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Applying the SOBC paradigm to explain how social media overload affects academic performance

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ABSTRACT

Research suggests University students are more disposed than others to develop problematic social media use. Social media overload, the phenomenon where users are exposed to a massive amount of information and communication demands via social media that may require energy and cognitive processing beyond their capabilities, is the specific problem under investigation in this paper. Combining qualitative data with the situation–organism–behavior–consequence paradigm, we develop a research model of the etiology of social media overload and its consequences for student performance in higher education. Using SEM-PLS techniques to analyze survey data from 182 students revealed a fear of missing out (the situation) is associated with feelings of overload (the organism), which in turn is linked to deficient self-regulation (the behavior) and ultimately reduced performance (the consequence). Our study advances the understanding of problematic social media use among students by demonstrating the psychological and behavioral conditions which hinder academic performance. Interventions designed to address social media overload should target the performance antecedents identified in this study.

1. Introduction

The use of social media is pervasive across the globe with Facebook alone having 2.7 billion monthly users (Statista, 2019). While social media undoubtedly provides many advantages to users, researchers are now more closely scrutinizing the problematic use of platforms such as Facebook. At the individual level, fatigue (Bright, Kleiser, & Grau, 2015; Lee, Son, & Kim, 2016; Maier, Laumer, Weinert, & Weitzel, 2015; Zhang, Zhao, Lu, & Yang, 2016), depression (Brooks & Longstreet, 2015; Elhai, Levine, Dvorak, & Hall, 2016), narcissism (Brailovskaia & Margraf, 2016), stress (Maier et al., 2015), and decreased performance (Brooks, 2015; Turel & Qahri-Saremi, 2016) are some of the problems associated with social media use. Due to their intense usage of and limited external control over their Internet use, extensive free time, and flexible schedules, university students are more disposed than others to develop problematic social media use (Turel & Qahri-Saremi, 2016). In this paper, we investigate the etiology and consequences of social media overload among university students, the phenomenon in which the extensive adoption and use of social media has exposed people to a massive amount of information and communication demands that may require energy and cognitive processing beyond their capabilities (Lee et al., 2016).

The context of our study is the general use of social media by university students. While some studies report on how social media enriches classroom collaboration and encourage its use in higher learning environments (Al-Rahmi, Alias, Othman, Marin, & Tur,

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2018), the majority of prior research has established the detrimental impact of social media use on students' academic performance (Datu, Yang, Valdez, & Chu, 2018; Junco, 2012b; Kirschner & Karpinski, 2010; Turel & Qahri-Saremi, 2016). For instance, some studies report on the negative relationship between social media use and engagement among students (Datu et al., 2018; Junco, 2012a). Time spent on social media has been found to be a significant predictor: Facebook users dedicate more time to the platform and less on their studies, resulting in lower grades (Junco, 2012b; Kirschner & Karpinski, 2010). Using time diaries and sensor data, Giunchiglia, Zeni, Gobbi, Bignotti, and Bison (2018) confirmed that the duration of usage and frequency of checking social media apps negatively affected students' academic performance. Likewise, the multitasking behaviors afforded by social media are linked to poor academic performance (le Roux & Parry, 2017; Junco & Cotten, 2012) and well-being (Becker, Alzahabi, & Hopwood, 2013) among students. While high usage of social media may not in itself be problematic (Turel & Serenko, 2012), it can cause strain in students which impacts their performance (Cao, Masood, Luqman, & Ali, 2018).

High use of social media itself may become problematic when the users feel overloaded by it. We conceptualize social media overload using two dimensions: information overload and communication overload. Very few prior research studies investigated the antecedents of information and communication overload in the social media context (Lee et al., 2016). Those that do have either focused on demographic and usage characteristics (Maier, Laumer, Eckhardt, & Weitzel, 2014), or system and information characteristics (Cho, Ramgolam, Schaefer, & Sandlin, 2011; Lee et al., 2016). Likewise, while the damaging influence of social media use on academic performance is clear, very few existing studies are underpinned by a solid theoretical mechanism to justify how social media may affect students' performance. We extend the existing knowledge base by applying the situation–organism–behavior–consequence (SOBC) paradigm (Davis & Luthans, 1980) to explain how the cognitive psychological condition 'fear of missing out' (the situation) leads to perceptions of social media overload (the organism), and how the subsequent deficient self-regulation (the behavior) results in impaired academic performance (the consequence).

By investigating the SOBC interdependencies, this study makes important contributions. Firstly, feelings of social media overload are not pleasant and can be debilitating. By focusing on the psychological and behavioral inhibitors of students' academic performance, our study can lead to development of expedient and targeted interventions rather than shallow technological solutions such as restricting social media access. Secondly, our study demonstrates the efficacy of the SOBC model in explaining problematic IT usage. Thirdly, this study supports the mediating role of self-regulation on the relationship between communication overload and academic performance. Overall, this study yields an enriched explanation and prediction of how and why the problems associated with social media use lead to poor academic performance.

2. Theoretical background

2.1. SOBC model

Stemming from social learning theory, the SOBC model states that the various aspects of the environmental situation (S) affect the internal states of people or the organism (O), which in turn, drive their behavioral responses (B) and the contingent consequences (C) which result. Initially proposed by Davis and Luthans (1980), the SOBC model is a more complex mechanism of human behavior which modifies and extends the SOR (stimulus-organism-response) (Mehrabian & Russell, 1974) and ABC (antecedent-behavior-consequence) (Skinner, 1963) models. Recognizing the effects of covert stimuli, such as dreams, ideas, and thinking, is a central feature of the SOBC model, as is the mediating role of the O and B between S and C. Likewise, self-regulation processes are established as an important construct in modifying an individual's relationship with their environment. People not only respond to the external consequences of their behavior, but also to their own critical assessment of their actions. Summing up the SOBC model, Davis and Luthans (1980) explain that a person's "... behavior may be grounded in the environment but is also partly socially derived and partly a product of conscious self-regulation and choice." Fig. 1 depicts and defines the elements of the SOBC paradigm.

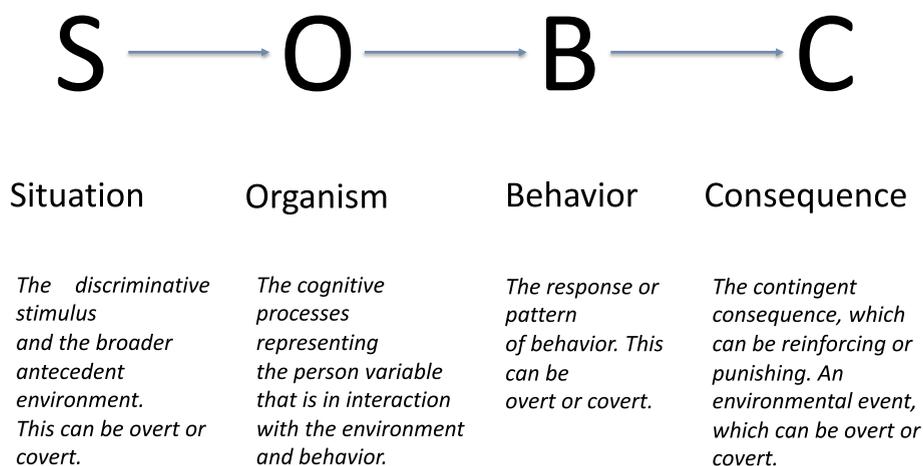


Fig. 1. The SOBC model of behavior (Taken from Davis & Luthans, 1980).

The SOBC model is appropriate for this study of the etiology of social media overload and performance. Firstly, very few if any studies have applied the SOBC model to study the effects of digital technology. However, the more established SOR model, and its variant stressor-stress-outcome model, have been applied to explore the dark side of social media (Cao & Sun, 2018; Dhir, Yossatorn, Kaur, & Chen, 2018; Luqman, Cao, Ali, Masood, & Yu, 2017). By applying the more advanced SOBC model, our study will extend this body of work and increase the diversity of theoretical perspectives that are being brought to bear in the study of social media in education. Secondly, the SOBC model provides a parsimonious and structured mechanism to specifically examine how a student's self-regulation, or lack of it, mediates between their technological experiences and performance implications. Our study considers how deficient self-regulation mediates between social media overload and academic performance. Many extant studies of problematic social media use lack strong theoretical foundations, which can lead to inconsistent and confusing results (Cao et al., 2018). The SOBC model provides us with a strong theoretical approach for developing and validating our research model.

2.2. Social media overload

Social media use can have positive outcomes such as increased social capital (Ellison, Steinfield, & Lampe, 2007), psychological wellbeing (Islam & Patil, 2015), and employee engagement (Koch, Gonzalez, & Leidner, 2012). However, it has been well documented that negative outcomes, such as stress (Maier et al., 2015), mental health problems (Chen & Lee, 2013), and decreased performance (Cao et al., 2018; Turel & Qahri-Saremi, 2016) emerge once social media use surpasses an optimal level, a phenomenon known as social media overload. Cognitive load theory (Sweller, 1988; 1989) provides an explanation. Human memory can be divided into working memory and long-term memory. New information is processed and stored in the long-term memory in the form of schemas resulting in cognitive load. If the cognitive load is too high, we enter the realm of overload where the absorption of information is impaired. The proliferation and constant switching between social media services such as video messaging apps (e.g., Snapchat and FaceTime), work-related channels (e.g., LinkedIn, Outlook), dating apps (e.g., Tinder, OKCupid), social networks (e.g., Facebook, Instagram, Twitter), and group messaging (e.g., WhatsApp, GroupMe), amplify the overload levels users are subjected to. Recent research demonstrates the energy requirements needed to cope with such social media overload is associated with exhaustion and discontinuous usage intentions (Luqman et al., 2017; Maier et al., 2015, 2014; Zhang et al., 2016).

Previous studies have theorized and empirically validated the dimensions of social media overload. Maier et al. (2014) proposed the concept of *social overload* to describe the situation when an individual perceives they are providing too much social support to friends through social media. Social media users often do not get all the functionality they want from one platform and need to constantly switch between too many different (non-) technological alternatives, resulting in negative perceptions which Maier et al. (2015) conceptualize as *replacement overload*. Referencing our "always connected" modern society, LaRose, Connolly, Lee, Li, and Hales (2014) find that *connection overload*, the demands imposed by the reception, maintenance, and updating of social media, enhances stress. Furthermore, Karr-Wisniewski & Lu (2010) describe technology overload in terms of information overload, communication overload, and system feature overload. *Information overload* occurs when the information that needs to be processed exceeds one's information processing capabilities (Milord & Perry, 1977). *Communication overload* is the undesirable condition arising when communication demands from IT channels, such as social media, exceed users' processing capacities (Cho et al., 2011). Finally, *system feature overload* occurs when the technology is too complex for a given task or the addition of new features is outweighed by the impact of technical resources and the complexity of use.

There is some overlap between the various dimensions of social media overload. In this study, we follow the approach of Lee et al. (2016) and Cao and Sun (2018) and conceptualize social media overload as the extensive adoption and use of social media which exposes people to a massive amount of information and communication demands which often require energy and cognitive processing beyond their capabilities. Thus, information and communication overload are the central components of social media overload.

3. Research model development

This section explains how the constructs we studied were chosen and aligned to the SOBC paradigm. We used an integrated research approach that includes both qualitative and quantitative data. Qualitative interview data were firstly collected from 12 students of an Irish university in order to shed light on the causes and consequences of social media overload. Following best practice in conducting interviews to inform the design of a quantitative study (Bryman & Bell, 2011), a semi-structured interview approach was adopted whereby general themes relating the study's objectives were presented, leaving the participant fair degree of freedom to discuss particular themes, how much to say, and how to express it. Questions discussed throughout the interviews included; what does social media overload mean to you, what would cause you or your friends to engage with social media in a way that would lead to feeling overloaded, are you or some of friends able to avoid social media overload better than others (and explain why), and can you give examples of how social media influence your academic performance? The average interview length was 35 min.

Combining these qualitative insights with the SOBC paradigm, a research model was then developed and tested with quantitative data. Fig. 2 depicts our research model where we theorize on the relationships between the covert stimulus fear of missing out (FoMO), social media overload, deficient self-regulation (DSR), and academic performance. Social media overload represents the O in our SOBC model, with FoMO and DSR representing the S and B respectively. FoMO is "... a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski, Murayama, Dehaan, & Gladwell, 2013). DSR occurs when conscious self-control is diminished (LaRose, Lin, & Eastin, 2003). Finally, academic performance, our dependent variable, is defined as the extent to which students have achieved their learning and career development goals.

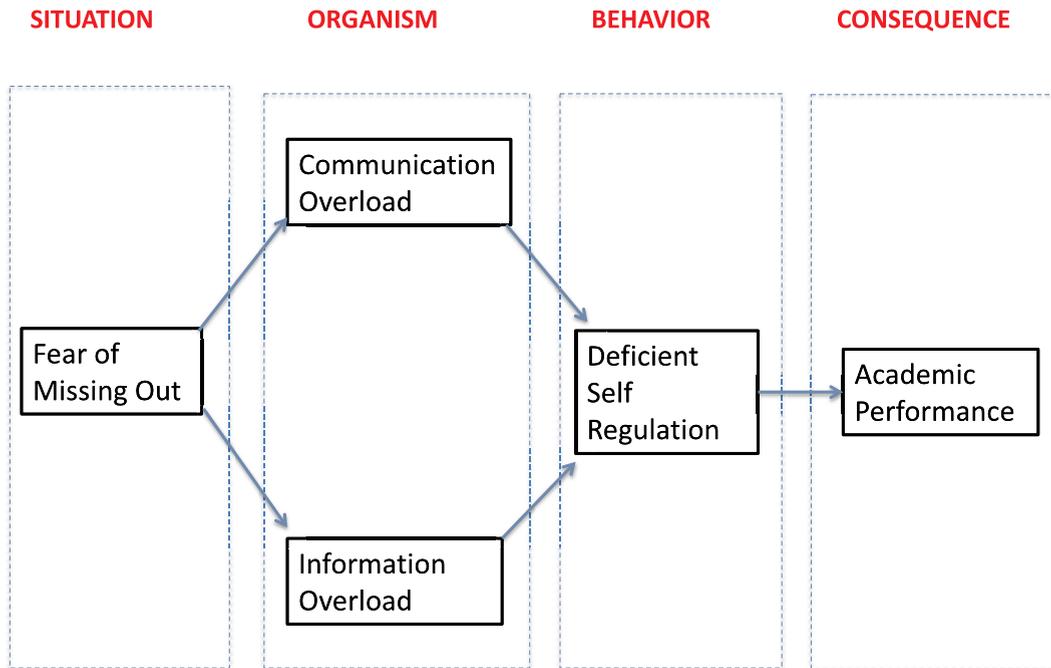


Fig. 2. Research model.

A call to participate in the interviews was sent to students taking an undergraduate business course. The call specifically sought students who believed they frequently struggled to deal with all the content they are exposed to on social media. Each exploratory interview was conducted by the lead author and ranged from 30 to 45 min in length. The interviews focused on understanding the main stimulus of social media overload and how it in turn relates to academic performance. In terms of stimuli, several were mentioned by the students, such as boredom, entertainment, and information seeking. Among the stimuli that were mentioned, FoMO was implicated most consistently across the interviews as a driver of social media use and overuse. Many interviewees acknowledged FoMO as a covert stimulus triggering their use of social media, as exemplified in the quotes below.

“For me, FoMO can be an automatic response. I’m often in the library focusing on an assignment. I could be making great progress for a while, and then I’d glimpse someone in another boot scrolling through Facebook. Then I’d start thinking about what my own friends are up to, and I’d have to check in. Deep down I know I’m not missing anything but I just seem to give in too easily.” [Interviewee 5]

“I wouldn’t be constantly thinking about what my mates are up to, just sometimes. When I’m in class, I’m normally quite focused. Three of my best mates are doing study abroad in the US. They are constantly posting up stuff on Facebook. Last night is a good example. I planned to do work on my assignment but I just got the urge to check what they were up to. I ended up spending most of the evening on social media and too tired to finish the assignment.” [Interviewee 11]

Following self-determination theory (Deci & Ryan, 1985) we can conceptualize FoMO as a covert situational construct (S in SOBC). According to this theory, one of the major psychological needs people seek is relatedness (or need to belong). FoMO is about a pervasive apprehension that others might be having rewarding experiences from which one is absent. The inherent need to belong provides the situational demand to observe others. Therefore, FoMO is situation specific construct that enable students to check social media frequently.

When the interviews focused on the connection between social media overload and academic performance, seven of the twelve interviewees mentioned “willpower” as a possible reason why academic performance suffers. As illustrated in the quotes below, social media overload depletes the self-regulation needed to develop learning and career development goals.

“I use WhatsApp most frequently. I’m a big Game of Thrones fan so after an episode I’m straight onto my WhatsApp group to see what people thought. You have all these opinions coming at you from all angles ... it can be overwhelming but that’s what I’m into. I’d be debating whether I should go to the gym or study after, but my willpower would be shot. I’d just end up looking at TV or reading magazines.” [Interviewee 2]

“... it can be hard enough to motivate yourself to study for a couple of hours. It’s hard for me at least. Coming up to the exams, I try not to login [to social media] until after a study session. I know if I open up my apps, I won’t have the willpower to study properly” [Interviewee 12]

While some scholars would consider FoMO and DSR as states, we follow the social learning approach (Davis & Luthans, 1980) and

conceptualize both as covert variables. In this regard, FoMO and DSR are similar to processes such as thinking, retrieving memories, processing information, and glandular responses, which are not overtly observed, yet, they hold significant value influencing the overt behaviors and bringing change to the environment.

Drawing from our qualitative data and the relevant literature, we now develop specific hypotheses to be tested with quantitative data.

3.1. FoMo and social media overload

FoMO stems from the need to frequently stay connected to social networks (Elhai et al., 2016) and is a problem in today's technology saturated environment, particularly among students. Our digital devices continually provide us with evidence our friends are making more money, have a better job, a better car, or a more interesting social life, which drives the compulsion to stay connected.

Scholars have recently begun to explore FoMO and its correlates. Studies drawing from psychological needs theory report on the linking role FoMO provides between adults' need satisfaction with social media engagement (Przybylski et al., 2013), and on its positive association with social media obsessive-compulsive disorder (James, Lowry, Wallace, & Warkentin, 2017). In a similar vein, problematic smartphone use (Elhai et al., 2016), increased Facebook use (Beyens, Frison, & Eggermont, 2016), and stress among adolescence (Jones, 2014), are strongly correlated with FoMO. In a vicious cycle, the possibility to be constantly connected with others may further fuel FoMO, driving people towards greater use of social media (Beyens et al., 2016). In one of the few studies of FoMO in an educational context, extrinsically and a motivated students report higher levels of FoMO, which in turn led to increased levels of social media engagement in the classroom (Alt, 2015).

While the links between FoMO and social media overload have not been considered in existing studies, FoMO has been found to explain the related concepts of social media fatigue (Dhir et al., 2018) and compulsive social media use (Beyens et al., 2016; James et al., 2017).

Aligning to the SOBC model, in our study, FoMO is conceptualized as a situation where a person's cognitive representation of their environment triggers a response. On experiencing FoMO, people are likely to persistently seek out and acknowledge the activities of those in their social network (Przybylski et al., 2013). Therefore, we hypothesize students are more likely to experience information and communication overload the more they experience FoMO.

H1. The fear of missing out is positively associated with communication overload.

H2. The fear of missing out is positively associated with information overload.

3.2. Social media overload and DSR

A behavior is an overt or covert response made by an organism. Self-regulation, a covert behavior, refers to the capacity for altering one's own behavior, especially to bring them into line with standards such as ideals, values, morals, and social expectations, and to support the pursuit of long-term goals (Kahneman, 2011). The 'strength model of self-regulation' argues that self-regulation is like a muscle, in that it fatigues and depletes the more it is used (Baumeister, Vohs, & Tice, 2007). The ability to regulate oneself becomes impaired following initial efforts to instigate self-regulation. For example, participants who performed a task designed to deplete self-regulation (following a set of confusing instructions) committed more errors during a subsequent color-word Stroop task (Job, Dweck, & Walton, 2010). This depletion of self-regulation may explain why Sana, Weston, and Cepeda (2013) found that non laptop-using students eventually become distracted by the media multitasking behaviors of colleagues within their line of sight.

Many studies have considered the role of self-regulation in a variety of contexts, but the causal arrow usually stems out from self-regulation to other variables. In one of the few studies to investigate how other variables influence self-regulation capabilities, video game difficulty was found to reduce cognitive control, but only if the game was perceived to be difficult (Engelhardt, Hilgard, & Bartholow, 2015). Social media overload has been conceptualized as a stressor which drains cognitive resources (Lee et al., 2016; Zhang et al., 2016). Similar to the way overload depletes energy levels (Cao et al., 2018; Dhir et al., 2018; Lee et al., 2016; Ravindran, Yeow Kuan, & Hoe Lian, 2014), we draw from strength model of self-regulation to hypothesize that high continuous perceptions of information and communication overload in social media using students will lead to DSR.

H3. Communication overload is positively associated with deficient self-regulation.

H4. Information overload is positively associated with deficient self-regulation.

3.3. DSR and performance

Individuals suffering from DSR lack the ability to judge their own behavior against appropriate standards, and to moderate their media consumption. Ability to control is associated with the idea of "willpower" (Baumeister et al., 2007), sacrificing something now to obtain benefits later. As such, DSR has been proposed as an explanatory mechanism for Internet addiction (LaRose et al., 2003), problematic online pornography use (Sirianni & Vishwanath, 2016), adherence to Internet use policies (Li, Luo, Zhang, & Sarathy, 2017), and compulsive social networking use (LaRose et al., 2010). Sub-standard task performance has also been attributed to DSR (Baumeister et al., 2007).

In a study of students' use of instant messaging, Lee and Perry (2004) noted that DSR was clearly evident across sample participants. Internet applications such as social media are purposefully designed to distract users from others tasks (Alter, 2017). As suggested by distraction-conflict theory, distractions occur and performance is diminished when persons are motivated by social comparison (Sanders, Baron, & Moore, 1978). In smartphones, people carry around a device affording ubiquitous social comparison through social networking services. It takes great self-regulation to stay focused on primary tasks when such immersive technology is close at hand (Turel & Qahri-Saremi, 2016). Indeed, poor self-regulation strategies explain why students who believe they are good at media multitasking, actually demonstrate diminished learning performance (Wu, 2017). Extrapolating to the current study, those with impaired self-regulation are more likely to be distracted and perform less well academically. Prior studies observe that self-regulation capabilities and resisting media gratification are shown to be associated with academic success (Gaudreau, Miranda, & Gareau, 2014). Likewise, people with stronger self-regulation are better able to resist impulses in support of long-term goals (Duckworth, 2011), such as developing one's career.

H5. Deficient self-regulation is inversely associated with academic performance.

4. Quantitative study design

4.1. Data collection

Following the qualitative study, quantitative data were collected from business students from one university each in Ireland (42%), the US (32%), and Finland (26%), using an online survey. A total of 567 students were contacted to complete the survey with 182 useable responses received (32% response rate). Participants who successfully completed the survey were entered into a draw to win one of four \$25 Amazon vouchers. Approximately 52% of the respondents were male. 79% respondents were Bachelor's students. The remaining 21% were Master's students. The average age of the respondents was 23 years. The social media services most frequently used were Facebook, Snapchat, WhatsApp, and YouTube.

All variables were adopted from prior literature and were measured on a five-point Likert scale with response choices ranging from "Strongly disagree (1)" to "Strongly agree (5)". The sources of the measures are presented in Appendix 1. Rather than measuring student performance using the standard method of grades achieved, participants were asked to assess their own academic performance across two dimensions – study performance and career development performance. Our dependent variable of academic performance is a second order construct comprising these two sub constructs. We selected this measurement for two reasons. First, we are comparing student performance across three Universities who each used different grading mechanisms. Unlike grade scores, a self-assessed construct provided the ability to reliably compare the performance of all students in our sample. Secondly, we believe these measures provide a more nuanced assessment of academic performance than grades achieved. Employers rate career development opportunities, such as work experience, volunteering, and extracurricular activities, as more important than GPA (Chronicle of Higher Education, 2012). Likewise, as suggested in the quote below from one of our preliminary interviews, a student may achieve a grade which is very good, but is still below what they believe they are capable of.

My average [grade] at the end of year 2 was 73%. While this was better than the majority of my classmates, I should have performed better. I did put the time in studying, but it probably wasn't quality study. If I had of tracked it, quite a bit of time was wasted on social media.

We distributed a pilot version of the survey to four researchers and eight social media users to evaluate content validity and assess the suitability, readability, and ambiguity of the scales. The survey was modified based on the feedback received from subsequent interviews.

4.2. Data analysis

We analyzed the survey data using the partial least squares (PLS) approach (Chin, 1998) with the SmartPLS software version 3.2.8 (Ringle, Wende, & Will, 2015). PLS is a second-generation regression method that combines confirmatory factor analysis with linear regression, which makes it possible to run the measurement and structural models simultaneously. PLS is an appropriate method to use when the goal of the study is both to evaluate the validity of a research model, and to test the hypothesized relationships within that model (Hair, Hult, Ringle, & Sarstedt, 2017), as is the case for this present study. While the covariance based (CB) approach could also have been used for this study, Hair, Ringle, and Sarstedt (2011, p.144) recommend selecting PLS over CB when "... the goal is predicting key target constructs or identifying key 'driver' constructs" and "... the research is exploratory or an extension of an existing structural theory." CB approaches are preferred to PLS when the goal is theory confirmation, or comparison of alternative theories. Based on this advice, PLS was deemed a better match for this study's objectives over the CB approach.

A rule of thumb for required sample size in PLS is that the sample should be at least ten times that of the most complicated multiple regression in the model (Barclay, Higgins, & Hombson, 1995; Hair et al., 2011). Our sample size (N = 182) fulfills this criterion. Additionally, gender, age, and nationality were employed as control measures. The significance of path coefficients was determined via a bootstrapping procedure by setting the number of cases equal to the sample size (as recommended by Tenenhaus, Vinzi, Chatelin, & Lauro, 2005) and the number of bootstrap samples to 5000 (Hair et al., 2017).

We followed Gefen & Straub's (2005) procedure to test convergent and discriminant validity. Convergent validity indicates the extent to which items on a scale, which are theoretically related, are also related in reality. We evaluated the convergent validity by

Table 1
Correlations between latent variables (square root of AVEs in the main diagonal).

	1	2	3	4	5
1. Academic Performance	.776				
2. Communication Overload	-.272	.783			
3. Deficient Self-Regulation	-.321	.474	.754		
4. FoMO	-.234	.473	.557	.722	
5. Information Overload	-.245	.590	.403	.379	.861

examining item loadings, composite reliabilities, and average variance extracted (AVE) values. With regard to item loadings, [Fornell and Larcker \(1981\)](#) have recommended values of at least 0.7 to be acceptable. Based on this criterion, some items were removed. The composite reliabilities being above 0.8 and AVE values exceeding 0.5 further support satisfactory convergent validity ([Fornell & Larcker, 1981](#)). The descriptive statistics, loadings, composite reliabilities, and AVEs are shown in [Appendix 1](#).

Discriminant validity refers to whether the items measure the construct in question or other (related) constructs ([Gefen & Straub, 2005](#)). We evaluated the discriminant validity by comparing the square roots of AVE values to the inter-construct correlations ([Fornell & Larcker, 1981](#)). [Table 1](#) shows the correlation matrix with the square root of AVE values presented diagonally. As can be seen from the table, the square roots of the AVE values for the variables are consistently greater than the off-diagonal correlation values, suggesting satisfactory discriminant validity between the variables ([Fornell & Larcker, 1981](#)).

Having verified the convergent and discriminant validity of the measurement, we addressed the potential concern of common method bias (CMB) ([Podsakoff, MacKenzie, Lee, & Podsakoff, 2003](#)). To evaluate the risk that CMB remained, we conducted several tests. First, we conducted the Harman one-factor test ([Harman, 1976](#)). A principal component analysis indicated five factors and no single construct accounted for a majority of the total variance. Second, we conducted a common method factor test by reusing all the indicators from the principal constructs in the PLS model, as described by [Liang, Saraf, Hu, and Xue \(2007\)](#). We then calculated each indicator's variances substantively explained by the principal construct and by the method factor. The results demonstrate that the average substantively explained variance of the indicators is 0.51, and the average method-based variance is 0.01. The ratio of substantive variance to method variance is about 51:1. Given the small magnitude of method variance, we conclude that the CMB is unlikely to be a serious concern for this study.

5. Results

The test of the structural model includes estimates of the path coefficients, which indicate the strengths of the relationships between the dependent and independent variables, and the R^2 values, which represent the amount of variance explained in the dependent variables. [Fig. 3](#) shows the results of the structural model test.

FoMO had a significant influence on communication overload and information overload, supporting [H1](#) and [H2](#) ([H1](#): $\beta = 0.484$, $p < 0.001$; [H2](#): $\beta = 0.379$, $p < 0.001$). As hypothesized in [H3](#) and [H4](#), both communication overload and information overload were significantly associated with DSF ([H3](#): $\beta = 0.364$, $p < 0.001$; [H4](#): $\beta = 0.186$, $p < 0.05$). Additionally, [H5](#) was supported as DSR was significantly inversely related to academic performance ([H5](#): $\beta = -0.229$, $p < 0.001$).

Next, we considered if the covert behavior (DSR) mediates between social media overload and academic performance. We have the following reasons for examining DSR as a mediator: (a) previous studies have established the mediating role of self-regulation on a variety of educational outcomes in academic settings ([Bertrams & Dickhäuser, 2009](#); [Wong, 2008](#)), and (b) it helps to examine how different aspects of Internet use interact with self-regulation to explain individual outcomes, an important theoretical issue highlighted by Internet addiction researchers ([Kim, Namkoong, Ku, & Kim, 2008](#); [LaRose et al., 2003](#)).

Mediation occurs when a third mediator variable intervenes between two other related constructs. To test for the mediation effects of DSR in the model, we followed the approach of [Hair et al. \(2017\)](#). This involves two main steps. First, we tested whether the indirect relationships between the independent variables and dependent variables, via the mediator, were significant. Next, we determined whether the direct path between the independent and dependent variables were significant. Full mediation occurs when the direct path is insignificant, but the indirect path is significant. Step 1 showed that the communication overload – DSR – academic

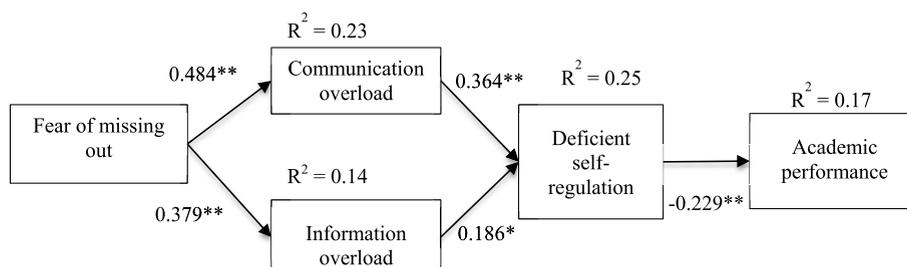


Fig. 3. PLS results. *: $p < 0.05$; **: $p < 0.001$.

performance path was significant ($p < 0.05$ for both). The indirect path involving information overload was insignificant. Step 2 showed that the direct path between communication overload and academic performance was insignificant ($p = 0.906$). The paths between information overload and academic performance was significant ($p < 0.05$). Thus, the results indicate that the effect of communication overload on academic performance was fully mediated by DSR. In terms of information overload and academic performance, there is no evidence of DSR providing a mediation effect.

Taken together, the model explained 23% of the variance of communication overload, 14% of information overload, 25% of DSR, and 17% of academic performance. The variances explained by the model can be considered in the moderate to high predictive power range (Falk & Miller, 1992). None of the control variables (age, gender, nationality) had a significant effect on any of the dependent variables. The f^2 effect size for the FoMO to communication overload path is 0.29, and 0.17 for the FoMO to information overload path. These f^2 effect measures indicate that FoMO has a substantive impact on social media overload, in the moderate to large effect range (Cohen, 1988; Hair et al., 2017). In terms of the predictors of DSR, communication overload had a moderate effect ($f^2 = 0.13$) while the information overload had a low effect ($f^2 = 0.03$). Finally, f^2 value for the DSR to academic performance path was 0.12 which is also in the moderate effect range.

6. Discussion and implications

Internet technology is omnipresent in our lives. With their flexible schedules, significant free time, and still developing self-control, students are susceptible to the maladaptive influences of the Internet, and especially social media. Recent research has observed the deleterious effects of social media overload (Bright et al., 2015; Dhir et al., 2018; Lutz, Ranzini, & Meckel, 2014; Maier et al., 2014), but has not offered theoretical explanations of how and why social media overload leads to impaired performance. The objective of this study was to explore the effect social media overload has on student performance in higher education.

To address our objective, we followed the theoretical framework of human behavior as advocated by the SOBC paradigm (Davis & Luthans, 1980). In doing so, the study advances research offering general explanations of the relationship between social media and performance toward more detailed and specific explanations of the causal pathway.

Previous studies have used FoMO to explain social media fatigue (Dhir et al., 2018) and compulsive social media use (Beyens et al., 2016; James et al., 2017). Our study builds on this important work by articulating the link between FoMO and social media overload dimensions. We find that FoMO is significantly positively associated with both communication overload and information overload. The inability to avoid FoMO impulses could cause students to actively use multiple communication channels and thus receive an overwhelming influx of content. However, if the volume of content exceeds one's processing capacity, communication overload and information overload will be felt.

Social media overload drains cognitive resources (Lee et al., 2016; Zhang et al., 2016). Thus, a student's ability to regulate oneself becomes impaired while experiencing overload. In our study, we find that DSR was associated with both communication overload and information overload. Without the inner regulatory mechanisms in place, students can continue using social media problematically. Sadly, the continued heavy usage of social media may ultimately affect their academic performance. Our study suggests social media overload impairs self-regulation, which is imperative for high academic performance.

6.1. Theoretical contributions

Our study makes multiple theoretical contributions. First, we adopted the SOBC paradigm to build a theoretical understanding of the antecedents and consequences of social media overload. Our study validates the efficacy of using the SOBC model to better understand digital technology and education phenomena. While prior literature adopted the SOR and stress-strain-outcome frameworks to understand the phenomenon of social media overload, we believe the SOBC paradigm helped to better articulate this complex human behavior. As advocated by the SOBC paradigm, self-regulation functions play a central mediating role in explaining the consequences of human behavior (Davis & Luthans, 1980). Our results support this aspect of the SOBC model in that DSR fully mediated the relationship between communication overload and academic performance. This means that enhancing self-regulation functions can mitigate the harmful effects of communication overload on academic performance. However, as our results show no mediation effects of DSR on the relationship between information overload and performance, enhanced self-regulation may only have a minor impact in negating the effects of information overload. Speculating on the contrasting mediating effects of DSR for communication and information overload leads us to focus on the values students ascribe to social media. Social media provides both hedonic and utilitarian value to the user (Leftheriotis & Giannakos, 2014). A hedonic system is pleasure-oriented, strongly connected to home activities, while a utilitarian system is productivity-oriented designed to help perform a specific task (van der Heijden, 2004). For students, communicating with friends through applications like Snapchat is likely to be viewed as providing hedonic value, while the processing of information loads, for example, synthesizing YouTube videos and Twitter feeds as part of a formal assignment or exam preparation, provide utilitarian value. It is possible that DSR has less of an impact when overload is derived from utilitarian systems, as these systems have to be used. Thus, a possible extension to the SOBC paradigm would be to separate covert behaviors into hedonic and utilitarian values. Further research would be needed to determine if such a classification enhances the theory.

Second, our results show that FoMO is significantly positively associated with information overload and communication overload. Existing studies of the antecedents of social media overload have either focused on demographic and usage characteristics (Maier et al., 2014), or system and information characteristics (Cho et al., 2011; Lee et al., 2016). In contrast, our study validates the efficacy of covert stimuli, such as FoMO, in explaining social media overload. The finding implies that the inability to override thoughts of missing out may ultimately lead to social media overload. A fruitful area for future research would be to identify the variables (e.g.,

personality, motivations, perceptions) which moderate the relationship between covert stimuli and social media overload.

Third, our results show that both information overload and communication overload are significant in predicting DSR. By its very nature, social media overload is a temporal phenomenon in that it takes a user a period of time using the technology to reach a state of overload. The failure to control social media use and to override the impulsive judgments can ultimately lead to DSR. Thus, our findings support recent studies drawing from dual systems theory (Evans, 2008) which report that problematic technology use is rooted in an imbalance between System 1 (e.g., fast, automatic, impulsive) and System 2 (e.g., slow, reflective, logical) cognitive processes (Soror, Hammer, Steelman, Davis, & Limayem, 2015; Turel & Qahri-Saremi, 2016). Our results show that DSR negatively affects both study performance and career development performance, conceptualized as overall academic performance. While prior literature mostly used DSR as the explanatory mechanism of problematic social media use (LaRose et al., 2003; LaRose et al., 2010), our study extends existing knowledge by demonstrating that DSR ultimately reduces student performance.

6.2. Practical contributions

In terms of practical implications, the findings from this study can be used as justification for developing targeted interventions that enhance cognitive control abilities so as to avoid social media overload and ultimately impaired performance. Unlike the common rhetoric that the best way to prevent overload is to just not use the technology as much (or at all), our results show the core problem is more nuanced and deserves different types of interventions. Future research should examine whether interventions designed to strengthen self-control - such as training of executive functioning, and re-training automatic associations (Frieese, Hofmann, & Wiers, 2011) – are effective in student populations for regulating their social media usage. Future research could also take existing cognitive training approaches, such as the NeuroRacer video game developed by Anguera et al. (2013) and adapt them specifically for students exhibiting high levels of communication overload. Ultimately, users will need to take responsibility for their well-being, but providing them with a number of tools and explicit recognition of the negative issues can provide much-needed assistance in fighting these negative effects.

Our study also offers valuable insights for developers of social media systems. It is well-known that social media developers build in features to distract users from alternate tasks in order to increase fixation with their own service (Alter, 2017). Some social media providers may even retain the services of companies such as Dopamine Labs (<https://usedopamine.com/>) who promise to help figure out how to design features to trigger the release of dopamine at the right moment so that users will stay longer and use an app more. These ‘addictive’ features essentially attempt to empower System 1 cognitive processes at the expense of System 2. Yet, System 1 initiatives, such as designing technology to create FoMO, may actually decrease technology use in the long run. When users are constantly connected, an unintended consequence is that they become overloaded with communications and information. We found that these overloads lead to DSR among students, and ultimately negatively affects their academic performance. Other studies report overloaded users are more likely stop using the service altogether (Maier et al., 2014). Thus, it makes business sense for social media providers to incorporate features in their service which assist the user in avoiding overload.

6.3. Limitations and future research

As with any empirical research, the present study is subject to a number of limitations, which can serve as avenues for further research. First, the study has been conducted amongst student users in higher education. This limits generalization of the findings directly to other user groups. Indeed, previous research has documented problematic social media use in other learning environments, such as organizations (Fox & Moreland, 2015; Turel, 2017). Thus, we suggest future research validate our findings by collecting data from other user groups in non-academic learning settings.

Second, while our study suggests the efficacy of the SOBC paradigm in explaining the causes and consequences of social media overload in higher education settings, the variance explained by our model is in the moderate range. Other scholars can build upon our work by examining if additional variables aligning with the SOBC paradigm may hold more predictive power. For example, alternative stimuli such as boredom or distraction could be substituted for FoMO, as could social overload (Maier et al., 2014) and replacement overload (Maier et al., 2015) for information and communication overload.

Third, our measures of communication and information overload are self-reported. It is possible that users may not even be aware they are overloaded. An interesting area of future research could use neuroscience tools and techniques to directly measure the neurophysiological markers associated with cognitive overload, such as changes in heart rate variability, pupil dilation, and electrodermal activity.

As we gathered data from students in Ireland, the US, and Finland, we considered whether cultural differences would manifest as differences in our findings. However, there was no significant difference between cultures in any of variables in our research model. This is in contrast with the LaRose et al. (2014) study of connection overload which reported differences between Irish, Korean, and US students in terms of habit strength, deficient self-reaction, and negative affect. We have a very limited understanding of whether, and how, cultural orientations may act as a buffer against problematic social media use. Future research should consider this topic, possibly by applying instruments such as Hofstede’s cross-cultural communication framework (Hofstede, 1980).

Finally, another area of future research is to investigate the effects of innovative social media features on information overload and communication overload. For example, it would be worth investigating to what extent Apple’s new iPhone self-monitoring features actually mitigate communication overload and information overload.

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Appendix 1. Item means, standard deviations (S.D.), loadings and significance levels

Construct	Item	Mean	S.D	Loading
Fear of missing out (Beyens et al., 2016) CR: 0.87 AVE: 0.52	Fomo1: I fear others have more rewarding experiences than me.	2.71	1.22	0.60*
	Fomo2: I get worried when I find out my friends are having fun without me.	2.36	1.19	0.80
	Fomo3: I get anxious when I don't know what my friends are up to.	2.61	1.17	0.74
	Fomo4: It is important that I understand my friends "in jokes".	2.49	1.16	0.71
	Fomo5: Sometimes, I wonder if I spend too much time keeping up with what is going on.	2.77	1.18	0.74
	Fomo6: It bothers me when I miss an opportunity to meet up with friends.	1.94	1.01	0.50*
	Fomo7: When I have a good time it is important for me to share the details online (e.g. updating status).	3.12	1.20	0.63*
	Fomo8: When I miss out on a planned get-together it bothers me.	3.10	1.23	0.72
	Fomo9: When I go on vacation, I continue to keep tabs on what my friends are doing.	2.16	1.14	0.73
Information Overload (Karr-Wisniewski & Lu, 2010) CR: 0.90 AVE: 0.74	In_Over1: I am often distracted by the excessive amount of information in social media	3.36	1.10	0.87
	In_Over2: I find that I am overwhelmed by the amount of information that I process on a daily basis from social media	3.27	1.15	0.90
	In_Over3: Usually, my problem is with too much information to make sense of, instead of not having enough information to make decisions	3.27	1.10	0.81
Communication Overload (Karr-Wisniewski & Lu, 2010) CR: 0.86 AVE: 0.62	Com_Over1: I feel that in a less connected environment, my attention would be less divided allowing me to be more productive	3.56	1.15	0.77
	Com_Over2: I often find myself overwhelmed because technology has allowed too many other people to have access to my time	2.95	1.19	0.85
	Com_Over3: I waste a lot of my time responding to messages that are not directly related to what I need to get done	3.18	1.32	0.77
	Com_Over4: The availability of electronic communication has created more of an interruption than it has improved communications.	2.76	1.22	0.76
Deficient self-regulation (LaRose et al., 2003) CR: 0.90 AVE: 0.59	Def_Self_reg1: I have a hard time keeping my Internet use under control.	3.05	1.22	0.81
	Def_Self_reg2: I have to keep using the Internet more and more to get my thrill.	2.35	1.03	0.75
	Def_Self_reg3: I get tense, moody, or irritable if I can't get on the Web when I want.	2.80	1.24	0.65*
	Def_Self_reg4: I have tried unsuccessfully to cut down on the amount of time I spend online.	2.51	1.10	0.75
	Def_Self_reg5: I sometimes try to conceal how much time I spend online from my family or friends.	2.23	1.10	0.81
	Def_Self_reg6: I would go out of my way to satisfy my Internet urges.	2.15	1.02	0.71
	Def_Self_reg7: I feel my Internet use is out of control.	2.01	1.06	0.80
Academic Performance (Welbourne, Johnson, & Erez, 1998) CR: 0.91 AVE: 0.59	Ac_Perf1: Quantity of study	2.68	1.11	0.72
	Ac_Perf2: Quality of study	2.92	1.15	0.85
	Ac_Perf3: Accuracy of study	3.04	1.01	0.80
	Ac_Perf4: Obtaining personal career goals	2.91	1.02	0.79
	Ac_Perf5: Developing skills needed for your future career	3.02	1.15	0.88
	Ac_Perf6: Making progress in your career	3.22	1.05	0.81
	Ac_Perf7: Seeking out career development opportunities	2.80	1.19	0.58*

Note: Average Variance Extracted (AVE), Composite Reliability (CR), * Items were removed due to loadings less than 0.70.

References

- Al-Rahmi, W. M., Alias, N., Othman, M. S., Marin, V. I., & Tur, G. (2018). A model of factors affecting learning performance through the use of social media in Malaysian higher education. *Computers and Education, 121*, 59–72.
- Alt, D. (2015). College students' academic motivation, media engagement and fear of missing out. *Computers in Human Behavior, 49*, 111–119.
- Alter, A. (2017). *Irresistible: The rise of addictive technology and the business of keeping us hooked*. New York, NY, USA: Penguin.
- Anguera, J. A., Boccanfuso, J., Rintoul, J. L., Al-Hashimi, O., Faraji, F., Janowich, J., et al. (2013). Video game training enhances cognitive control in older adults. *Nature, 501*(7465), 97–101.
- Barclay, D., Higgins, C., & Hompson, R. (1995). The partial least squares (PLS) approach to causal modelling: Personal computer adoption and use as an illustration. *Technology Studies, Special Issue on Research Methodology, 2*(2), 285–309.
- Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16*(6), 351–355.
- Becker, M. W., Alzahabi, R., & Hopwood, C. J. (2013). Media multitasking is associated with symptoms of depression and social anxiety. *Cyberpsychology, Behavior, and Social Networking, 16*(2), 132–135.
- Bertrams, A., & Dickhäuser, O. (2009). High-school students' need for cognition, self-control capacity, and school achievement: Testing a mediation hypothesis. *Learning and Individual Differences, 19*(1st Quarter), 135–138.
- Beyens, I., Frison, E., & Eggermont, S. (2016). "I don't want to miss a thing": Adolescents' fear of missing out and its relationship to adolescents' social needs, Facebook use, and Facebook related stress. *Computers in Human Behavior, 64*, 1–8.

- Brailovskaia, J., & Margraf, J. (2016). Comparing Facebook users and Facebook non-users: Relationship between personality traits and mental health variables - an exploratory study. *PLoS One*, *11*(12).
- Bright, L. F., Kleiser, S. B., & Grau, S. L. (2015). Too much facebook? An exploratory examination of social media fatigue. *Computers in Human Behavior*, *44*, 148–155.
- Brooks, S. (2015). Does personal social media usage affect efficiency and well-being? *Computers in Human Behavior*, *46*, 26–37.
- Brooks, S., & Longstreet, P. (2015). Social networking's peril: Cognitive absorption, social networking usage, and depression. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *9*(4), 1–19.
- Bryman, A., & Bell, E. (2011). *Business research method* (3rd ed.). Oxford: Oxford University Press.
- Cao, X., Masood, A., Luqman, A., & Ali, A. (2018). Excessive use of mobile social networking sites and poor academic performance: Antecedents and consequences from stressor-strain-outcome perspective. *Computers in Human Behavior*, *85*, 163–174.
- Cao, X., & Sun, J. (2018). Exploring the effect of overload on the discontinuous intention of social media users: An S-O-R perspective. *Computers in Human Behavior*, *81*, 10–18.
- Chen, W., & Lee, K.-H. (2013). Sharing, liking, commenting, and distressed? The pathway between facebook interaction and psychological distress. *Cyberpsychology, Behavior, and Social Networking*, *16*(10), 728–734.
- Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
- Cho, J., Ramgolam, D. I., Schaefer, K. M., & Sandlin, A. N. (2011). The rate and delay in overload: An investigation of communication overload and channel synchronicity on identification and job satisfaction. *Journal of Applied Communication Research*, *39*(January), 38–54.
- Chronicle of Higher Education (2012). The role of higher education in career development: Employer perceptions. Retrieved <https://www.voced.edu.au/content/ngv%3A73458>, Accessed date: 15 November 2018.
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences. *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum 2nd ed.
- Datu, J. A. D., Yang, W., Valdez, J. P. M., & Chu, S. K. W. (2018). Is facebook involvement associated with academic engagement among Filipino university students? A cross-sectional study. *Computers and Education*, *125*, 246–253.
- Davis, T. R. V., & Luthans, F. (1980). A social learning approach to organizational behavior. *Academy of Management Review*, *5*(2), 281–290.
- Deci, E., & Ryan, R. (1985). *Self-determination theory*. New Jersey: John Wiley & Sons.
- Dhir, A., Yossatorn, Y., Kaur, P., & Chen, S. (2018). Online social media fatigue and psychological wellbeing—a study of compulsive use, fear of missing out, fatigue, anxiety and depression. *International Journal of Information Management*, *40*, 141–152.
- Duckworth, A. L. (2011). The significance of self-control. *Proceedings of the national academy of sciences: Vol 108*, (pp. 2639–2640). 7.
- Elhai, J. D., Levine, J. C., Dvorak, R. D., & Hall, B. J. (2016). Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. *Computers in Human Behavior*, *63*, 509–516.
- Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of facebook “friends:” Social capital and college students’ use of online social network sites. *Journal of Computer-Mediated Communication*, *12*(4), 1143–1168.
- Engelhardt, C. R., Hilgard, J., & Bartholow, B. D. (2015). Acute exposure to difficult (but not violent) video games dysregulates cognitive control. *Computers in Human Behavior*, *45*, 85–92.
- Evans, J. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, *59*(1), 255–278.
- Falk, R., & Miller, N. B. (1992). *A primer for soft modeling*. Arkon: The University of Arkon Press.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurements error. *Journal of Marketing Research*, *18*(4), 39–50.
- Fox, J., & Moreland, J. J. (2015). The dark side of social networking sites: An exploration of the relational and psychological stressors associated with Facebook use and affordances. *Computers in Human Behavior*, *45*, 168–176.
- Friese, M., Hofmann, W., & Wiers, R. W. (2011). On taming horses and strengthening riders: Recent developments in research on interventions to improve self-control in health behaviors. *Self and Identity*, *10*(3), 336–351.
- Gaudreau, P., Miranda, D., & Gareau, A. (2014). Canadian university students in wireless classrooms: What do they do on their laptops and does it really matter? *Computers and Education*, *70*, 245–255.
- Gefen, D., & Straub, D. W. (2005). A practical guide to factorial validity using PLS-GRAPH: tutorial and annotated example. *Communications of the Association for Information Systems*, *16*(5), 20.
- Giunchiglia, F., Zeni, M., Gobbi, E., Bignotti, E., & Bison, I. (2018). Mobile social media usage and academic performance. *Computers in Human Behavior*, *82*, 177–185.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Thousand Oaks: Sage.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152.
- Harman, H. (1976). *Modern factor Analysis*. Chicago: Chicago University Press.
- Heijden, H. Van Der (2004). User acceptance of hedonic information systems. *MIS Quarterly*, *28*(4), 695–704.
- Hofstede, G. (1980). *Culture's consequences: International differences in work related values*. Berkeley Hills Calif Sage Publishing Inc.
- Islam, A. K. M. N., & Patil, S. (2015). Engagement and well-being on social network sites. *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing Pages* (pp. 375–382). Canada: Vancouver, BC.
- James, T. L., Lowry, P. B., Wallace, L., & Warkentin, M. (2017). The effect of belongingness on obsessive-compulsive disorder in the use of online social networks. *Journal of Management Information Systems*, *34*(2), 560–596.
- Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion-is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*, *21*(11), 1686–1693.
- Jones, T. (2014). Students’ cell phone addiction and their opinions. *The Elon Journal of Undergraduate Research in Communications*, *5*(1), 74–80.
- Junco, R. (2012a). The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. *Computers and Education*, *58*(1), 162–171.
- Junco, R. (2012b). Too much face and not enough books: The relationship between multiple indices of Facebook use and academic performance. *Computers in Human Behavior*, *28*(1), 187–198.
- Junco, R., & Cotten, S. R. (2012). No A 4 U: The relationship between multitasking and academic performance. *Computers and Education*, *59*(2), 505–514.
- Kahneman, D. (2011). *Thinking, fast and slow*. Book. New York, NY, USA: Farrar, Straus and Giroux.
- Karr-Wisniewski, P., & Lu, Y. (2010). When more is too much: Operationalizing technology overload and exploring its impact on knowledge worker productivity. *Computers in Human Behavior*, *26*(5), 1061–1072.
- Kim, E. J., Namkoong, K., Ku, T., & Kim, S. J. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits. *European Psychiatry*, *23*(3), 212–218.
- Kirschner, P. A., & Karpinski, A. C. (2010). Facebook and academic performance. *Computers in Human Behavior*, *26*(6), 1237–1245.
- Koch, H., Gonzalez, E., & Leidner, D. (2012). Bridging the work/social divide: The emotional response to organizational social networking sites. *European Journal of Information Systems*, *21*(6), 699–711.
- LaRose, R., Connolly, R., Lee, H., Li, K., & Hales, K. D. (2014). Connection overload? A cross cultural study of the consequences of social media connection. *Information Systems Management*, *31*(1), 59–73.
- LaRose, R., Lin, C. A., & Eastin, M. S. (2003). Unregulated Internet usage: Addiction, habit, or deficient self-regulation? *Media Psychology*, *5*(3), 225–253.
- Lee, A. R., Son, S. M., & Kim, K. K. (2016). Information and communication technology overload and social networking service fatigue: A stress perspective. *Computers in Human Behavior*, *55*, 51–61.
- Lee, K. C., & Perry, S. (2004). Student instant message use in a ubiquitous computing environment: Effects of deficient self regulation. *Journal of Broadcasting & Electronic Media*, *48*(3), 399–420.
- Lefftheriotis, I., & Giannakos, M. N. (2014). Using social media for work: Losing your time or improving your work? *Computers in Human Behavior*, *31*(1), 134–142.

- Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Quarterly*, 31(1), 59–87.
- Li, H., Luo, X., Zhang, J., & Sarathy, R. (2017). Self-control, organizational context, and rational choice in Internet abuses at work. *Information and Management*, 55(3), 358–367.
- Luqman, A., Cao, X., Ali, A., Masood, A., & Yu, L. (2017). Empirical investigation of Facebook discontinues usage intentions based on SOR paradigm. *Computers in Human Behavior*, 70, 544–555.
- Lutz, C., Ranzini, G., & Meckel, M. (2014). Stress 2.0: Social media overload among Swiss teenagers. *Studies in Media and Communication*, 1(8), 1–22.
- Maier, C., Laumer, S., Eckhardt, A., & Weitzel, T. (2014). Giving too much social support: Social overload on social networking sites. *European Journal of Information Systems*, 24(5), 1–18.
- Maier, C., Laumer, S., Weinert, C., & Weitzel, T. (2015). The effects of technostress and switching stress on discontinued use of social networking services: A study of facebook use. *Information Systems Journal*, 25(3), 275–308.
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*, Vol 315. Cambridge Mass The MIT Press.
- Milord, J. T., & Perry, R. P. (1977). Methodological study of overload. *The Journal of General Psychology*, 97(1), 131–137.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903.
- Przybylski, A. K., Murayama, K., Dehaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior*, 29(4), 1841–1848.
- Ravindran, T., Yeow Kuan, A. C., & Hoe Lian, D. G. (2014). Antecedents and effects of social network fatigue. *Journal of the Association for Information Science and Technology*, 65(11), 2306–2320.
- Ringle, C. M., Wende, S., & Will, A. (2015). *Smart PLS*. Germany <http://www.smartpls.de.hamburg>.
- le Roux, D. B., & Parry, D. A. (2017). In-lecture media use and academic performance: Does subject area matter? *Computers in Human Behavior*, 77, 86–94.
- Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers and Education*, 62, 24–31.
- Sanders, G. S., Baron, R. S., & Moore, D. L. (1978). Distraction and social comparison as mediators of social facilitation effects. *Journal of Experimental Social Psychology*, 14(3), 291–303.
- Sirianni, J. M., & Vishwanath, A. (2016). Problematic online pornography use: A media attendance perspective. *The Journal of Sex Research*, 53(1), 21–34.
- Skinner, B. F. (1963). Operant behavior. *American Psychologist*, 18(8), 503–515.
- Soror, A. A., Hammer, B. I., Steelman, Z. R., Davis, F. D., & Limayem, M. M. (2015). Good habits gone bad: Explaining negative consequences associated with the use of mobile phones from a dual-systems perspective. *Information Systems Journal*, 25(4), 403–427.
- Statista (2019). *Cumulative number of monthly Facebook product users as of 1st quarter 2019*. Retrieved <https://www.statista.com/statistics/947869/facebook-product-mau/>, Accessed date: 27 May 2019.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257–285.
- Sweller, J. (1989). Cognitive technology: Some procedures for facilitating learning and problem solving in mathematics and science. *Journal of Educational Psychology*, 81(4), 457–466.
- Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics & Data Analysis*, 48(1), 159–205.
- Turel, O. (2017). Organizational deviance via social networking site use: The roles of inhibition, stress and sex differences. *Personality and Individual Differences*, 119, 311–316.
- Turel, O., & Qahri-Saremi, H. (2016). Problematic use of social networking sites: Antecedents and consequence from a dual-system theory perspective. *Journal of Management Information Systems*, 33(4), 1087–1116.
- Turel, O., & Serenko, A. (2012). The benefits and dangers of enjoyment with social networking websites. *European Journal of Information Systems*, 21(5), 512–528.
- Welbourne, T. M., Johnson, D. E., & Erez, A. (1998). The role-based performance scale: Validity analysis of a theory-based measure. *Academy of Management Journal*, 41(5), 540–555.
- Wong, M. M. (2008). Perceptions of parental involvement and autonomy support: Their relations with self-regulation, academic performance, substance use and resilience among adolescents. *North American Journal of Psychology*, 10(3), 497–518.
- Wu, J. Y. (2017). The indirect relationship of media multitasking self-efficacy on learning performance within the personal learning environment: Implications from the mechanism of perceived attention problems and self-regulation strategies. *Computers and Education*, 106, 56–72.
- Zhang, S., Zhao, L., Lu, Y., & Yang, J. (2016). Do you get tired of socializing? An empirical explanation of discontinuous usage behaviour in social network services. *Information and Management*, 53(7), 904–914.