A Social Presence Model of Task Performance: A Meta-Analytic Structural Equation Model

Full Paper

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Abstract

Using the Elaboration Likelihood Model, we build a social presence model of task performance and hypothesize that social presence impacts task performance through two routes – central and peripheral. Using a meta- analytic sample of 80 studies, we test our model with the multivariate meta-analytic structural equation modeling methodology. We find support for all our hypotheses. We show that in the central route, social presence positively impacts task performance through its positive effect on flow. In the peripheral route, social presence positively impacts trust, which in turn negatively impacts task effort. Finally, reduced task effort improves task performance. We also show the moderating role of task complexity, which negatively moderates the social presence-flow relationship and positively moderates the social-presence-trust relationship.

Keywords

Social presence, elaboration likelihood model, meta-analytic structural equation model, task performance, trust, flow, task complexity

Introduction

Tasks like learning, networking, shopping, gaming, etc. that were purely offline erstwhile are now mainstream online. To persuade users to successfully perform these tasks, Information Systems (IS) are designed with features such as 3D views, audio, video, warm welcome messages, interactive chat agents, social robots, comment box, product reviews, like button, and profile display, as opposed to traditional features like "ok" button, "cancel" button, and "shopping cart" (Qiu and Benbasat 2009). Also, firms make significant investments in design, and staff who interact with customers online to help task accomplishment. Services like Vuukle provide commenting platforms, and sentiment analysis widgets for firms to integrate in their websites and eventually facilitate, monitor and analyze online customer dialogue. Vuukle reported a growth of 1500 percent in 2015 (Chronicle 2016). The basic idea behind these design interventions is to bring about a social space online. In other words, they make IS high on what Short et al. (1976) in their pioneering work on telecommunication systems called "social presence" – the ability of information system to project a high "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (Short et al. 1976). Scholars show a positive relationship between social presence and task performance. However, there are three major gaps.

One, there is lack of coherence due to the volume and variety in the constructs mediating the social presence-task performance relationship. Though the literature posits a myriad of mediators, the underlying theory on how social presence impacts task performance is still unclear. Social presence is shown to be positively related to task performance, both directly (Animesh et al. 2011; Gefen and Straub 2003) and\or indirectly (Fortin 1997; Lee and Park 2014). So, there is lack of clarity in the understanding of the best pathway in the social presence-mediators-task performance relationship. Thus we ask: How does social presence impact task performance? Two, there is a dearth of studies addressing the moderators in the social presence and task performance relationship. Particularly, we are interested in the moderating role of task complexity. Since IS support tasks that vary in complexity, it is important to know if social presence can improve task performance for simple as well as complex tasks. Finally, SP–task performance studies have been conducted in various contexts showing differing levels of strength and

support. Our analysis shows that the effect size of the social presence-task performance relationship ranges from 0.092 (Joe 1996) to 0.795(Yeh et al. 2011). Knowing the overall strength of social presence on the mediating mechanisms will be helpful in justifying the costs and personnel investments that websites make in bringing about a social space online.

We address the above-mentioned gaps and make three contributions to the literature. First, based on arguments from the Elaboration Likelihood Model (ELM) (Petty and Cacioppo 1986) we propose that social presence impacts task performance through two key pathways – central route processing of task-relevant information and peripheral route processing of social cues. We theorize how each variable in the nomological net is related to each other and build a social presence model of task performance. We test our model using state-of-the-art multivariate meta-analytic structural equation modeling approach (Cheung 2015a). By doing so we identity the theoretical mechanisms, integrate the social presence theory and the ELM, and eventually bring coherence and unity to the literature. Second, we hypothesize and test the moderating role of task complexity in the relationship between social presence and the mediating constructs. We show how task complexity as a moderator improves the salience of one route over the other. By doing so we advance the social presence model of task performance. Third, through our analyses we show the overall impact of social presence on the variables in the nomological net, in terms of strength, sign and significance. By doing so we synthesize the extant research on the social presence construct and appraise about the state of research.

Social Presence and its Effects on Task Performance

To address the media choice issue, Short et al. (1976) introduced the concept of "social presence" to rate and differentiate media based on its ability to project virtual collaboration partners and the nature of communication with them. They rated social presence of a medium using survey items asking the extent to which the medium is warm, personal, sociable, sensitive, and to the extent to which there is human contact. The idea is that face-to-face medium affords the highest social presence followed by video, audio, and written communication. Users would prefer a CMC medium that afford them the social presence required by the interpersonal involvement of the task they wish to accomplish.

We reviewed literature linking social presence and task impacts - task performance and task effort. Early work in the IT diffusion area hypothesized and tested the direct positive link between social presence and task performance (Straub 1994). These studies were in the context of email, voice mail, face to face, telephone and fax (Straub and Karahanna 1998). Later studies in the early part of the next decade extended this line of thought. They integrated the social presence theory with the technology acceptance model, and argued that social presence will directly and positively impact task effort expectancy, in addition to task performance expectancy (Karahanna and Limayem 2000) in the context of ecommerce (Gefen & Straub, 2003) and email and v-mail (Karahanna and Limayem 2000). However, only few studies test the direct relationship between social presence and effort expectancy. Till date scholars continue to test the direct effect of social presence - performance expectancy relationships in contexts such as ecommerce (Ogonowski et al. 2014) and microblogging (Yan and Huang 2014). In later part of the last decade, there was another line of research arguing that social presence is indirectly related to task performance, mediated by task effort (Chandra et al. 2010), trust (Lee and Park 2014; Walter et al. 2015), and factors similar to flow such as enjoyment (Peng et al. 2015; Phang and Kankanhalli 2009), concentration (Peng et al. 2015), meta-cognitive activity (Gueutal et al. 2009), and participation (Peng et al. 2015). Amongst them, trust and enjoyment were most often posited mediating mechanisms. Based on our literature review, we found several inconsistencies as identified in the introduction section.

Theory Development

In our research we use the Elaboration Likelihood Model (ELM) to show how social presence can persuade users to successfully perform their tasks. ELM argues that attitude change due to a persuasive message happens through cognitive elaboration - thinking about a message (O'Keefe 2013). The extent of elaboration determines the degree and endurance of the attitude change. Based on the extent of elaboration, persuasion will happen through two routes - central and peripheral. When people are highly motivated and have high ability to process the message they will perform high elaboration - they will take the central route characterized by intense, effortful, and rational thinking about a persuasive message. In

assessing and adopting the message, people will perform information processing by applying internal logic and careful scrutiny to the message claims, facts and proofs (Lowry et al. 2012). A strong message will have a lasting attitude change because it was internalized with high cognitive effort. When the motivation and ability to process the message is low, people will perform low elaboration - they will take the peripheral route characterized by less effortful thinking about the persuasive message. In assessing and adopting the message, people will use heuristics, shortcuts, and emotions (Petty et al. 2002). In this scenario, superficial cues from the source and the message such as source attractiveness, message credibility, and message length will be used to form the attitudes (Petty and Cacioppo 1986). However, the attitude change so obtained is short lived and less resistant to counter argumentation because it was based out of superficial cues and "shallow" thinking (Petty et al. 2002).

We argue that social presence will persuade the user to perform tasks by facilitating central processing of task-relevant information and peripheral processing of social cues. We also argue that task complexity will be a key moderator deciding the prominence of one route over the other. We found prior work in consonance with our idea of linking social presence and elaboration. For example, Skalski and Tamborini (2007) showed that social presence will induce message processing and source thoughts in shaping favorable attitudes about online interactive social agents. Using arguments from ELM, Jin (2009) argues that modality (audio vs. video) of presenting an advertisement message can impact the user's evaluation of the credibility of an avatar and informational value of the message in Second Life.

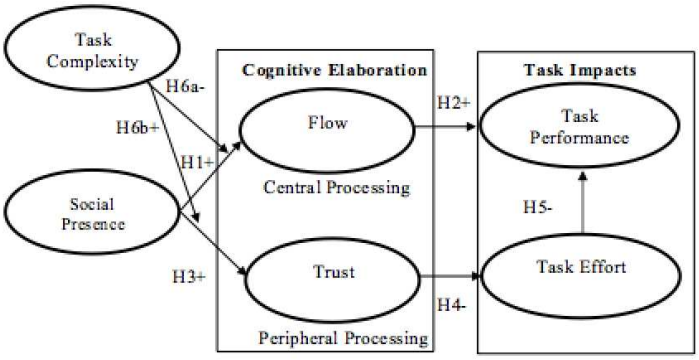


Figure 1. Theoretical Model

Flow

Flow is defined as a holistic sensation that people feel when they act with total involvement (Csikszentmihalyi 2014). In task performance context, if high elaboration was to happen though the central route, it should be characterized by processing of task relevant messages with high attention, involvement, interest and concentration (Petty and Cacioppo 1986). We argue that high social presence media facilitates such intense focus on task relevant messages by leading users to a state of flow. We pose several arguments for the social presence- flow relationship. One, the sense of being with others gets the user's attention (Skalski and Tamborini 2007). Two, human contact fosters online relationships and thereby a feeling of proximity and psychological closeness to the media (Lim et al. 2013; Zhang et al. 2014). Three, virtual interactions get users into deep and sustained task engagement (Animesh et al. 2011). Four, higher personalization increases user's task involvement because of the greater consequences of low task performance (Petty and Cacioppo 1986). Therefore, through a state of flow social presence gets users engaged, engrossed, and involved in their task and task-relevant messages (Animesh et al. 2011; Zhang et al. 2014). In line with our conceptualization, prior research has conceptualized personalized services (Zhou 2012), web personalization in online reviews (Tam and Ho 2005), interactivity in ecommerce (Cui et al. 2010) as central cues in persuading IS behaviors. Prior research links social presence with increased systematic message processing. Moreover, prior research links social presence with constructs such as cognitive absorption, flow, enjoyment, concentration and pleasure. Thus, we hypothesize that: ***H1:*** *Social presence is positively related to flow-based central processing*.

Task performance is the degree to which the system will provide task performance, efficiency and effectiveness. Higher the cognitive elaboration higher will be the deep, careful, and systematic thought given by users on task relevant information. For example, by concentrating on instructional material and

by interacting with other students in virtual discussion, better learning outcomes were achieved for students in Second Life (Phang and Kankanhalli 2009). Based on their chat interactions with real agents facilitated by an ecommerce website, customers felt they could make better decisions on the product (Xu 2016). Flow suggests focused immersion where the attentional resources of a user are focused on the task (Evaristo and Karahanna 1998). It also suggests curiosity where the user's act of interacting with the system will excite him to look for task related possibilities (Webster et al. 1994). Prior research in non IS contexts has linked elaborative processing to performance in areas such as academic performance (Sadowski and Gülgös 1996)and work group performance (Homan et al. 2007). Prior research has also established the positive relationship between social presence and task performance outcomes such as academic performance (Gueutal et al. 2009; Phang and Kankanhalli 2009), perceived usefulness (Walter et al. 2015), mediated through elaboration related constructs such as meta cognitive activity, enjoyment (Wang et al. 2012), concentration (Phang and Kankanhalli 2009). Thus, we hypothesize that: ***H2:*** *Flow-based central processing is positively related to task performance.*

Trust

Trust is defined as "the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (Rousseau et al. 1998). Simply put, it is a belief that the website or the website vendor is trustworthy. Most of the online tasks such as shopping in ecommerce sites, sharing information in social networking site, interacting with unknown actors in virtual worlds, are prone to risks and uncertainty (Toufaily et al. 2013). Trust is one way of coping with this uncertainty by presuming that the trustee will behave in a socially acceptable manner (Pavlou and Gefen 2004). The social presence literature considers the trust in the seller and website synonymously in terms of the arguments, antecedents and consequents. We follow that tradition, and generally term both entities as trustees.

Affective association or simple rule based inference characterizes peripheral cue processing. Greater availability of peripheral cues offer more scope for peripheral cue processing (Petty and Cacioppo 1986). High social presence media support vivid social cues, high interactivity and richness through various modalities thereby affording the user a high opportunity for heuristic processing. Extant empirical evidence of high trustworthiness in the high social presence media is indicative of peripheral cue processing. Prior research links social presence with increased heuristic processing though high source thoughts (Skalski and Tamborini 2007). Moreover, trustworthiness as an indicator of peripheral cue processing has been established in the literature (Lowry et al. 2012).

We argue that due the high salience of human contact and relationships, peripheral cue processing in high social presence media is trust-based. Based on its ability to project more social (peripheral) cues, media with high social presence is evaluated to be trustworthy. There are three main reasons for this positive social presence-trust relationship. First, social cues make it difficult to hide untrustworthy information. Consequently, users associate transparency to media with high social presence (Hess et al. 2009). Second, using social cues enable users to assess how well the media caters to their expectations. Since users can make such assessments in high social presence media, their trust is enhanced (Hess et al. 2009). Third, given the high investment in relationships in high social presence, users would trust such media more thinking that the through untrustworthy behavior the trustee has more to lose (Hess et al. 2009).On the same lines, prior research has linked social presence with constructs such as trust, credibility, reliability, swift trust, user trust, and trustworthiness. Thus we hypothesize that: ***H3:*** *Social presence is positively related to trust-based peripheral cue processing*.

Task effort is the degree the system will increase the task effort (Venkatesh et al. 2003). We argue that trust will persuade users to invest less effort in learning and interacting with the trustee and the associated messages- the system and the agent alike. It persuades the user to simplify his interaction with the system (Walter et al. 2014). One, due to high trust, users will be more assured and less the anxious about their use of the system (Casey and Poropat 2014). Two, they will save the effort needed to understand, monitor and control their task performance (Chircu et al. 2000). For example, with high trust, an online shopping task would be easier because the user need not check every action of the seller (Pavlou 2003) or reevaluate the task relevant information provided by seller (Walter et al. 2014). Thus, we hypothesize that: ***H4:*** *Trust-based peripheral cue processing is negatively related to task effort.*

The lesser the effort spent on understanding the trustee, the more will be the task performance. We argue that the effort saved by the user due to peripheral cue processing will be redeployed to perform the task at

hand, enabling the user to accomplish more with lesser effort (Davis et al. 1989). Thus, we hypothesize that: ***H5:*** *Task effort is negatively related to task performance.*

Task Complexity

Highly complex tasks need a media that allows the user to interpret the task-relevant information in a slow paced manner (McGuire 1969). Moreover, users would want to revisit and reprocess the task-relevant information to improve their task performance (Dennis et al. 2008). In media with high social presence, the central processing happens primarily through the interactions and the high personalness of the media as argued in H1. This creates an obligation to respond quickly or to attend the salient others in the medium (Te'eni et al. 2001). Users would prefer not looking for alternate sources of information because they would be hesitant in disrupting a conversation. Consequently, there is lower scope for slow paced task interpretation and reprocessing of the message – users cannot "elaborate at will". The resulting high cognitive load and mental strain due to high complexity and social presence will lead the users to perform their tasks using peripheral cues (Grisé and Gallupe 1999; Miller 1956). On the other hand, low social presence media can better facilitate the user to look for other sources of information.

Robert and Dennis (2005) show that while on one hand social presence can improve the motivation or attention towards the message (in line with our H1), it could also reduce the ability to process the message due to the fast-paced nature of interactions, over exposure, and low reprocessibility. They proposed that when faced with a complex message, users would pick a media with low social presence or try to elaborate on the peripheral cues. On the other hand, users who encounter a less complex message would perform high elaboration using the high social presence media due the high motivation. Early research on modality effects on persuasion shows that audio and video presentations make it difficult to process the issue relevant message compared to print presentation (Chaiken and Eagly 1976). In such a difficult situation where the exposure is forced rather than self-paced, users will look for simple cues that would turn out to be powerful determinants of persuasion (Petty and Cacioppo 1986). Thus we hypothesize that: ***H6a:*** *Task complexity negatively moderates the positive relationship between social presence and flow-based central cue processing*. ***H6b:*** *Task complexity positively moderates the positive relationship between social presence and trust-based peripheral cue processing*.

Methodology

We use the state-of-art two-staged random-effects meta-analytic structural equation modeling (TS RE-MASEM) method to test our theoretical model (Cheung 2015a). This is a quantitative method that synthesizes effect size matrices across primary studies and tests a set of hypotheses in a theoretical structural equation model. The MASEM is the best approach given our research problem– inconsistencies in strength, significance, and mediating paths across studies. Meta-analyses as an effective instrument in theory testing has been established. The MASEM approach combines the strengths of both meta-analyses and SEM. Compared to a primary study, the MASEM – increases the sample size and bolsters the statistical power, improves accuracy of parameter estimates by correcting for sampling error (Montazemi and Qahri-Saremi 2015). Compared to a univariate meta-analyses and the univariate meta-analytic SEM, the TS MASEM - doesn't neglect the interdependency among effect sizes and hence precisely captures the effect sizes, addresses the problem of missing data, considers the total sample size as opposed to harmonic mean or the mean sample size, and considers the covariance matrix (Cheung 2015a). Therefore, the TS RA-MASEM obtains robust estimates with high statistical power, fit statistics unaffected by study artifacts, and accounts for the heterogeneity across studies by letting the researcher choose a fixed effects versus a random effects MASEM.

We used the search term "social presence" in the search fields title, abstract and keywords. We queried major research databases. To avoid potential bias in our data we considered conference proceedings and dissertations. We started with the year 1990 because this is when the literature linking social presence and task performance bloomed. We considered those studies that had two different samples as independent studies. One of the studies was removed when two studies used a same sample. We included those studies that had (a) used Short et al. (1976) scales to measure social presence, (b) the study reports information such as correlations, sample sizes, and reliabilities necessary to calculate effect sizes, (c) studies were performed at user-level and not at team-level, and (d) studies should report a correlation between social presence and a variable that is conceptually similar to at least one of the other constructs in our model. To

ensure the above inclusion criteria we screened the articles' titles, abstracts, full text, and the measurement scales. Finally, we arrived at a sample containing 80 relevant articles.

Task Performance: The degree to which the system will provide task performance, efficiency and effectiveness. (Kim and Han 2011; Venkatesh et al. 2003). **Constituting Labels:** performance expectancy, perceived usefulness, purposive value **Sample Item:** "Using the shopping assistant enabled me to shop more quickly" (Al-Natour et al. 2011)
Task Effort: The degree the system will increase the task effort. (Venkatesh et al. 2003). **Example Construct Names:** effort expectancy, ease of use, convenience, ease of contact **Sample Item:** "My interaction with the system would be clear and understandable" (Venkatesh et al. 2003)
Flow: A holistic sensation that people feel when they act with total involvement characterized by control, attention focus, curiosity, and intrinsic interest (Trevino and Webster 1992). **Example Construct Names:** flow, cognitive absorption, enjoyment, arousal, entertainment value **Sample Item:** "It's fun to interact with Second Life" (Animesh et al. 2011)
Trust: The degree to which the user believes the system or the system owner will fulfill commitments notwithstanding the user's vulnerability and dependence. (Gefen et al. 2003) **Example Construct Names:** trust in the seller, swift trust, trust in staff, credibility **Sample Item:** "I trust the information presented in this website."(Cyr et al. 2007)
Task complexity: was coded using the scales provided by (Wood 1986). The tasks in each study were rated for complexity on a six item 5-point likert scale - number of acts involved in the task, number of cues involved in the task, type and number of relationships among acts, type and number of relationships among cues, changes in acts and the relationship among, changes in cues and the relationship among them. One task complexity score was obtained for the tasks in each study by averaging the scores for each item. Average task complexity score was taken for the sample. Studies that had higher than average task complexity score was coded as 1, or 0 otherwise.

Table 1. Coding Study Constructs

We developed a coding protocol to specify the kind of variables and statistics to be coded. We designed an excel file to code the effect sizes (e.g., correlations), sample size, and moderators. The coding scheme for task performance, task effort, flow and trust are provided in Table 1 with definitions, sample items, and construct-label synonyms. We mapped those constructs in the primary study to the variables in our study based on conceptual similarity (Montazemi and Qahri-Saremi 2015) and widely accepted definitions (Gajendran and Harrison 2007). We looked at the measurement instruments of the constructs instead of relying on the labels given by the study authors because different labels could measure a similar construct or similar labels could measure different constructs(Montazemi and Qahri-Saremi 2015). Coding conceptually similar constructs makes the content validity of our study higher that that of the primary studies. After coding, the corresponding effect size of each construct with each other construct in our nomological net was entered in the database. When one study contained two or more variables (for example, trust in the seller and trust in the website measuring trust) measuring the same construct, we included the average effect size. Task complexity was coded using the scales provided by Wood (1986). We used a consensus based approach for coding where the coding of the constructs and moderators were performed by one of the authors of this study, and verified by another author who is a senior IS scholar.

Results

We used the metaSEM package from R to estimate our model (Cheung 2015b; Team 2016). The analyses proceeded by performing the stage one of the TS RE MASEM – producing a pooled correlation matrix and an asymptotic covariance matrix (ACM). As input we provided 5 x 5 correlation matrices and the corresponding sample sizes from our 80 studies. Not all studies will have all effect sizes in the matrix. So, we mentioned "NA" for missing effect sizes. The total sample size was 25511. In table 2, we provide the pooled correlations, which shows the overall strength of the effect sizes across studies for the total N using the multivariate random-effects model. We also show the significance, heterogeneity, and the standard error of these estimates.

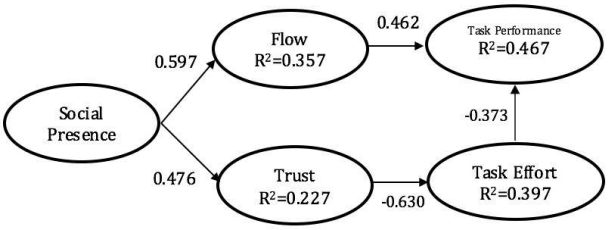
The high variability in the effect sizes across studies is indicated by the I^2 heterogeneity values ranging from 0.848 -0.928. So, we are justified in using the random-effects model. Moreover, all effect sizes were high statistically significant (at $p < 0.001$). The pooled correlation matrix ties back to our contribution 3.

The social presence-flow effect size (ES= 0.583 s.e=0.020; p<0.001) was the highest in strength, whereas the social presence-task effort (ES= -0.338 s.e=0.030; p<0.001) was the lowest. The social presence-task performance effect size, the key effect size of interest in this study was (ES=0.427; s.e=0.023; p<0.001). By showing the overall strength, and significance of these effect sizes we provide consensus to the literature in this area.

In the second stage, we estimated the structural equation model using the Generally Weighted Least Squares Approach (GWLS) estimated by inputting ACM, total sample size, and the pooled correlation matrix. Figure 2 reports the estimated path coefficients and their significance, and the R^2 values of each endogenous variable. Table 4 reports the model fit statistics. Table 3 reports the indirect effects, and their corresponding 95% confidence intervals. Our results show that all our hypotheses were supported. Social presence was significantly positively related to flow (ES= 0.597; 95% LB CI=0.560, UB CI=0.634), showing support for H1. Flow was significantly positively related to task performance (ES=0.462; 95% LB CI=0.405, UB CI=0.518), showing support for H2. Social presence was significantly positively related to trust (ES=0.476; 95% LB CI= 0.427, UB CI=0.526) showing support for H3. Trust was significantly negatively related to task effort (ES=-0.630; 95% LB CI=-0.696, UB CI=-0.564), showing support for H4. Task effort was significantly negatively related to task performance (ES= -0.373; 95% LB CI=-0.454, UB CI=-0.290), showing support for H5. The indirect paths were significant as well. Consistent with the ELM, the indirect effect through central processing was stronger than peripheral processing.

Construct	Social Presence	Task Performance	Flow	Trust	Task Effort
Social Presence	1	0.916	0.886	0.914	0.888
Task Performance	0.427 (0.023)	1	0.848	0.916	0.928
Flow	0.583 (0.020)	0.560 (0.024)	1	0.882	0.868
Trust	0.437 (0.029)	0.480 (0.042)	0.402 (0.049)	1	0.865
Task Effort	-0.338 (0.030)	-0.512 (0.037)	-0.489 (0.041)	-0.494 (0.043)	1
Note: lower triangle shows pooled effect size (standard error), upper triangle shows I^2 Heterogeneity Index					

Table 2. Pooled Correlation Matrix – Full Sample



All beta coefficients are significant based on 95% Confidence Intervals.

Figure 2. Results for Proposed Model with Full Sample (n=25511)

Path	Estimate	95% LB CI	95% HB CI
SP->Flo->Perf	0.276	0.239	0.313
SP->Tru-->Eff	-0.300	-0.341	-0.261
SP->Tru->Eff->Perf	0.112	0.085	0.141

Table 3. Indirect Effects – Full Sample Model

Model	df	X^2	p	RMSEA	TLI	CFI	SRMR	Δdf	Δ X^2	p
Full Sample	4	39.967	0.000	0.0188	0.962	0.985	0.0801			
Unconstrained	8	62.79	0.000	0.023	0.979	0.948	0.112			
Constrained	13	74.59	0.000	0.019	0.977	0.964	0.113	5	11.806	0.038

Table 4. Model Fit – Full Model and Moderator Analyses

To perform moderator analyses, we split the sample into two groups of studies – one with low task complexity, and the other with high task complexity. First, we estimate our hypothesized model for the two groups of studies using the TS RE MASEM. Second, we fit an unconstrained model where the parameters in both models are freely estimated, and the combined fit is calculated. Third, we fit a constrained model where the direct effects are constrained to be equal across groups. A significant χ^2 test between the two models where the χ^2 increases in the constrained model indicates one or more of the parameters are considered significantly different across groups.

Figure 3 shows the model estimates for low and high complexity models. Table 5 shows the direct and indirect effects of both the models. The moderator analyses results are reported in table 4. The model fit for both models were in the agreeable thresholds. The hypothesized path coefficients for both the models were statistically significant. Our moderator analysis shows the fit of the constrained model was significantly (p=0.038) higher than the unconstrained model indicating that the one or more path coefficients of the constrained model were significantly different across both the groups. The path coefficient between social presence and flow in the low complexity model (ES=0.627; 95% LB CI=0.584, UB CI=0.670) was higher compared to the high complexity model (ES=0.562; 95% LB CI=0.505, UB CI=0.619) supporting our hypothesis H6a. The path coefficient between social presence and trust is lower in the low complexity model (ES=0.446; 95% LB CI=0.391, UB CI=0.518) compared to the high complexity model (ES=0.555; 95% LB CI=0.463, UB CI=0.647) supporting our hypothesis H6b. The indirect effects suggest that central processing is more pronounced in low task complexity, while peripheral processing is more pronounced in high task complexity.

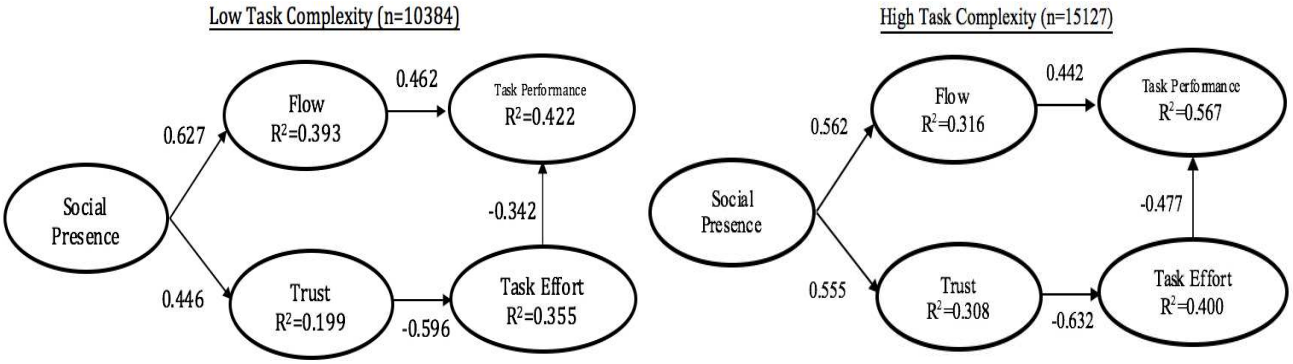


Figure 3. Moderator Analyses – Task Complexity

Path	Low Task Complexity			High Task Complexity		
	Estimate	95% LB CI	95% HB CI	Estimate	95% LB CI	95% HB CI
SP->Flo->Perf	0.289	0.246	0.334	0.249	0.192	0.306
SP->Tru-->Eff	-0.266	-0.311	-0.223	-0.351	-0.419	-0.385
SP->Tru->Eff->Perf	0.091	0.065	0.120	0.167	0.117	0.224

Table 5. Moderator Analyses - Indirect Effects

Conclusion

Our study and its findings make three theoretical contributions. First, based on arguments from the ELM we build a social presence model of task performance. We theorize that in the central route social presence positively impacts flow, which in turn improves task performance. In the peripheral route, social presence positively impacts trust, which reduces task effort and the reduced task effort improves the performance. The indirect effects show that the central route is more persuasive than the peripheral route. Using the state-of-the-art rigorous TS RE MASEM, we empirically tested our hypotheses. Our study provides clarity to the literature that has proposed a myriad of mediators and pathways, by answering the question: How does social presence impact task performance? Second, we hypothesize and test the moderating effect of task complexity. We show that highly complex tasks will enhance the salience of peripheral processing, and suppress the salience of central processing. Using the multi-group analyses in the TS RE MASEM we empirically test our hypotheses. Our results showed that task complexity negatively moderates the positive relationship between social presence and flow, and positively moderates the positive relationship between social presence and trust. Our results make important contributions to the literature that lacks studies on the moderators of social presence-task performance mediators. Third, through our analyses we show the overall impact of social presence on the variables in the nomological net – flow, trust, task effort and task performance, in terms of strength, sign and significance. We showed medium to strong effect sizes that were statistically significant. By doing so we synthesize extant research on the social presence construct and appraise the scholars in the area about the state of research. Overall, our paper shows that social presence is persuasive, how? And when?

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