. Flow is a continuous variable with different levels, ranging from an absence of flow to an intense state of flow [22].

Flow is experienced in a variety of activities such as playing sports, reading a book, or watching a movie. In activities within a computer-mediated environment, one can experience online flow. Hoffman and Novak [4] and Novak et al. [23] adapted Csikszentmihalyi's theory of flow to cover the use of computer-mediated environments. Hoffman and Novak [24] argue that online flow can be experienced when one is completely immersed in an online activity. Flow represents computer users' affective responses to computer usage, characterizing playfulness, and exploration as defining characteristics of human–computer interactions [25]. Flow has been proposed as the central process in a user's web navigation [23,26,27], online gaming [28], software use [25], and e-shopping [29]. The focus of the present study is on the assessment of flow as it relates to social media use.

Csikszentmihalyi [9,53][9,p. 53] outlines the main aspects of flow. Flow occurs when tasks involve a balanced amount of challenge and skill; we are able to concentrate on the task; the task undertaken has clear goals; and the task provides immediate feedback. This usually enhances our concentration on the task. When in flow, involvement in the activity is deep but effortless; enjoyable experiences allow people to exercise a sense of control over their actions; concern for the self disappears; and finally, the sense of the duration of time is distorted. The mixture of all these elements leads to a sense of deep enjoyment.

The dimensions, antecedents, and consequences of flow have been further theorized since Csikszentmihalyi's seminal work. However, most studies inconsistently assess these eight factors. Earlier studies in human–computer interaction have adopted overlapped conceptualizations of major constructs related to flow experience often with different terminology. The literature review of Siekpe [30], Hoffman and Novak [24], and more recently Mahnke et al. [31] reveal that the concept is still in "conceptual identity crisis" due to the multifaceted and broad set of related constructs. For example, Trevino and Webster [32] propose a causal model using four dimensions to describe flow: control, attention focus, curiosity, and intrinsic interest. Webster et al. [33] empirically distinguished intrinsic interest and curiosity. They also recommended a third dimension representing a combination of intrinsic interest and curiosity. Ghani and Deshpande [34] argue that the two key characteristics of flow are total concentration in an activity and the enjoyment one derives from an activity. Agarwal and Karahanna [35] measure flow with five constructs: curiosity, control, temporal dissociation, focused immersion, and heightened enjoyment. Koufaris [29] conceptualizes flow as comprised of intrinsic enjoyment, perceived control, and concentration/attention focus.

In this research, the flow concept is operationalized with five dimensions: concentration, enjoyment, control, challenge, and curiosity. We estimate that these dimensions are directly related to social media and sufficiently parsimonious to capture the entire experience of flow in this context. These dimensions are commonly examined in computer–human interaction research as key components of flow and have received consistent support in the information systems (IS) literature [31,30]. These five factors also represent the absorption and fluency dimensions advocated by Mahnke et al. [31]. Concentration and perceived challenges depict the absorption dimension. Perceived control illustrates the fluency dimension.

To be in flow, an individual's attention must focus on the activity. Concentration can be defined as the extent to which the individual's attention is completely absorbed in the activity to the degree that nothing else matters [9]. Concentration has been a significant component of flow [29]. Moneta and Csikszentmihalyi [20] found that an imbalance between challenge and skill can affect concentration in certain contexts. Pfister's [36] research supports the claim that when individual skill exceeds task challenge, positive affect and concentration occur. Users of social media, such as Facebook, often view a dashboard where interactive indicators provide a myriad of information. That information can include notification of who is online, posts made by the user, comments by others on the user's posts, and likes/dislikes. This variety of activity, sometimes on a screen as small as 640 pixels (which is the average smartphone's screen resolution) requires deep concentration. The user experiences enjoyment and disappointment as a result. Flow should facilitate social media

performance due to its highly functional state (e.g., need for deep concentration) [37].

In computer-mediated environments, enjoyment has been described as an intrinsic motivation. It has been defined as the degree to which using a virtual world is perceived as pleasurable, regardless of performance consequences resulting from system use [38]. In several studies (e.g., Ref. [29]), enjoyment is measured by the emotional response to atmospheric variables [39]. The flow experience itself is regarded as pleasant, interesting, fun, and exciting.

Novak et al. [23] define challenges as a consumer's opportunities for action on the Internet. Ghani and Deshpande [34] note that challenge should be related to the perceived complexity of an activity. Flow occurs when challenge and skills are matched and are higher than a critical level. When balance between one's skills and the challenges of the task are absent, the challenge of the experience decreases [40]. In human–computer interactions, researchers find that the level of perceived skill and challenge facilitate achievement of the flow state [34,23]. Even if flow is characterized by the perceived balance between challenge and skills, this does not necessarily mean that flow is always experienced when this balance is present according to Engeser and Rheinberg [37].

It can become challenging for the social media user to achieve various goals while using this platform. It is crucial to control the interface for that reason. Sustained curiosity about the evolution of the technology, such as the addition of new features, modifications of graphic displays, and creation of new widgets are all important in enabling the user to perform novel tasks. On a social network, users can feel both optimally challenged and confident that everything is under control following actions on the platform, such as uploading a photo, sharing a video, or commenting on a statement posted by a "friend."

Control refers to web users' perception of their ability to successfully navigate through the web environment and their perception of how the web responds to their inputs [34]. Control suggests that users are not frustrated by the Internet and know how to use it [23]. Previous empirical researchers also point out that the mediating role of flow focuses on the uses of communication tools, such as blogs and instant messaging [41]. Thus, a feeling of control can be engendered through the use of computer technologies, such as responsive interactive elements [42] available on Facebook (e.g., chat, comment, poke, like, etc.). The flow state therefore has a strong functional aspect, in that individuals experiencing flow are concentrating deeply and optimally challenged while being in control of the action [37].

Curiosity is the extent to which an experience arouses an individual's sensory and cognitive interest [43] . Moon and Kim [44] explain that curiosity is the combination of inquisitiveness and technical competence while engaged in an action. Curiosity is aroused by varied, novel, and surprising stimuli. Web users may engage in social media not only for communication and entertainment purposes, but they can also obtain new information, knowledge, and novelty that ignite their curiosity. Therefore, social media content can heighten cognitive curiosity and exploratory behavior.

Both curiosity and challenge refer to the novelty and the skills of the user. Curiosity concerns the user's evoked interest in a topic and often inspires a desire for deeper insight on the subject. Malone[43] further explain that curiosity is inquisitiveness and technical competence while engaged in an action. Comparably, a challenge can be viewed as an extension of curiosity, in that it can arouse a competitive response from the user. As noted earlier (e.g., Ref. [23]), challenges are "a consumer's opportunities for action on the Internet." Furthermore, challenge has been operationalized as the process of stretching a user's capabilities to his/her limit [23]. For instance, a visitor to a social media site may be intrigued by the information exchange between users on the site. The same user may visit another social media site and feel compelled to try an online game to test her wit against other users. The user feels curious in the first scenario. In the second, she feels challenged.

In this paper, we present a compilation of the most recent research on flow in marketing, IS, e-commerce, and the neighboring disciplines. Given the relevance of telepresence and its relationship to flow, we reviewed journal publications on telepresence and flow in online environments and provide a summary of the review in Table 1. As shown in Table 1, flow positively influences brand equity, e-commerce, motivation, emotion, attitudes, intentions, and behaviors.

Although there is a body of work that empirically tests Hoffman and Novak's [45] model and supports a causal relationship between flow and online user behavior [46,23,47], the antecedents and behavioral consequences of flow are not thoroughly documented [24].

Telepresence, as identified by Hoffman and Novak [4] and empirically tested [23], is a key attribute of flow in computer-mediated environments. Creating the perceptual illusion of being present in the mediated environment produces a feeling of immersion and enables the user to concentrate on the computer-based task. Thus, flow is enabled. Recent studies have indicated that telepresence may be an antecedent to flow [24,48]. Therefore, we attempt to model that relationship in this research, instead of incorporating other antecedents such as skills, challenges, and interactivity. Given the engaging qualities of social media, such as vividness, richness, immediate responsiveness, and amusement, the concept of telepresence is particularly relevant.

It is important to acknowledge that the concepts of telepresence and flow, although different, have some noticeable similarities, such as the ability to arouse attention and elicit involvement. Focused attention and involvement are heightened during a flow experience. However, telepresence does not require the balance between challenge and skills, which tends to occur during a flow experience. In defining telepresence, Lombard and Ditton [49] refer to a perceptual immersion. It is the degree to

Table 1
Indicators of discriminant validity of constructs (correlation coefficient matrix; N = 464).

Constructs	*AVE*	*MSV*	*ASV*	Flow	Enjoy.	Conc.	Cont.	Chall.	Curi.	Time D.	Telep.
Overall Flow	0.658	0.487	0.264	*0.811*							
Enjoyment	0.568	0.365	0.244	0.463	*0.753*						
Concentration	0.657	0.421	0.307	0.634	0.604	*0.810*					
Control	0.531	0.256	0.113	0.226	0.228	0.323	*0.729*				
Challenge	0.607	0.245	0.205	0.445	0.465	0.464	0.365	*0.779*			
Curiosity	0.506	0.346	0.257	0.417	0.588	0.511	0.506	0.480	*0.712*		
Time Distortion	0.722	0.379	0.278	0.566	0.484	0.616	0.344	0.443	0.586	*0.850*	
Telepresence	0.501	0.487	0.292	0.698	0.527	0.649	0.270	0.495	0.435	0.595	*0.707*

Note: MSV: maximum shared variance; ASV: average shared variance; The diagonal elements show the square root of the average variance extracted; the off diagonal elements show the correlations between the constructs.

which a virtual environment submerges the perceptual system of the user. In this regard, telepresence is viewed as a subjective feeling of immersion into a virtual environment. Thus, telepresence is a specific case of immersion. Immersion can be viewed as an objective characteristic associated with technology, while telepresence is a subjective experience, which is only perceived by the person experiencing it.

Besides the conceptualization of telepresence as immersion, Lombard and Ditton's [49] review of the literature suggests five other conceptualizations of telepresence. (1) Presence as social richness: the extent to which a medium is perceived as sociable, warm, sensitive, personal, or intimate when it is used to interact with other people; (2) presence as realism: the degree to which a medium can produce seemingly accurate representations of objects, events, and people; representations that look, sound, and/or feel like the "real" thing; (3) presence as transportation: can be identified as "You are there," in which the user is transported to another place; "It is here," in which another place and the objects within it are transported to the user's location; and "We are together," in which two (or more) communicators are transported together to a place they share; (4) presence as social actor within a medium: to illogically overlook the mediated artificial nature of an entity within a medium and attempt to interact with it; this occurs when people talk to the people on the television screen as if they are truly able to converse with them; [50] and (5) presence as a medium of social actor: the extent to which users ignore, in a counter-logical way, the mediated nature of a communication experience and treat the medium as a social entity; this occurs when a viewer believes it is proper etiquette to wait for a segment break before ending television viewing. To end in the middle of a segment would be rude.

According to Jeandrain [51], there are two types of telepresence: physical telepresence and social telepresence. Ijsselsteijn et al. [52] divided the concept into spatial presence, social presence, and co-presence. Empirical researchers operationalize the construct with components, such as control [53], spatial presence, involvement, interest, verisimilitude, [54] and attention [55]. In the absence of a cohesive definition, telepresence has been widely viewed as a sense of "being there" in studies of computer-mediated environments [56].

Several researchers have studied the consequences of flow. Their findings indicate that flow positively influences learning, attitudes, intentions, and behaviors. This research contributes to the empirical advancement of the flow experience during social media use by considering the following two flow consequences: perceived time distortion and frequency of social media use.

In defining flow, Csikszentmihalyi [9] refers to a condition of time distortion. Individuals who are in a state of flow are characterized as being so deeply involved in the task at hand that they lose their sense of self and track of time. Time distortion has been studied in different media contexts (e.g., web navigation, e-shopping, and online game). However, the effect of flow on perceived time distortion during social media use has not yet been explored. In this context, time distortion is an excellent candidate for study due to the extensive amount of time users spend on these sites. The immersive and gratifying experience of using social media may cause browsers to forget the time elapsed.

The frequency of social media use is of interest because it may be an important indicator of social media's stickiness. Website stickiness, the website's ability to retain online customers and prolong the duration of each visit, is one of the key factors of e-commerce success [57]. When stickiness occurs, users will browse more content and view more advertisements. A web user's willingness to stick to a website is a strong predictor of his/her intention to transact [58]. This construct can be used as a valid metric for social media success. Understanding how flow influences social media effectiveness is therefore managerially relevant. The next section further explains the relationships in the model and the associated hypotheses.

3. Research model and hypotheses

3.1. Overall flow

The flow experience was operationalized in this study using a dual approach. The first deals with flow as a holistic, unidimensional construct [59,23]. It is measured with a three-item scale, prefaced by a narrative description of flow. The second approach assesses flow according to its aforementioned dimensions [34,29,60,33]. Given the disparities in flow measurement, Hoffman and Novak [24] propose a measure of flow combining the two approaches. We adopt the latter measure and we postulate that enjoyment, concentration, challenge, control, and curiosity will contribute to the overall judgment of the flow experience:

H.1. Flow dimensions will positively affect the overall flow experience:

H.1.1. Enjoyment will positively affect the overall flow experience.

H.1.2. Concentration will positively affect the overall flow experience.

H.1.3. Challenge will positively affect the overall flow experience.

H.1.4. Control will positively affect the overall flow experience.

H.1.5. Curiosity will positively affect the overall flow experience.

3.2. Telepresence

It has been hypothesized that within virtual environments, telepresence leads to flow [14]. In their empirical research, Novak et al. [23] found that enhanced telepresence in online environments corresponds to enhanced flow. Weibel et al. [61] and Faiola et al. [62] observed a strong relationship between telepresence and flow while playing online games. Recently, Nijs et al. [63] showed a significant, strong, positive correlation between flow and telepresence in the context of interactive music systems.

Few researchers have tested the relationship between telepresence and enjoyment, concentration, challenge, control, or curiosity. However, researchers have speculated that an association between these variables exists [64]. Research participants who experienced telepresence reported that their media experiences were enjoyable and pleasant [64]. Telepresence permits media users to immerse themselves in the world constructed within a medium. This leads to a loss of self-consciousness and a sense of escapism. Thus, users enjoy themselves [4,61,64]. Similarly, Finneran and Zhang [65] add that telepresence is an essential factor for enabling concentration on computer-based tasks. An immersed individual demonstrates more cognitive absorption and focused attention [35]. Moreover, telepresence may increase the curiosity aroused by the interaction, the challenge created by obstacles, and the control maintained over the navigation. Social media, and more generally the social media environment, increases the vividness of user interaction by offering a greater number of sensory inputs and outputs as compared with a normal website. Sensory inputs and outputs in social media include dynamic discussion threads on a wall

(Facebook), on a timeline (Twitter, G+), or on a channel (YouTube). They include the ability to simultaneously "chat" on another part of the screen or to launch a video by simply moving the mouse over a frozen picture. There is also haptic feedback (i.e., vibrating notifications that occur with incoming messages) and sounds. These simulate real sensations in social media users, [66] especially when a smartphone or tablet are used. As social media captivates, amuses, provides escapism, evokes curiosity, creates challenges, and offers control, we hypothesize that there is a connection between telepresence and the flow dimensions during social media interaction:

H.2. Telepresence will positively affect flow dimensions:

H.2.1. Telepresence will positively affect enjoyment.

H.2.2. Telepresence will positively affect concentration.

H.2.3. Telepresence will positively affect challenge.

H.2.4. Telepresence will positively affect control.

H.2.5. Telepresence will positively affect curiosity.

3.3. Time distortion and social media use

A direct consequence of flow in computer-mediated environments is exploratory behavior. In flow, the user is willing to interact with the environment, such as messaging friends and visiting their profile pages, to prolong the experience. Then, the exploratory behavior increases the amount of time spent online and immersed in the social media experience. Subsequently, one loses track of time [23]. Therefore, we hypothesize that the flow experience will effect perceptions of time expenditure.

Ensuring that users repeatedly visit a site is one of the primary goals of all social media service providers. Previous researchers have argued that people who experience flow attempt to replicate that state [9]. Other studies have indicated that flow can positively affect the use of e-mail [32], computer software [33], the Internet [23], e-commerce [29], and social network games [28]. Social media features, such as chatting, posting, and file sharing can influence a user's revisit and frequency intentions. We, therefore, postulate that

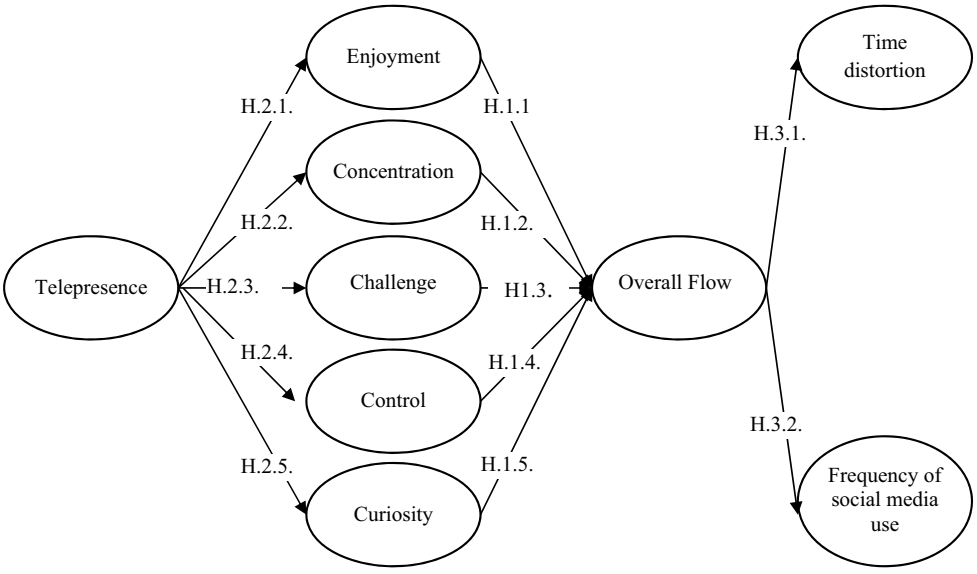
H.3. Overall flow experience will positively affect user behavior during social media use.

H.3.1. Overall flow experience will positively affect time distortion.

H.3.2. Overall flow experience will positively affect the frequency of social media use.

In addition, we expect that overall flow will mediate the effects of telepresence on time distortion and frequency of social media use. This prediction is based on the studies referenced above showing a positive relationship between telepresence and flow and the literature that asserts the positive effect of telepresence on behavior. Evidence of these effects can be specifically found in the context of computer-mediated communication and web environments [12,4]. For instance, Heeter [67] stated that, given the immersive nature of a medium, telepresence leads to a loss of self-consciousness or a sense of escape from the real world. Users subsequently forget their worries and the time elapsed. In addition, telepresence increases enjoyment [61], which may increase time distortion.

Previous researchers have explained that the virtual experience created by telepresence can simulate a real sense of "seeing" an object, which leads to a stronger sense of "believing" in the information embedded in the mediated communication [12]. For example, Park and Hwang [68] found that flow mediates the relationship between telepresence and online game addiction. Therefore, as the feeling of being present in the mediated environment increases, the frequency of use of that mediated environment is also expected to increase. This suggests that telepresence and the frequency of social media use should be positively correlated. Based on the above studies, we expect overall flow to be a mediator between telepresence and behavior:



H.4.1: Telepresence → Overall Flow (mediator) → Time Distortion
H.4.1: Telepresence → Overall Flow (mediator) → Frequency of social media use

Fig. 1. Proposed model.

H.4. Overall flow experience will mediate the positive effects of telepresence on user behavior during social media use:

H.4.1. Overall flow experience will mediate the positive effects of telepresence on time distortion.

H.4.2. Overall flow experience will mediate the positive effects of telepresence on the frequency of social media use.

The following model depicts our hypothesized relationships. It explains how telepresence and the flow experience during social media use can influence a user's perception of time distortion and the frequency of social media use (Fig. 1). The proposed model is grounded in pervious investigations of flow. It is unique in three ways. First, it is adapted for social media interaction. Flow is connected to constructs, such as telepresence and time distortion, which are more relevant to this context. Second, this research positions the flow dimensions as contributors to overall flow: enjoyment, concentration, control, challenges, and curiosity. This approach of constructing the analysis corresponds with Hoffman and Novak's [24] suggested avenue of research. Third, our model tests for mediation relationships. Overall flow is expected to be a mediator between telepresence and behavior. Few studies have examined how flow may mediate the effects of telepresence on outcome variables. However, it should be noted that the list of conditions, dimensions, and effects included in this flow model is not exhaustive and we do not claim that the variables within each block are independent. Particularly, the five flow dimensions may be interconnected. We limit our interest to the study of a number of relationships rather than expanding the investigation to all the interrelations between constructs.

4. Methodology

4.1. Data collection and sampling

The research model was tested with data collected from an online survey. The approximate completion time for the survey was 10 min. Brief instructions on the purpose of the study, the estimated completion time, and data anonymity were presented to participants. The survey included general information about social media use, the scales to measure the constructs, and sociodemographic questions. Each question was presented on a single page in the online survey [69,70].

Participants were solicited by two methods. They received a message while using social media or viewed a link placed on a social media banner. In both situations, viewers were invited to participate in an online study evaluating social media use and they were forwarded to an online questionnaire by clicking on the link provided. The survey questions were used to measure constructs in the proposed model. Several social media sites were used to solicit participants, including Facebook, Twitter, LinkedIn, Badoo, Viadeo, and MySpace. Traditional methods of survey administration (face-to-face, telephone, or mail) were not used.

A total of 464 respondents completed the survey. Sixty-three percent were male. The average age of the respondents was 26 years. Approximately 98% of the sample had a computer and Internet connection at home. Nearly 96% used Facebook and YouTube three to four times per week. Most respondents were highly educated (university level, 88%), 34.3% had managerial occupations, and 54.1% were students. A student sample was deemed suitable for this project, as this group exemplifies the characteristics of the social media user population. In addition, Internet usage penetration within the age groups of 18–29 exceeds 95% [71].

4.2. Measurements

Validated measures were adopted from previous research. Telepresence was measured by a nine-item scale by Kim and Biocca [12] (e.g., I forget my immediate environment when I use social networking). Enjoyment, concentration, and challenge were each assessed by four-item scales adopted from Ghani and Deshpande [34] (e.g., I am deeply engrossed in activity). A three-item curiosity scale was adopted from Webster et al. [33] (e.g., Using social media aroused my imagination). Control, frequency of social media use, and time distortion were measured with scales from Novak et al. [23] (e.g., When I use social media, I tend to lose track of time). Control was assessed by a four-item scale [23]. Frequency of social media use was measured by a single item. Time distortion was evaluated by two items. Overall flow was measured with a three-item scale preceded by a narrative description drawn from Novak et al. [23] (e.g., Do you think you have ever experienced flow on social media?). All items were five-point Likert scales. A complete list of items is included in the Appendix.

5. Results

5.1. Measurement model evaluation

The proposed model shown in Fig. 1 was tested with SPSS AMOS 20.0, using the two-step model-building approach as specified by Anderson and Gerbing [72]. The Cronbach alpha of the various scales exceeded the lower limit of acceptability of 0.60 ranging from 0.69 to 0.86 confirming the internal consistency of the scales [73].

The measurement model, including the latent constructs and their respective observed variables, was analyzed to measure convergent and discriminant validity. For all constructs, the composite reliability (CR) exceeded 0.70, the average variance extracted (AVE) surpassed the recommended value of 0.50 and CR was above the AVE value suggesting adequate convergent validity [74]. The confirmatory factor analysis showed a good fit (chi square = 111.234; df = 58; CMIN[A2] /DF = 2.132; CFI = 0.949; GFI = 0.911; AGFI = 0.920; TLI = 0.973; SRMR = 0.048; root mean squared error of approximation (RMSEA) = 0.054) with all the fit indices greater than the recommended cutoff values [74]. As shown in Table 1, the square root of the AVE of each construct was greater than the correlations between the construct and any other construct in the model, satisfying Fornell and Larcker's [75] criteria for discriminant validity. Discriminant validity was examined further by ensuring that maximum shared variance (MSV) and average shared variance (ASV) were less than AVE [74].

5.2. Structural model evaluation and hypotheses testing

The fit of the initial structural model was relatively poor because the RMSEA was >0.08 [74,76]. To improve the model, the paths with insignificant regression weights were dropped and another path analysis was conducted on the revised model.

The results showed that the fit of the final model was satisfactory, and all fit indices were well within recommended guidelines given our sample size and the number of observed variables (the indices are highlighted in Table 1). As expected, telepresence had a significant effect on the flow state. This effect was positive for enjoyment ($\beta = 0.637$; t-value = 8.041; $p < 0.001$), concentration ($\beta = 0.734$; t-value = 12.002; $p < 0.001$), challenge ($\beta = 0.572$; t-value = 9.527; $p < 0.001$), control ($\beta = 0.351$; t-value = 5.298; $p < 0.001$), and curiosity ($\beta = 0.571$; t-value = 8.567; $p < 0.001$). These results led us to accept hypotheses H.2.1–H.2.5.

Overall flow was positively influenced by enjoyment ($\beta = 0.128$; t-value = 2.179; $p < 0.05$), concentration ($\beta = 0.585$; t-value = 7.729;

$p < 0.001$), challenge ($\beta = 0.156$; t-value = 2.960; $p < 0.01$), and curiosity ($\beta = 0.306$; t-value = 4.862; $p < 0.001$), but not by control ($\beta = 0.035$; t-value = 0.680; $p > 0.05$). This provided support for hypotheses H.1.1–H.1.3 and H.1.5 Hypothesis H.1.4 was not supported.

Furthermore, we found a significant, positive relationship between overall flow and time distortion ($\beta = 0.752$; t-value = 8.935; $p < 0.001$) and between overall flow and frequency of social media use ($\beta = 0.350$; t-value = 4.461; $p < 0.001$), confirming H.3.1 and H.3.2. Squared multiple correlations are presented in Table 2. Key statistics for the final structural model are reported in Fig. 2.

H.4 predicted that overall flow mediates both the positive effects of telepresence on user's perceived time distortion and frequency of social media use. To perform the analysis, AMOS was used to conduct a structural equation modeling (SEM) bootstrap test of the indirect effects. The recent literature proves the superiority of this test over Baron and Kenny's [77] conditions and shows that only a significant indirect effect is required for mediation effect testing [78,79].

Table 3 provides the results of a bootstrap test of direct and indirect effects of the two mediational paths proposed in H4. Bias-corrected bootstrap confidence intervals set at 95% were used to determine whether the indirect effect was statistically different from zero. The mediation tests were two tailed. Specifically, a 5000-bootstrapped sample was used.

The bootstrap analysis provides support for H.4.1 and H.4.2. To interpret the results, the type of mediation was classified as recommended by Zhao et al. [78] For the two paths, the significance of the standardized coefficients and the opposite signs of indirect and the direct effects suggest a competitive mediation [78]. Competitive mediation described by Zhao et al. [78] is similar to the term, partial mediation, used by Baron and Kenny [77]. The negative direct effect is outweighed by the positive indirect effect. The increase in telepresence decreased users' time distortion ($\beta = -0.208$; $p < 0.01$) and frequency of social media use ($\beta = -0.411$; $p < 0.001$) directly but increased these two variables (time distortion: $\beta = 0.911$; $p < 0.001$; frequency of social media use: $\beta = 0.403$; $p < 0.001$) indirectly through overall flow. The results thus support our hypothesis, suggesting that other potential but omitted mediation mechanisms may be operating [78].

6. Discussion

Based on flow theory, we hypothesized that telepresence would predict social media users' experience of flow as measured by concentration, enjoyment, challenge, control, and curiosity. Flow was projected to influence user's behavior in terms of time distortion and frequency of social media use. Among 14 hypotheses, this research finds support for 13. Consequently, we discover empirical evidence that flow theory and telepresence are valuable within the context of social media use.

Our findings demonstrate that telepresence can enhance flow state. The more social media visitors are immersed, and feel present, in the mediated virtual environment, the more apt they are to concentrate, enjoy, feel challenged, feel in control, and display curiosity. The behavioral outcome is the experience of flow. These results validate previous assertions that telepresence leads to flow within the context of computer-mediated environments [45,56,10], and they support previous empirical findings of telepresence as a flow antecedent [63,23,61,45].

More specifically, these results are in line with theoretical elaborations on the relationship between telepresence and the enjoyment dimension of flow. Our findings suggest that the "sensation of being there" may lead users to find browsing social media websites fun rather than merely being utilitarian. The results mirror those obtained by other researchers in similar context [49,64] and provide empirical support that flow is directly linked to exploratory behavior [80] and perceived play [46], both of which are conceptual components of hedonic value. It also extends earlier research [42] that indicates flow is indeed an important contributor to consumers' perceptions of hedonic and utilitarian value.

Likewise, findings from this study empirically validate the relationship between telepresence and concentration. We affirm, as did Finneran and Zhang [65], that in a computer-mediated environment such as a social media website, telepresence is an essential factor in enabling a person to concentrate on a computer-

Table 2
Results of hypotheses testing (N = 464).

Path	Hypotheses	Standardized Regression Weights (β)	Standard Error	Critical Ratio t-value	Testing
Telepresence → Enjoyment	H.2.1	0.637	0.050	8.041***	*Accepted*
Telepresence → Concentration	H.2.2	0.734	0.061	12.002***	*Accepted*
Telepresence → Challenge	H.2.3	0.572	0.057	9.527***	*Accepted*
Telepresence → Control	H.2.4	0.351	0.066	5.298***	*Accepted*
Telepresence → Curiosity	H.2.5	0.571	0.048	8.567***	*Accepted*
Enjoyment → Overall Flow	H.1.1	0.128	0.074	2.179*	*Accepted*
Concentration → Overall Flow	H.1.2	0.585	0.060	7.729***	*Accepted*
Challenge → Overall Flow	H.1.3	0.156	0.045	2.960**	*Accepted*
Control → Overall Flow	H.1.4	0.035	0.042	0.680	Rejected
Curiosity → Overall Flow	H.1.5	0.306	0.069	4.862***	*Accepted*
Overall Flow → Time Distortion	H.3.1	0.752	0.099	8.935***	*Accepted*
Overall Flow → Frequency of Social Media Use	H.3.2	0.350	0.088	4.461***	*Accepted*
Model Fit	Chi square = 800.755; ddl = 284; $p = 0.000$			–	
	CMIN/DF = 2.820			<3	
	CFI = 0.911			>0.90	
	GFI = 0.865			>0.90	
	AGFI = 0.833			>0.80	
	TLI = 0.898			>0.90	
	SRMR = 0.068			<0.09	
	RMSEA = 0.063			<0.08	
Squared Multiple Correlations	Enjoyment = 0.406; Concentration = 0.539; Challenge = 0.327; Control = 0.128; Curiosity = 0.326; Overall Flow = 0.849; Time Distortion = 0.565; Frequency of Social Media Use = 0.464				

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

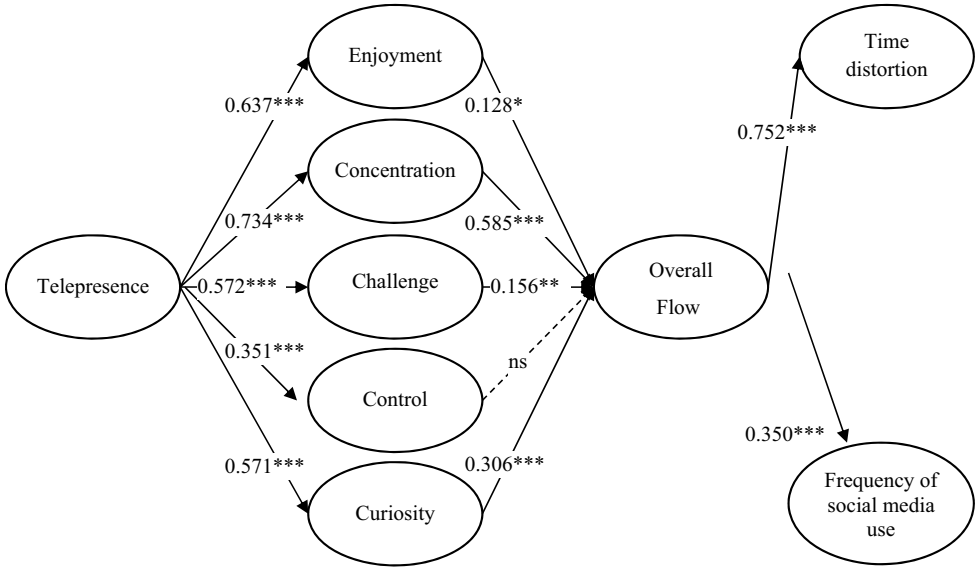


Fig. 2. Structural model.

Table 3
Bootstrap results of mediated effect hypotheses testing (N = 464).

Path	Hypothesis	Direct effect	Indirect effect			Type of Mediation	Testing
		Standardized Regression Weights (β)	Standardized Regression Weights (β)	95% Bootstrap Confidence Interval			
				Lower	Upper		
Telepresence → Overall Flow → Time distortion	H.4.1	−0.208**	0.911***	0.818	1.009	*Competitive mediation*	*Accepted*
Telepresence → Overall Flow → Frequency of Social Media Use	H.4.2	−0.411***	0.551***	0.403	0.705	*Competitive mediation*	*Accepted*

** $p < 0.01$.
*** $p < 0.001$.

based task. Similarly, there is support for the relationship between telepresence and challenge, telepresence and control, and telepresence and curiosity. Specifically, during social media interaction, telepresence increases perceptions of challenge, improves the control felt during task completion, and arouses curiosity. These relationships have been poorly considered in the IS and marketing literature heretofore.

This research finds that concentration, enjoyment, challenge, and curiosity are key elements of overall flow during social media use [34,4,29,23]. Some researchers view control, as a factor of flow [34,27,29]. Others view it as a consequence of flow [4]. Our results did not indicate the existence of a relationship between the two variables. A posteriori, we posit that the lack of relationship is specific to the social media context where activities organically unfold and very little structure exists. One of the advantages (or disadvantages) of social media is its unmediated environment and the real-time impact of online activities. The ability to influence online communities is powerful and may lead to feelings of control. In this instance, control may be more of a consequence than an antecedent of flow. Although widely studied over the past years, the direction of causality between control and flow is still uncertain. Thus, this research identifies an important and testable phenomenon in which the flow experience is different during social media use than during other online activities. Future researchers should consider testing this alternate relationship.

Despite the lack of empirical evidence in the Internet context, our findings highlight the positive effect of flow on time distortion during respondents' social media experience. That is, flow may lead users to spend more time and visit more pages enabling more exploratory browsing of the social media platform. Our findings also provide empirical support for our predictions that flow directly influences the frequency of social media use. This research is consistent with other studies in which flow was found to influence the intent to revisit [29], use the Internet [35], and act toward the website [4]. Flow also affects shopping intentions [81], web navigation [23], and use of communication tools such as blogs and instant messaging [41]. The influence of flow on shopping intentions may carry an interesting infusion of customized advertising as social media sites increase.

Further analysis suggests that flow mediates the relationships between telepresence and time distortion, and between telepresence and frequency of social media use. There are only a few studies in which these effects are empirically investigated [68]. Moreover, for the two paths, a competitive mediation was found. As such, additional, unmeasured, and unidentified mediating mechanisms may explain the connection between telepresence, flow, and behavior. This may be especially true in the social media context and generally in the field of human–computer interaction. Thus, future research investigations in this area are warranted.

7. Implications for theory and practice

Based on these collective findings, this research has theoretical and managerial implications. Theoretically, this research makes four contributions. First, this study extends flow theory by exploring antecedents and outcomes of the flow state experience during social media interaction. Our research demonstrates that flow and its correlates, such as telepresence and time distortion, create a suitable framework to explain user behavior on social media.

Second, although telepresence is recognized as a decisive characteristic for a successful computer-mediated environment, this is one of the few studies that have included telepresence as a key variable in empirically examining the preconditions of the flow experience [24,48]. Telepresence was investigated as a direct antecedent of flow providing empirical evidence of its critical role during social media use.

Third, flow has been addressed in previous literature using a dual approach: a direct unidimensional measure of overall flow or multi-item scales measuring the dimensions of flow. This research reconciles the two approaches by considering flow's dimensions as the antecedents of the overall flow. In so doing, we demonstrated that enjoyment, concentration, challenge, and curiosity, but not control, contribute to the overall flow experience. This holistic judgment is able to influence behavior.

Fourth, this research is one of the few studies that tests flow as a mediator of the relationship between telepresence and behavior. Our results show a competitive mediation suggesting other intervening constructs between telepresence, flow, and behavior.

From a managerial standpoint, our research shows that the social media experience can be enhanced by flow and telepresence opportunities. The premise of most social networks is the accumulation of "friends" and the sharing of information [82]. Playing digital games is a social phenomenon given that 62% of gamers play games with others either online or in person [83]. Social network games typically try to incorporate friends in game play to intensify exchange within the network. Our results suggest that certain social media platforms, such as Facebook, should continue "gamification" activities such as Candy Crush Saga and FarmVille 2 as means of captivating, entertaining, and challenging users. Game play coupled with rich content, easy sharing tools, roll-over activation, auto-completion technology, and other facets of graphic user interface may significantly contribute to telepresence and enrich flow.

In addition, the findings of our online study show that telepresence affects the five dimensions of flow: enjoyment, concentration, challenge, control, and curiosity. These dimensions (except control) are positively related to the overall flow experience, which influences perceptions of time spent on the site and propensity to visit a social media site. It has been suggested that within virtual environments, telepresence leads to flow [14], while playing online games [61] and using interactive music systems. The results presented here extend this phenomenon to the realm of social media.

Our model addresses the facets of the social media experience that managers should consider in the development of online sites. For example, the results suggest that social media design must pique the user's curiosity and require concentration, but it cannot be so intense that the site is deemed onerous. Conversely, if the site does not challenge the user, boredom may ensue and the site will not be revisited. The development of a site which aptly combines curiosity, enjoyment, concentration, and challenge may be difficult. Thus, the true utility of our model lies in its ability to help developers assess a site's ability to meet the experiential needs of users.

Social media users are not simply looking for efficiency. They value an engaging experience. Therefore, focus on popular entertainment, pleasing aesthetics, and self-indulging activities is recommended. However, excessive ads, video, music, or animation may reduce user concentration and inhibit flow. Designers can develop IS and marketing strategies to deliver telepresence and flow experiences, which facilitate favorable user outcomes. We herein find evidence of the importance of flow in a social media context, and the results imply that the flow experienced on a specific social site is the underlying mechanism by which behavioral responses can be explained [81].

8. Limitations and future research directions

Some limitations in this research warrant further investigation. Approximately half of the sample was composed of students due to the use of a convenience sampling method. Thus, the sample might not be representative of the basic Internet user population. Information on country of origin was not collected from respondents, although that information may assist in identifying important social media trends. Both the use of a convenience sample and the lack of information on respondents' country of origin make it difficult to determine the external validity of the results across cultures.

Data from a self-report questionnaire were used to measure the constructs in this study. A more objective measurement tool is suggested as a means of capturing cognitive and affective states in future studies. Likewise, a self-report questionnaire is a retrospective measure when a more prospective method is better suited. Csikszentmihalyi and LeFevre[40] recommended the use of the experience sampling method where respondents are intercepted at random intervals throughout the day and asked to describe their flow experience. The final limitation is that our model does not test for the interdependencies between the five dimensions of flow. We recommend that future researchers consider these issues when examining flow experience.

Our findings suggest the importance of telepresence for flow in virtual settings. However, empirical examinations of the relationship between telepresence and the components of flow experiences are scarce. For more rigorous and practical implications, further research is warranted to thoroughly investigate the role of telepresence in enhancing the components of flow mentioned by Csikszentmihalyi [22]. Moreover, we know relatively little about the effects of specific, vivid, and interactive characteristics of social media on telepresence and flow. For instance, it would be useful to more fully understand the role played by collaborative Web 2.0 interactive technologies such as the "Like" button, geospatial mapping, and social sharing in optimizing user flow.

In the future, the research model could be extended by considering other factors. First, it would be valuable to monitor the role of individual characteristics, such as need for cognition, personality traits, and variety-seeking behavior in influencing telepresence and flow. In addition, it is important to examine the role of sociodemographic characteristics (age and education), situational factors (Internet involvement and visit goals), cultural settings, and used/preferred device when visiting social media (smartphone, tablet, watch, glasses, etc.). Such investigations will facilitate our understanding of this universal phenomenon. Next, future research should further investigate the scope of behaviors associated with social media use to obtain a deeper understanding of telepresence and flow outcomes. Tests of the effects of independent variables, such as satisfaction, electronic word of mouth (e-WOM), and addictive behavior may also prove valuable.

Finally, our results about the association between telepresence, flow, and behavior reveal the need to identify variables that are competitive mediators of this relationship. We argue that the flow

characteristics, antecedents, and consequences included in Csikszentmihalyi's original theory [8,9] may play a latent role in the proposed effects.

9. Conclusion

In summary, the goal of this study was to inform the discussion on users' interactions with social media. Telepresence and flow are key aspects of this experience. To this end, we investigated the role of telepresence on social media users' experiences of flow. The study revealed that flow and telepresence are influential within the context of social media patronage. Creating opportunities that enhance telepresence and flow motivates users to prolong their social media visits and visit regularly. The literature on telepresence and flow is extensive. Yet, theoretical inconsistencies exist. Future research must think carefully about the measurements used to assess flow and the direction of causality between the components of flow. In the present work, we identify the antecedents of flow while using social media and we encourage additional examination of this relevant and timely topic.

Acknowledgments

The authors thank the anonymous reviewers from *Information and Management* and from the 19th International Association of Information & Management (AIM) conference, Aix-en-Provence, 19–21 May 2014, for their suggestions, which helped to improve the paper.

Appendix A.

Items on questionnaire

Telepresence [12]

- While using a social media (Facebook, Twitter, Flikr[A3] . . .), the website came to me and created a new world for me, and this world suddenly disappeared when I stop surfing.
- While browsing social media, I felt I was in the world the website created.
- I forget my immediate environment when I use social networking.
- Having used a social media, I felt like I came back to the "real world" after a journey.
- While surfing a social media, I feel like my body is in the room, but my mind is inside the world created by the website.
- Social media-generated world seem to me "somewhere I visit" rather than "something I see."
- While browsing a social media, the world generated by the website is more real or present for me compared with the "real world."
- While browsing social media, I feel that I am in the world the website created.
- While browsing social media, I momentarily forget where I am.

Flow [12]

The word "flow" is used to describe a state of mind sometimes experienced by people who are deeply involved in some activity. One example of flow is the case where a professional athlete is playing exceptionally well and achieves a state of mind where nothing else matters but the game; they are completely and totally immersed in it. The experience is not exclusive to athletics – many people report this state of mind when playing games, engaging in hobbies, or working.

Activities that lead to flow completely captivate a person for some period of time. When in flow, time may seem to stand still and nothing else seems to matter. Flow may not last for a long time on any particular occasion, but it may come and go over time. Flow has been described as an intrinsically enjoyable experience.

- Thinking about your own use of social media.
- Do you think you have ever experienced flow on social media?
- In general, how frequently would you say you have experienced "flow" when you use social media?
- Most of the time I use social media I feel that I am in flow.

Enjoyment [34]

- Interesting.
- Fun.
- Exciting.
- Enjoyable.

Concentration [34]

- I am deeply engrossed in activity.
- I am absorbed intensely in activity.
- My attention is focused on activity.
- I concentrate fully on activity.

Challenge [34]

- Using social media provides a good test of my skills.
- Using social media challenges me to perform to the best of my ability.
- I find that using social media stretches my capabilities to my limits.
- Using social media challenges me.

Control [23]

- Controlling.
- Influential.
- Dominant.
- Autonomous.

Curiosity [25]

- Using social media excited my curiosity.
- Interacting with social media made me curious.
- Using social media aroused my imagination.

Time Distortion [23]

- Time seems to go by very quickly when I use social media.
- When I use social media, I tend to lose track of time.

Social Media Use [23]

- How often do you browsing social media? Qualify your responses from 1 (Rarely) to 5 (Regularly).

Reference	Dependent Variable	Independent Variable	Experiment	Results	Critic
Mahnke et al. [18]		Goals, motivation, absorption, fluency, information organization, information quality/ quantity, information filter accuracy	Interviews	Study developed a grounded theory of flow experiences in the context of online shopping, and shed light on the theoretical relationships between concrete realizable website design options, corresponding latent constructs, and flow experience	To date, there is little concrete knowledge of or advice on how to design a website for flow
Moon et al. [84]	UGC (User-generated content) usage for entertainment and communication, Flow	Extraversion and introversion; neuroticism and stability	Survey (in-person questionnaire) of individuals who have had experience using UGC (user-generated content)	The findings indicate that extraversion is positively related to UGC usage for entertainment and negatively related to communication and information, whereas neuroticism is positively related to UGC usage for entertainment and communication. Only extraversion has an influence on flow, which is positive, and flow, in turn, has a positive influence on UGC usage for entertainment and communication	Previous literature has explored potential motivations, such as knowledge sharing, information search, and social networking. Although these studies have shed light on the phenomenon, a detailed exploration of the impact of personal factors on UGC participation is still lacking. Research has just begun to explore the connection between personality and behavior in computer interactions (i.e., UGC usage)
Mahnke et al. [31]	Flow, absorption, fluency, continuance intention	Enjoyment, demands, skills	Review of existing literature	Reconceptualizing and validating the flow construct for IS flow research, we show that flow does not substantially depend on balanced demands and skills and that the effect of flow on continuance intention is mediated by enjoyment	Despite strong interest in Csikszentmihalyi's flow theory to understand user behavior in information systems, the existing literature shows significant inconsistencies on the conceptualization, conditions, and effect mechanisms of the flow construct
Wang and Hsu [85]	Learning satisfaction and learning performance	Challenge–skill balance	Study A: traditional paper-and-pencil questionnaire to measure the flow experience of participants during the computer-based instruction process Study B: same as that of Study A, except that an inexpensive EEG brainwave headset was used in Study B. Sample of 189College students	The results revealed that brainwave attention is related but not equal to flow experience. That is, brainwave attention cannot exactly represent flow experience. The inequality between flow experience and brainwave attention reveals that attention is only a component rather than an equivalent of flow experience. Also, the second study showed that challenge–skill balance plays an important role in affecting learners' attention, especially at difficult learning level. Balance between challenge and skill correlated with attention. Learners who perceived challenge-skill balance would have much higher attention compared with those perceiving imbalance	The relevance of EEG and flow in computer-based instruction environments has not been addressed sufficiently
Aubé et al. [86]	Flow	Team performance, goal commitment, information exchange between team members, team size	Data were gathered from 85 teams comprised of graduate and undergraduate students who participated in a project management simulation	The results show that the flow experience is positively related to team performance. This relationship is mediated by team goal commitment and moderated by the level of information exchange between team members	Although a number of studies show that the flow experience is related to different outcomes at the individual level, the role of flow in work teams remains unclear
Liu et al. [87]	Effort, arousal, enjoyment	Competition	Surveys and participation in computer gaming (80 undergraduate students)	When players compete with players of similar skill levels, they apply more effort as indicated by more games played and longer duration of play. But when players compete with players of lower skill levels, they report higher levels of enjoyment and lower levels of arousal after game playing	In an era of scarce attention, games are believed to be crucial for building an "engagement economy" that works by motivating participants with intrinsic rewards and competitive engagements (McGonigal 2011, p. 243). But to harness the benefits of serious games in organizations, it is necessary to obtain a theoretical understanding on how different game designs affect player behaviors and emotional responses. This task provides an excellent opportunity for information system researchers to conduct investigations by taking advantage of their expertise on information technology and

(*Continued*)

Reference	Dependent Variable	Independent Variable	Experiment	Results	Critic
					organizations; however, little research is being conducted (Altinkemer and Shen 2008)
Carlson and O'Cass [88]	Flow	Consumer evaluations of website service interface performance components (Website Communication Performance, Website Technical Performance, Website Aesthetic Performance, Website exchange Performance), Internet self-efficacy	A survey was administered to two samples of online consumers (499 total)	The delivery of compelling website-service interface performance (via web-based components) is significantly related to the development of flow experiences	Although the study of flow has attracted the interest of scholars seeking to understand its nature and effects on consumption related behaviors, it has received limited attention from Internet researchers seeking to understand factors controllable by firms, which influence its formation
Nah et al. [89]	2D/3D	Telepresence, enjoyment, brand equity, and behavioral intention	Laboratory experiment with 445 students	3DVW environment induces a greater sense of telepresence and enjoyment than the 2D environment. Navigating and interacting in a 3DVW site can distract subjects in attending to the audio and visual information on a site. This is explained by distraction–conflict theory	The findings suggest that the 3D virtual world environment produces both positive and negative effects on brand equity
Schüler [90]	Flow	Motive incongruence, achievement situations, nonachievement situations	A total of 127 badminton players (volunteers) to participate in badminton games, followed by answering questionnaires	Study 1 and Study 2 showed that participants with incongruent implicit and explicit achievement motives reported less flow in achievement- versus nonachievement-oriented sport situations. In Study 3, we experimentally manipulated achievement and nonachievement situations. Again, motive incongruence impaired the experience of flow in achievement but not in nonachievement situations	Although the motive-incongruence score appears to represent the most appropriate method for the purposes of the present research, information regarding the directionality of effects may be of interest for related research questions and additional analyses with separate implicit and explicit motive scores are thus presented

For a revue before 2009, please see Hoffman, and Novak [24] and Siekpe [30].

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