


# Social Networking Services and Social Trust in Social Commerce: A PLS-SEM Approach

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## ABSTRACT

This study researches the mediating consequence of social trust (identification-based trust and information-based trust) on the relationship between social networking services (SNS) use and social commerce intention. The study also explores whether and how gender differences impact the use of SNS on endogenous constructs. The proposed research model is empirically examined using a sample of 170 consumers who have had a prior online shopping experience. The statistical analysis employs partial least squares structural equation modelling (PLS-SEM) methods such as PLS algorithm, model assessments, PLS predict, PLS goodness-of-fit, invariance assessment and multi-group analysis, and importance-performance map analysis. The study provides empirical insights into the effects of SNS on social trust towards s-commerce intention. Also, men and woman consumers are found to exhibit different emphases in using SNS to trust the s-commerce.

## KEYWORDS

IPMA, PLS-SEM, Social Cognitive Theory, Social Commerce, Social Networking Services, Trust

## 1. INTRODUCTION

S-commerce (social commerce) is a form of e-commerce business model, which makes use of the Web 2.0 participative and the social web technology to provision social-related exchange activities. Social interactions on the web through the growth of social media created new opportunities for businesses. The rise of Web 2.0 has enabled the integration of social media with e-commerce platforms (Liang and Turban, 2011). The commercial influence of social media is vividly apparent to firms (Zhang et al., 2014), which brought development in e-commerce to become social commerce (s-commerce). The increasing popularity of s-commerce has changed the way we think about online purchasing (Füller et al., 2009). S-commerce provides the communication hub helps them in recommending the goods and services, share the experience, participation in the forums, give reviews on others' comments and opinions and rate the products (Hajli, 2015). Moreover, consumers co-create the firm's value (Hajli et al., 2014). The influence of social interaction on the consumers where consumers interact with each other is the primary advantage of this era of s-commerce (Hajli, 2015).

The mediator of the s-commerce is social media (Shi and Chow, 2015) and this is related to the rapidly growing social networking sites and online communities. The rise of s-commerce has transferred the power from sellers to consumers (Gu et al., 2012). New design features of s-commerce built upon Web 2.0 tools to support consumer engagement and participation, resulted in a more trustworthy social web environment (Lu et al., 2016). Consumer trust is becoming a challenging

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issue in a highly interactive social commerce environment (Shi and Chow, 2015). The relationship between the sellers and the consumers fails to be shaped well because of distrust (Jones and Leonard, 2008). Consumer perception of information obtained from social networking sites is directly related to cognition (Ha et al., 2016). In such cases, consumer trust is developed through social interactions with other members in the virtual communities. The issue of trust can be supported by social commerce, which includes the interaction between the consumers that consequently results in an increased trust level (Hajli et al., 2013). S-commerce firms need to understand the technological and social factors in building consumer trust. To better understand the trust concepts, a multi-dimensional aspect of trust needs to be taken into consideration (Cheng et al., 2017, Kim and Park, 2013). In particular, the effect of social trust in the s-commerce context is still limited.

Hence, the first objective of this research is to assess consumers' increased usage of social networking services effect on social trust. Therefore, we address the following research questions (1) what impact does social networking services usage have on social trust? (2) Does social trust influence s-commerce intention? Thus, this study researches the mediating consequence of social trust (Identification-based trust and Information-based trust) on the relationship between social networking services (SNS) use and social commerce intention. The second objective of this study is to explore whether and how gender differences impact the use of SNS on endogenous constructs.

The paper is structured as follows. First, we review the literature that discusses s-commerce and social networking services. Drawing on research on social cognitive theory (Bandura, 2002) and s-commerce trust (Shi and Chow, 2015), this study develops a theoretical framework to connect social trust (Identification-based trust and Information-based trust) in s-commerce context. The research model is then empirically tested using data collected in Australia. We conclude our paper with a discussion, and implications with potential extensions.

## **2. THEORETICAL BACKGROUND**

This section discusses s-commerce, trust in s-commerce, and the concept of social cognitive theory employed in this study.

### **2.1 Social Commerce (s-Commerce)**

In e-commerce, the s-commerce is considered as the new stream that has recently emerged from the Web 2.0 tools. The emerging Web 2.0 tools support the use of social networks, communities, blogs, and wikis have changed the web structure dramatically (Hajli, 2013, Shin, 2013). S-commerce combines two main elements: social media and commercial activities (Liang and Turban, 2011, Liang et al., 2011). In (Yadav et al., 2013), the author defines s-commerce as the "exchange-related activities that occur in, or are influenced by, an individual's social network in computer-mediated social environments, where the activities correspond to the need recognition, pre-purchase, purchase, and post-purchase stages of a focal exchange." S-commerce is e-commerce conducted via the social media environment (such as Facebook and Twitter (Ng, 2013). Indvik (2013) described seven species of s-commerce, which includes the social network-driven sales platforms (such as Facebook), peer recommendation websites (such as Amazon), peer-to-peer sales platforms (such as eBay), group buying websites (such as Groupon), and social shopping websites (such as Motilo), user-curated shopping (such as Lyst) and participatory commerce (Kickstarter). Most e-commerce sites have integrated social applications to assist the consumer to connect and buy. According to (Huang and Benyoucef, 2013, Liang and Turban, 2011), there are two types of social commerce: (1) social network-driven sales platforms (e.g., Facebook), and (2) e-commerce websites that integrate social networking technologies to enable consumers social interaction and sharing (e.g., Amazon and eBay). In the context of this research, we considered s-commerce based on the above two types.

## 2.2 Social Cognitive Theory

The Social Cognitive Theory (SCT) commenced as the Social Learning Theory (SLT) (Bandura, 2002). The SCT explains that learning happens in a social context such that the person's cognition, behaviour, and the environment, work in a dynamic and the reciprocal interaction way (Wood and Bandura, 1989). The theory emphasis on social influences and suggests that the over the environment, people employ their control regarding self-efficacy. The SCT extends the formation of self-efficacy to collective efficacy (Bandura, 2002). "The strength of family, communities, school systems, business organization, social institutions, and even nation lies partly in people's sense of collective efficacy that they can solve the problem they face and improve their lives through unified effort" (Bandura, 2004). This indicates that people prefer to join the social networks and community if the trust is rewarded and the vice versa is also true. The disengagement is led by the betrayal of trust (Bandura, 2002).

In previous research, the Social Cognitive Theory has been used in studying factors of Internet use behaviour (LaRose and Eastin, 2004) and social media use (Khang et al., 2014). Thus, this research aims to investigate the effect of social networking services use (such as communities, ratings and review, referrals and recommendations) on social trust (identification and information-based trust) towards s-commerce intention.

## 2.3 Social Networking Services

Social networking services (SNS) denote actors (people/organizations) and the connections among the actors indicating some relationship (friendship/affiliation/information exchange) (Grabner-Kräuter, 2009) cited in (Sohaib and Kang, 2015b). The social commerce enables collaboration among consumers through social networking services (such as communities, forums, ratings and review, referrals and recommendations) mediated by the social media (Hajli, 2015). SNS has the potential to considerably change the association between buyers and e-vendors (Lee et al., 2011). The information provided on the social networking services tools provides the source of online social support. The reviews and rating regarding the products can be easily posted online (Chen et al., 2011). Product reviews lead to the engagement of customers in the content generation that empowers them (Füller et al., 2009) and provides the opportunity to learn from other experiences. Hence, the level of trust is increased due to the ratings and customer feedbacks, the referrals and recommendations, and via communities and forums (Hajli, 2015, Hajli and Sims, 2015). However, according to Hu et al. (2012), companies manipulate online reviews to some extent to increase their sales. Social media and the other Web 2.0 tools provide information sharing support and experience in the context of s-commerce (Lu et al., 2010).

## 2.4 Trust in S-Commerce

McKnight et al. (2000, 2002) define trust as "trust in an unfamiliar web vendor" is a relationship between two parties where they don't have reliable information but trust will develop over time. Such as the Interpersonal trust between two a consumer and a vendor (McKnight and Chervany 2001). However, trust in another human is important (McKnight et al. 2011).

S-commerce is a subgroup of the e-commerce business model (Hajli et al., 2013) and different subsets of e-commerce face trust and reliability issues. In (Gefen and Straub, 2004), the authors discussed that in all the commercial activities, traditional or technology-based, the trust holds central position, especially when there are no formal contracts and agreements between the vendor and the consumer and trust wholly supports the completion of a transaction with honesty and integrity. Internet users find it difficult to trust the e-commerce and s-commerce sites because security risks are involved in it (Hajli and Lin, 2016). Over the Internet, the consumers and the e-vendors have a direct relationship to trust the e-vendors, the consumers like to seek opinions and recommendations from other users. Online reviews and product ratings can help companies in gaining the trust of potential clients and customers (Chen et al., 2011). Trust is influenced by personal social interaction and societal experiences (Lange, 2015). Creating trust in social network relationships has become

essential in business interactions (Hsu et al., 2011). The forums and communities, information about the experiences and customer reviews facilitate consumer trust (Lu et al., 2010). Consumer trust in an online social network group is developed from trust among its members (Ng, 2013).

(Shi and Chow, 2015) conceptualize that trust in the s-commerce context as information-based trust and identification-based trust. “Information-based trust represents customers’ trust in the information that posted on the social commerce website, including information from companies and from other customers.” “Identification-based trust represents customers’ trust in other members in the social commerce website, which is based on the trustworthiness of other customers.” These two dimensions (Identification-based trust and Information-based trust) shape online social support. Informational supports are the two main factors of social support in the s-commerce environment (Hajli and Sims, 2015, Chen and Shen, 2015). For example, identification with other members in social networking communities supports consumers to create trust. Also, the other participating party is the company involved in social commerce activities, which provided information to the customers. In this study, the social trust is conceptualize as Identification-based trust and Information-based trust (Shi and Chow, 2015).

### **3. RESEARCH MODEL AND HYPOTHESES**

Based on the theoretical foundation discussed in the above section, a cognitive-affective communication model for designing information technology (Te’eni, 2001), takes account of the communication medium and the message form. The s-commerce platform is a communication medium that influences consumer cognitive perceptions. Information support are present on the s-commerce website (Chen and Shen, 2015). Therefore, in this research, the s-commerce platform is the medium, and the message form is characterized by information provided by the company or by another customer (such as reviews, rating, etc.) with the potential to influence s-commerce purchasing intention. See Figure 1 the proposed research model.

#### **3.1 Social Networking Services and Social Trust**

Social networking services such as rating and reviews create a positive effect on consumer trust (Hajli, 2015). The consumers feel more secure and intent to buy when the e-commerce platforms create a social presence (Weisberg et al., 2011). The information provided by a company enhances consumer trust (Shi and Chow, 2015). According to the (Lu et al., 2016), s-commerce website containing more social networking to develop more trustworthy behaviours. Accordingly, we propose the following hypothesis.

**H1:** Social networking services have a positive effect on Information-based trust.

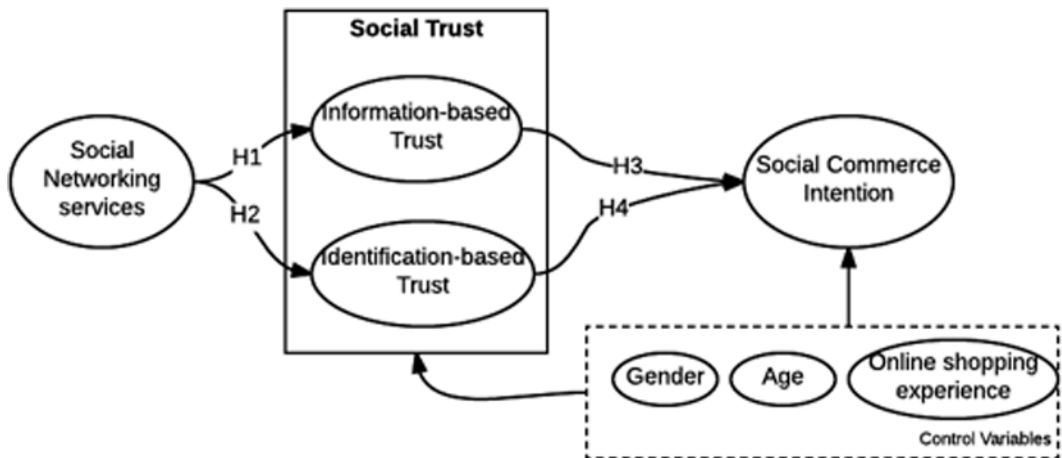
The social interaction creates positive networking and hence increases the level of trust (Kim and Park, 2013). Product-related information present in s-commerce website developed trust from other customers (Hajli et al., 2013). In addition, trust toward online communities members positively influences online participatory behaviours, such as sharing information in the online community (Chen and Shen, 2015). Thus, we propose the following hypothesis.

**H2:** Social networking services have a positive effect on Identification-based trust.

#### **3.2 Social Trust and S-Commerce Intention**

The advent of Web 2.0 has increased consumer social trust in the s-commerce environment (Hajli et al., 2013). This social context is a significant characteristic of trust (Gefen and Straub, 2004). Information present on the s-commerce website helps customers with advice and guidance to help

Figure 1. Research model



them make good decisions (Liang et al., 2011, Liang and Turban, 2011). Trust towards the community and members is positively related to s-commerce intention provided with information support (Shi and Chow, 2015). An identification-based trust in online community would positively improve social interaction (Royo-Vela and Casamassima, 2011, Li and Du, 2011). In addition, (Shi and Chow, 2015) also confirm that Identification-based trust and the Information-based trust impact consumers' electronic word-of-mouth intention. Thus, we propose the following hypothesis.

**H3:** Information-based trust has a positive effect on social commerce intention.

**H4:** Identification-based trust has a positive effect on social commerce intention.

#### 4. RESEARCH METHODOLOGY

The following sections present the data collection and the data analysis to test the hypotheses.

##### 4.1 Data Collection

An online survey was conducted in Australia to collect the data. We focused our target population on University students. The social media usage of University students is comparatively higher than the other age group (Hajli, 2013). We contacted graduate and undergraduate students at the University of Technology Sydney. The criteria for selecting participants were to have online shopping experience and users of social network-driven sales platforms (e.g., Facebook). A total of 180 participants completed the survey. After removing incomplete responses, 170 were usable for data analysis. The demographic details include males (58%) and females (42%), All participants had social networking experience, with 87% had to experience 5 years and above, 65% of participants had 1-3 years of online purchasing experience.

##### 4.2 Measurement

In this study, validated survey items were adopted and modified to fit the research context. Social networking services adopted from dimensions of s-commerce construct (Hajli, 2015), modified to focus on social networking services. Information-based trust and Identification-based trust are two aspects of social trust, modified from (Shi and Chow, 2015). S-commerce intention was modified from (Hajli and Sims, 2015). All items are presented in Appendix A. Additionally, gender, age, and online shopping experience are included as control variables to affect social trust and s-commerce

intention. Previous researches have recommended that gender differences, age and online shopping experience impact consumer intention to receive and share their experiences (Zhang et al., 2014, Zhang et al., 2011).

## 5. DATA ANALYSIS AND RESULTS

Variance-based structural equation modelling (SEM) statistical analysis, such as Partial Least Squares (PLS) path modelling using SmartPLS 3.0 (Ringle et al., 2014) was performed to test the hypotheses. Reinartz et al. (2009) provided an effective overview of variance-based and covariance-based SEM. Partial Least Squares (PLS-SEM) method is considered a preferred statistical analysis approach in business information systems research because it doesn't necessitate a large sample size, doesn't involve normality and consequently works without distributional assumptions and with ordinal, nominal and interval-scaled factors (Haenlein and Kaplan, 2004, Hair et al., 2014, Hair et al., 2011). According to the Sarstedt et al. (2016) "PLS is ideal for estimating composite models while simultaneously allowing the approximation of common factor models involving effect indicators with practically no limitations". In contrast, covariance-based (CB-SEM) and consistent PLS (PLSc) estimation of reflectively measured constructs involve severe biases in parameter estimates when the data stem from a composite population, providing their use unsuitable in these instances (Sarstedt et al., 2016). Henseler et al. (2014) discussed the work of Rönkkö and Evermann (2013) and proved that PLS-SEM performs better than CB-SEM in finding the true model. In addition, Hair et al. (2017) highlighted that PLS-SEM is considerably better than CB-SEM in explaining variance in the dependent construct indicators. Furthermore, variance-based PLS-SEM can handle different types of measurement models such as composites, common factors, and causal-formative measurement (Henseler 2017).

Moreover, Covariance-based SEM techniques are not appropriate for formative variables (Henseler et al., 2009). However, PLS-SEM accepts both formative and reflective variables to be tested together (Chin et al., 2003, Hair et al., 2014, Sarstedt et al., 2017), which is the case in this study. Therefore, variance-based SEM (also called Component-based SEM) is appropriate for this study. PLS-SEM is now a well-established approach in information systems research (Ringle et al., 2012). In our research model, Information-based trust and Identification-based trust, and s-commerce intention were modelled as reflective indicators. Whereas SNS is modelled as a formative construct because it is considered as a multi-dimensional factor, which covers different groups such as social networks sites, forums, ratings and reviews, referrals and recommendations, etc. (Sohaib and Kang, 2015a, Sohaib and Kang, 2015b). Formative constructs are not exchangeable; this means a change in one indicator does not necessarily denote a change in other indicators (Sohaib and Kang, 2015a, Sohaib and Kang, 2015b). Such as, an increase in effect from available reviews would affect the consumer to purchase online even if there were no impact from other social networks sources.

### 5.1 Measurement Model

The reliability and validity assessment were assessed by observing internal consistencies, convergent validity, and discriminant validity (Fornell and Larcker, 1981). Cronbach's reliability and Internal consistencies with composite reliability for each latent variable exceed the recommended value of 0.70. The loadings of all items for each reflective construct exceeded 0.7 values and were significant ( $p$ -value  $< 0.05$ ). In addition, all correlations were less than the square root of average variance extracted (AVE) for each variable, thereby indicating sufficient discriminant validity. AVE of all variable values exceeds the recommended value of 0.50. The assessment of formative measurement models follows Hair et al. (2014). SNS is a formative construct that cannot be analyzed in this procedure. However, the variance inflation factor (VIF) value less than 5 indicated no multicollinearity to determine formative indicator reliability. In addition, the construct validity using outer weights was also significant ( $p$ -value  $< 0.05$ ). Table 1 and 2 shows items loadings and weights. Table 3 shows the reliability and validity of the assessment.

Table 1. Social networking services items weight

Social networking services	Weights	p-value	VIF
SNS1	0.305	0.000	1.65
SNS2	0.156	0.002	1.62
SNS3	0.198	0.009	2.16
SNS4	0.300	0.000	1.79
SNS5	0.310	0.000	1.92
VIF: Variance inflation of all items < 5 and significant at the 0.05 level.			

In addition, we also performed a discriminant validity using Heterotrait-monotrait (HTMT) criterion. Henseler et al. (2015) demonstrated in detail that HTMT-based validity assessment criteria are a preferred approach for variance-based SEM. The HTMT is established, all  $HTMT_{0.85}$  values of the latent variables are below the critical and conservative value of 0.85 (Henseler et al., 2015). In addition, we performed  $HTMT_{inference}$  using the bootstrapping, and all the confidence interval values are below 1, which indicates discriminant validity is also established using HTMT. Please refer to the comprehensive explanation given by (Henseler et al., 2015) regarding Heterotrait-monotrait (HTMT), new criteria for assessing discriminant validity.

**PLS Bias:** PLS method requires no bias when assessing data from a composite model population, irrespective of whether the measurement model is reflective or formative (Sarstedt et al., 2016). However, according to Kock (2015), if all factor level “VIFs resulting from a full collinearity test is equal to or lower than 3.3, the model can be considered free of common method bias”. In our research model, all factor level VIFs are lower than 3.3 indicating no bias data.

**PLS Goodness-of-fit:** Concerning Goodness-of-fit (GoF) indices for PLS path modelling, Henseler and Sarstedt (2013) show that the GoF and the relative goodness-of-fit index are not appropriate for model validation. However, Henseler and Sarstedt (2013) explained in detail that the GoF is useful for a PLS multi-group analysis for the same PLS path model. Therefore, the model fit

Table 2. Social trust and s-commerce items loading

Information based trust	Loadings	p-value
InfT1	0.81	0.000
InfT2	0.73	0.000
InfT3	0.83	0.000
<b>Identification based trust</b>		
IdT1	0.73	0.000
IdT2	0.83	0.000
IdT3	0.84	0.000
<b>Social commerce intention</b>		
SIN1	0.86	0.000
SIN2	0.91	0.000
SIN3	0.81	0.000
All items are significant at the 0.05 level.		

Table 3. Reliability and validity assessment

	AVE	CR	C-alpha	IdT	InfT	SIN	SNS
IdT	0.64	0.84	0.72	<b>0.80</b>			
InfT	0.63	0.83	0.71	0.58	<b>0.79</b>		
SIN	0.74	0.87	0.83	0.47	0.32	<b>0.86</b>	
SNS	NA	NA	NA	0.72	0.58	0.54	<b>NA</b>

*Notes: AVE: Average Variance Extracted, CR: Composite Reliability, C- Alpha: Cronbach's Alpha, IdT: Identification-Based Trust, InfT: Information-Based Trust, SNS: Social Networking Services, SINT: Social commerce Intention. Diagonal elements are the square root of AVE.*

is also assessed by examining the model fit of the PLS path models, namely, the Standardized Root Mean Square Residual (SRMR) (see <http://www.smartpls.de/documentation/fit>). For the SRMR, the recommended value should be lower than 0.08. We computed model fit for the samples (males and females). The fit indices for the two samples: Men sample [SRMR=0.07]; Women sample [SRMR=0.06] indicate a good model fit of the data.

## 5.2 Structural Model

The structural model quality is examined by the path coefficients significance and the R square (R<sup>2</sup>) variance of the dependent variables. The results of the R<sup>2</sup> indicate that 25% of the variance in the s-commerce intention to buy. The R<sup>2</sup> for Information-based trust (70%) and Identification-based trust (57%) of the variance of these factors were accounted for social networking services. Therefore, the result of the R<sup>2</sup> shows a satisfactory level of explanation. The Stone-Geisser criterion Q<sup>2</sup> is also measured using the blindfolding method to compute the construct cross-validated redundancy for assessing the predictive relevance (Henseler et al., 2009). In our analysis, all Q<sup>2</sup> values range for the 's-commerce intention' endogenous construct (i.e., 0.318 for the overall model, 0.372 for the female sample and 0.335 for the male sample) above the threshold value of zero, thus indicating a strong predictive relevance.

In addition, to substantiate the predictive relevance of the model, we use the PLSpredict algorithm to predict the performance of the PLS models (Shmueli et al., 2016). The PLSpredict algorithms include cross-validated case-wise and average-case point predictions, root means squared error of predictions (RMSE), mean absolute error (MAE), and mean absolute percentage error (MAPE). The PLSpredict rests on the k-fold cross-validation principle, which is also useful for the holdout sample validation (Shmueli et al., 2016). We use the ten number of folds (k=10) and ten number of repetitions (r=10) to perform the PLSpredict test. PLSpredict offers two naïve benchmarks 1) linear model (LM) predictions and 2) mean value Q<sup>2</sup> to measure the predictive quality of the PLS path model estimations. Table 4 shows the analysis of the PLSpredict. The lower values of PLS-SEM than a simple linear model (LM) indicates higher predictive power. Q<sup>2</sup> values are also greater than zero. The PLS-based prediction yields more accurate out-of-sample predictions (i.e., smaller prediction errors) for all indicators.

The estimation results using SmartPLS 3.0 software are shown in Figure 2 and Table 5. The significance of the PLS-SEM results, such as path coefficients was determined using the bootstrapping technique. SmartPLS 3.0 can perform bootstrapping ("a nonparametric procedure that can be applied to test whether coefficients such as outer weights, outer loadings, and path coefficients are significant by estimating standard errors for the estimates") (Ringle et al., 2014) for both the inner and outer model to specify the t-value for significance. Bias-corrected and accelerated (BCa) confidence interval method using 5000 sub-samples with a five per cent significance level (0.05) were employed.



Table 4. PLS Predict results

	RMSE		MAE		MAPE		Q <sup>2</sup>	
	LM	PLS-SEM	LM	PLS-SEM	LM	PLS-SEM	LM	PLS-SEM
IdT3	1.05	1.03	0.83	0.82	23.45	23.27	0.44	0.43
IdT2	1.18	1.17	0.93	0.92	25.15	25.09	0.34	0.34
IdT1	1.31	1.30	1.05	1.04	30.67	30.38	0.16	0.19
InfT1	1.28	1.27	1.00	0.99	33.85	33.55	0.24	0.24
InfT2	1.56	1.55	1.28	1.27	62.94	63.30	0.11	0.11
InfT3	1.29	1.28	1.03	1.00	37.59	37.45	0.24	0.24
SIN1	1.33	1.31	1.02	0.97	30.35	32.32	0.23	0.22
SIN3	1.54	1.53	1.17	1.16	38.24	39.33	0.14	0.12
SIN2	1.53	1.49	1.13	1.02	38.63	42.67	0.25	0.21

-PLS-SEM < Linear Model (LM); Q<sup>2</sup> > 0; Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE) ; See Appendix for all items.

The results show that social networking services have a significant effect on social trust. Therefore, H1 and H2 are supported. The effect of Information-based trust on s-commerce intention is not significant. Hence, H3 is not supported. An identification-based trust also positively affects s-commerce intention, which supports H4. Among control variables, gender significantly influence Identification based trust and s-commerce intention. In addition, online shopping experience has a significant effect on social trust. Table 6 shows the results of the control variables.

Table 5. Path testing

	Path	Path Coefficient mean	Standard Deviation	t-value	p-value	Supported
H1	SNS -> InfT	0.21	0.05	4.26	0.000*	Yes
H2	SNS -> IdT	0.51	0.05	7.61	0.000*	Yes
H3	InfT -> SIN	0.05	0.07	1.16	0.421	No
H4	IdT -> SIN	0.31	0.06	4.01	0.000*	Yes

IdT: Identification-Based Trust, InfT: Information-Based Trust, SNS: Social Networking Services, SIN: Social commerce Intention. \*Significant at the 0.001 level

**Measurement Invariance:** To meet the second objective of the study, we also performed the multi-group PLS analysis using SmartPLS 3.0 to determine whether the effect differs for males vs. females' participants. According to Henseler et al. (2016), group comparison can be misleading in the SEM approach unless the measurement invariance is established. Therefore, we performed the measurement invariance of composite models (MICOM) in PLS-SEM approach suggested by Henseler et al. (2016) using a 3-step approach. The configural (Step 1) and compositional (Step 2) is required to compare the standardized path coefficient estimates of the structural relationships between the composites across the groups. The configural and compositional invariance must be established first to have partial measurement invariance. In step 3, the composites must have

Figure 2. Path coefficients

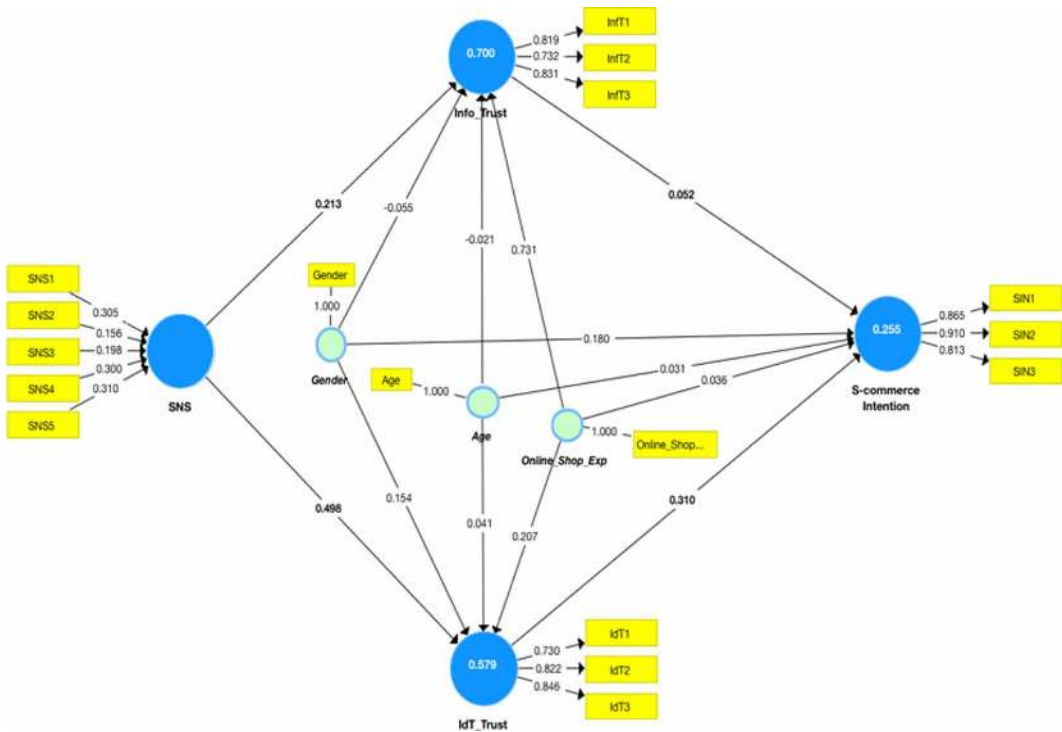


Table 6. Control variables path testing

Path	Path Coefficient mean	Standard Deviation	t-value	p-value
Age -> InfT	-0.02	0.03	0.69	0.24
Age -> IdT	0.03	0.03	1.16	0.48
Age -> SIN	0.03	0.07	0.63	0.52
Gender -> InfT	-0.05	0.04	1.24	0.21
Gender -> IdT	0.15	0.05	2.64	0.009*
Gender -> SIN	0.17	0.07	2.39	0.01
Online_ShopExp -> InfT	0.73	0.02	9.12	0.00**
Online_ShopExp -> IdT	0.19	0.04	4.36	0.00**
Online_ShopExp -> SIN	0.03	0.08	0.42	0.67

\*Significant at the 0.05 level, \*\*Significant at the 0.001 level

equal mean values and variances across the groups to establish full measurement invariance. Table 7 and 8 show the MICOM procedure.

Table 7. Compositional variance (Step 2)

Factor	Original Correlation	Correlation Permutation Mean	5.00%	Permutation p-Values
IdT_Trust	0.996	0.998	0.995	0.135
Info_Trust	0.997	0.987	0.989	0.674
S-commerce Intention	0.998	0.972	0.994	0.219
SNS	0.984	0.975	0.942	0.655

In Step 1, we used the identical models to establish configural invariance. In step 2, as highlighted in Table 8, the original correlation of all factors is greater than 5%-quantile. Therefore, compositional invariance is established.

As highlighted in Table 8, the latent variable mean scores (2.5% and 97.5%) and variances scores (2.5% and 97.5%) do not differ significantly between males and females, supporting full measurement invariance.

Multi-group PLS analysis (MGA-PLS) allows for the comparisons of structural model differences between groups (Chin et al., 2003). However, according to the Chin (2003), the permutation-based method needs group sample sizes to be justly similar (Chin and Dibbern, 2010). Therefore, Sarstedt et al. (2011) developed a Nonparametric Confidence Set Approach based on Keil et al. (2000) parametric test to overcome the prior method's limitations. The MGA-PLS compare the groups specific bootstrap confidence intervals, irrespective of whether the data are normally distributed or not. Figure 3 and Table 9 shows MGA-PLS of males and females.

The findings also show that the use intensity of SNS (such as reviews and ranking, recommendations from friends/family, discussions, etc.) is higher in females in building the identification-based trust towards s-commerce intention. Concerning the males, the use of social networking services has a higher impact on information-based trust towards social commerce intention. Furthermore, the variance in identification-based trust (31%) is higher in females than in males (29%). However, the variance in information-based trust (29%) is higher in males than females (22%). On the other hand, the variance in female's s-commerce intention (39%) is greater than males (33%). This means the main driving force for females is identification-based trust towards s-commerce intention, whereas males consider information-based towards their s-commerce intention.

**Importance-Performance Map Analysis (IPMA):** The IPMA is also a useful method for resulting additional findings and conclusions for managerial actions (Ringle and Sarstedt, 2016). The

Table 8. Full measurement invariance (Step 3)

Factor	Mean - Permutation Mean Difference (Males – Females)	2.50%	97.50%	Variance - Permutation Mean Difference (Males – Females)	2.50%	97.50%
IdT_Trust	0.008	-0.21	0.219	-0.005	-0.298	0.302
Info_Trust	0.011	-0.2	0.232	-0.007	-0.296	0.255
S-commerce Intention	0.004	-0.224	0.227	-0.013	-0.387	0.355
SNS	0.007	-0.224	0.239	-0.017	-0.328	0.285

Figure 3. Path coefficients original values (males and females)

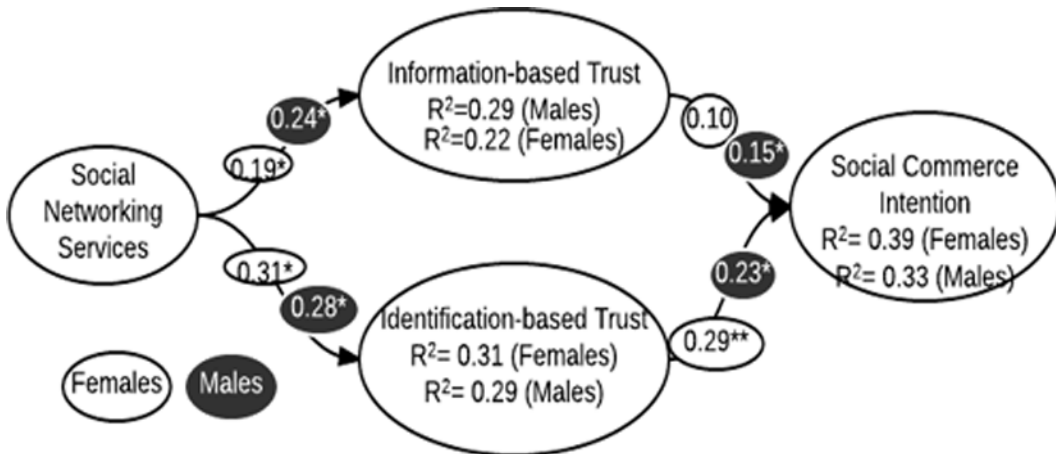


Table 9. Path testing (males and females)

Path	Path value mean (Males)	Path value mean (Females)	Path co-efficient original values difference	t-value
SNS -> InfT	0.35	0.17	0.18	2.05*
SNS -> IdT	0.52	0.74	0.22	2.21*
InfT -> SIN	0.19	0.10	0.09	1.03
IdT -> SIN	0.32	0.40	0.12	1.99*

*IdT: Identification-Based Trust, InfT: Information-Based Trust, SNS: Social Networking Services, SIN: Social commerce Intention.\*Significant at the 0.05 level,\*\*significant at the 0.01 level*

IPMA technical details are explained in details by (Ringle and Sarstedt, 2016, Hock et al., 2010). Performing an IPMA involves determining a targeting construct, such as information-based trust, identification-based trust and s-commerce intention in our PLS path model. The performance of each construct measured on a scale from 0 to 100 for both males' and females' sample. The IPMA results contrast the structural model total effects (importance) and the average values of the latent construct scores (performance) for a specific criterion factor. All total effects larger than 0.10 are significant at the  $p \leq 0.10$  level. Table 10 to 12 and Figure 3 to 5 shows the IPMA result of the three target constructs (Information-based trust, identification-based trust, and s-commerce intention). The IPMA results are also aligned with our results of the multi-group analysis.

The maximum performance values per group-specific (Males and Females) IPMA computation is highlighted at the indicator level (Social Networking Services) effect on social trust (identification-based trust and information-based trust) in Table 10-11. The performance of women is slightly higher than men; women like to use people's online recommendation, willing to share their own shopping experience in virtual communities.

Figure 4 and 5 illustrates that SNS4 ("I am willing to share my own shopping experience with other through ratings and reviews") is also the most important indicator to social trust in the group of

Table 10. IPMA results of the criterion Identification-based trust (males and females)

Items	Males		Females	
	IdT_Trust (Importance)	Performances	IdT_Trust (Importance)	Performances
SNS1	0.260	67.612	0.210	67.504
SNS2	0.151	55.467	0.093	56.621
SNS3	0.142	69.067	0.148	67.428
SNS4	0.135	55.467	0.265	57.686
SNS5	0.305	66.133	0.172	67.275
SNS: Social Networking Services; IdT_Trust: Identification-based Trust See Appendix for all items.				

Table 11. IPMA results of the criterion Information-based trust (males and females)

Items	Males		Females	
	Info_Trust (Importance)	Performance	Info_Trust (Importance)	Performance
SNS1	0.215	67.610	0.166	67.504
SNS2	0.125	55.467	0.073	56.621
SNS3	0.117	69.067	0.117	67.428
SNS4	0.111	55.467	0.210	57.686
SNS5	0.252	66.133	0.136	67.275
SNS: Social Networking Services; Info_Trust: Information-based Trust See Appendix for all items.				

females. However, SNS5 (“I would like to use people’s online recommendations to buy a product”) is the most important indicator in a group of males towards social trust.

Concerning the s-commerce intention as a direct consequence, the highest performance values per group-specific (Males and Females) IPMA computation is highlighted at the indicator level (Identification-based trust, Information-based trust and Social Networking Services) effect on s-commerce intention in Table 12.

As illustrated in Figure 6, we find that the Identification-based trust IdT3 (“Overall, most people on the on the social commerce websites are honest”) is the most important indicator towards s-commerce intention in the group of females. But, the indicator IdT2 (“I know most people on the social commerce peer-recommendation site (e.g., Amazon, eBay) will do everything within their capacity to help others”) is the most important indicator towards s-commerce intention in the group of males. IdT2 is the second highest priority in females, however, in males IdT3 is the second most priority. Regarding the Information-based trust, InfT3 (“Overall, the information offered by social commerce websites is honest and sincere”) is the most important indicator towards s-commerce intention in both males and females. Also, InfT1 (“I think that the information offered by the social network commerce website (e.g., Facebook, Twitter) is trustworthy”) is the second highest priority for both males and females.

Figure 4. IPMA results of the criterion Identification-based trust (males and females)



Similarly, concerning the indirect effects of social networking services usage towards s-commerce intention. The findings show that SNS4 (“I am willing to share my own shopping experience with other through ratings and reviews”) and SNS5 (“I would like to use people’s online recommendations to buy a product”) is the important indicator in the group of females. SNS1 (“I will ask people on forums and communities to provide me with their suggestions before I go shopping”) is also slightly higher in the group of females than males. However, in males SNS3 (“I am willing to share my own shopping experience with other people on forums and communities.”) is the most important indicator. This is also aligned with the results of the direct effect of SNS indicators on social trust (Identification and Information-based trust).

## 6. DISCUSSIONS AND CONCLUSION

According to the path coefficients, as indicated in Figure 2 and Table 5, the effect of SNS on ‘Identification-based trust’ is greater than that of ‘Information-based trust.’ The results reveal that the one dimension of s-commerce trust ‘identification-based’ in turn influences s-commerce intention. But, contrary to our hypothesis, information-based trust doesn’t positively influence s-commerce intention. In other words, trust toward social networks members is positively related to s-commerce intention (Chen and Shen, 2015), which is the consumer reliability to trust on information sharing by other members of the s-commerce community. Our result is also consistent with (Shi and Chow, 2015). Our findings recommend that social networking services usage create a positive impact leading

Figure 5. IPMA results of the criterion Information-based trust (males and females)



to more Identification-based trust, which in turn leads to high s-commerce intention. This indicates a high level of identification with other members in the s-commerce environment develops positive s-commerce intention. In conclusion, this study highlighted the role of social networking services to shape social trust (Identification-based trust and Information-based trust) and increase the level of intention to buy.

The IPMA results showed clear differences in the gender-specific performance outcomes (Tables 10 to 12). The findings showed that differences exist in the usage of social networking services (SNS) and forming social trust towards s-commerce intention in both males and females. We highlighted the most important SNS indicators for triggering trust and s-commerce intention both in males and females. The findings make a strong case for target gender-specific s-commerce strategies. Previous research found that female consumers pay more attention while participating in a brand microblog, and show interest in what the company does (Zhang et al., 2014). Our results show that the use intensity of SNS (such as reviews and ranking, recommendations from friends/family, discussions, etc.) is higher in females in building the identification-based trust towards s-commerce intention. Concerning the males, the use of social networking services has a higher impact on information-based trust towards s-commerce intention.

Table 12. IPMA results of the criterion s-commerce intention (males and females)

Items	Females		Males	
	S-commerce Intention (Importance)	Performances	S-commerce Intention (Importance)	Performances
IdT1	0.132	66.591	0.129	66.410
IdT2	0.178	64.764	0.152	61.333
IdT3	0.225	60.654	0.150	59.733
InfT1	0.033	53.120	0.084	55.333
InfT2	0.022	32.268	0.044	38.667
InfT3	0.037	50.152	0.086	49.201
SNS1	0.103	67.504	0.140	67.610
SNS2	0.043	56.621	0.074	55.467
SNS3	0.071	67.428	0.068	69.067
SNS4	0.118	57.686	0.072	55.467
SNS5	0.085	67.275	0.153	66.133

SNS: Social Networking Services; IdT\_Trust: Identification-based Trust; Info\_Trust: Information-based Trust. See Appendix for all items.

## 6.1 Implications

Several theoretical and practical implications resulting from this study. First, the study provides a social trust model that offers new insight into the context of social networking services in the s-commerce environment. Concerning the previous development of s-commerce constructs and s-commerce trust in different contexts (Shi and Chow, 2015, Hajli, 2015), this research advances the understanding of social networking services and social trust by applying it in the s-commerce.

The findings also provide practical implications for s-commerce businesses. Online businesses focusing on social networking services (such as forums and communities, recommendations and referrals, and ratings and reviews) should provide their consumers with high-quality information and create an environment of mutual trust among members of the community. This implies that s-commerce managers need to focus on building social trust based on the consumers' level of social networking services. The findings have shown that consumer trust related to members identification of the s-commerce site drive consumers' intention to buy. It is imperative to enable mutual trust among members on the s-commerce site (Hajli et al., 2013).

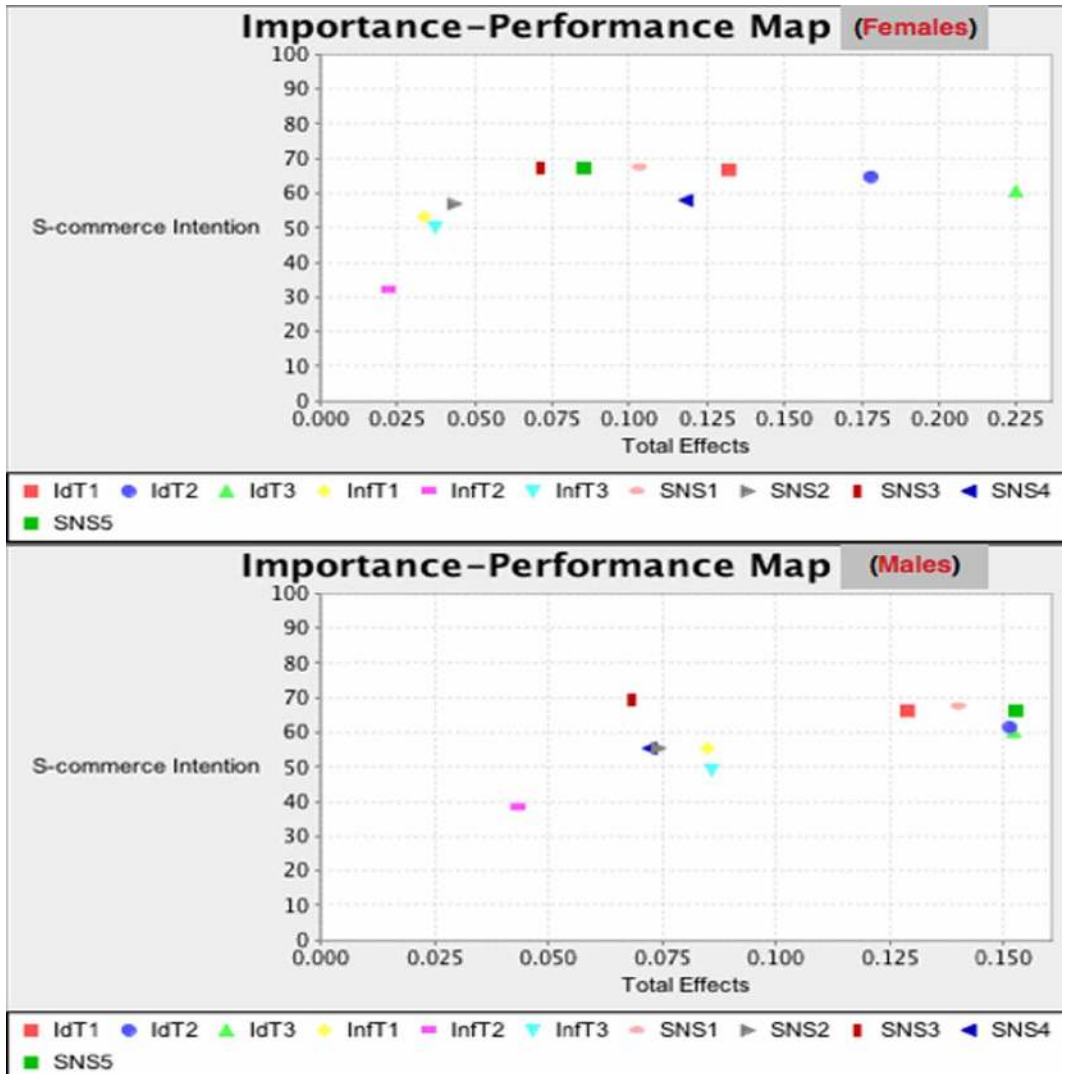
Furthermore, concerning gender differences, male and female consumers are found to exhibit different emphases in using social networking services towards their s-commerce intention. For example, firms should pay special attention to what information is posted if they intend to target male consumers. Whereas, for firms targeting female consumers, should include more discussion related activities to facilitate mutual trust among users.

## 6.2 Limitations and Future Work

There are some limitations in this study, which could be focused on future research. First, the data were collected in Sydney Australia. Therefore, the generalizability of the findings may be limited. Second, the study did not consider all possible factors that could impact social trust in the s-commerce context that has been used in prior studies. We believe that future research should include technology readiness by (Parasuraman and Colby, 2015) in the research model. Third, gender, age and online shopping experience factors are used as a control variable. In this regard, future work will also



Figure 6. IPMA results of the criterion s-commerce intention (males and females)



examine the moderating role of these control variables. However, it will be interesting to see another possible control variable such as social media usage, etc. Finally, the much wider use of the PLS-SEM capabilities in future research will allow more elaborate results.

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## APPENDIX

Table 13.

<b>Social networking services</b>	<b>Sources</b>
<b>SNS1:</b> I will ask people on forums and communities to provide me with their suggestions before I go shopping.	
(Hajli, 2013, 2015; Sohaib and Kang, 2015)	
<b>SNS2:</b> I am willing to recommend a product that is worth buying to other people on the social commerce website.	
<b>SNS3:</b> I am willing to share my own shopping experience with other people on forums and communities.	
<b>SNS4:</b> I am willing to share my own shopping experience with other through ratings and reviews.	<b>Information based trust</b>
<b>SNS5:</b> I would like to use people's online recommendations to buy a product.	
<b>InfT1:</b> I think that the information offered by social network commerce website (e.g., Facebook, Twitter) is trustworthy.	
(Shi and Chow, 2015)	<b>Identification based trust</b>
<b>InfT2:</b> I think that the information offered by social commerce peer-recommendation website (e.g., Amazon, ebay) is trustworthy.	
<b>InfT3:</b> Overall, the information offered by social commerce websites is honest and sincere.	
<b>IdT1:</b> I know most people on the social network commerce (e.g., Facebook, Twitter) page will do everything within their capacity to help others.	<b>Social commerce intention</b>
(Shi and Chow, 2015)	
<b>IdT2:</b> I know most people on the social commerce peer-recommendation site (e.g. Amazon, ebay) will do everything within their capacity to help others.	
<b>IdT3:</b> Overall, most people on the on the social commerce websites are honest.	<b>Social commerce intention</b>
<b>SIN1:</b> I am willing to buy the products recommended by people on social commerce websites.	
(Hajli, 2013; Hajli and Sims, 2015)	
<b>SIN2:</b> I will consider the shopping experiences of people on social commerce websites when I want to shop.	<b>Social commerce intention</b>
<b>SIN3:</b> I intend to continue using social commerce in the future.	