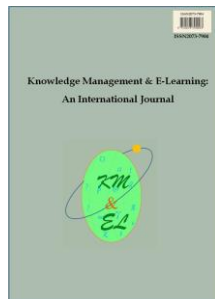# Examining the antecedents of Facebook acceptance via structural equation modeling: A case of CEGEP students

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Examining the antecedents of Facebook acceptance via structural equation modeling: A case of CEGEP students

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Abstract: Although the last decade has witnessed social networking sites of varied flavors, Facebook's user growth continues to balloon, and relatedly, Facebook remains popular among the college populace. While there has been a growing body of work on ascertaining antecedents of Facebook use among college students, *Collège d'enseignement général et professionnel* (CEGEP) students' acceptance of Facebook remains underexplored. The purpose of this study was to analyze CEGEP students' acceptance of Facebook using the technology acceptance model (TAM). Structural equation modeling was conducted on data from a survey of 214 CEGEP students. We find that Facebook use is motivated by the core TAM constructs as well as the added factors of peer influence, perceived enjoyment, perceived self-efficacy, relative advantage, risk, and trust.

Keywords: Technology acceptance; Facebook; CEGEP; Antecedents of technology use; Social media; College students

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1. Introduction

Facebook is the world's largest social networking site, with over 1.4 billion users to date (Newsroom, 2016). The way social media changes our interactions with others continues to be the subject of much debate. Turkle (2011) argued that social networks instrumentalize relationships and provide the illusion of connection yet all at once distances ourselves from each other. For instance, a Facebook friend is only superficially related to being a friend in real life. It gives the appearance of connectedness without having to engage in the hard work required for maintaining a friendship in real life.

Given the widespread adoption of social networking technology and owing to the concerns of social commentators including Turkle and others about their effects, it is important to understand why people choose to use social networks such as Facebook. To better understand how technology shapes social interactions, it appears necessary to first understand the antecedents of social network technology acceptance and use. Understanding the underlying motivations for acceptance of Facebook is key to leverage the potential of platforms such as Facebook for educational uses (Lampe, Wohn, Vtak, Ellison, & Wash, 2011; Doleck, Bazelais, & Lemay, 2016). Moreover, a better understanding of the factors of technology acceptance can help inform the design of software applications by informing on the uses to which individuals apply such technologies. Thus, the purpose of our study is to examine and understand the antecedents of Facebook acceptance among students enrolled at an English-language CEGEP located in Montreal, Canada.

2. Literature review

Technology acceptance is an important area of research in information systems (Legris, Ingham, & Collerette, 2003; Venkatesh, & Davis, 2000). A number of models have been widely applied to understand users' behavioral intentions towards use of technology, such as: Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975), Technology Acceptance Model (TAM; Davis, 1989), Theory of Planned Behavior (TPB; Ajzen, 1991), Model of PC Utilization (Thompson, Higgins, & Howell, 1991), Innovation Diffusion Theory (Rogers, 2003), and Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis, & Davis, 2003). The present study relies on the well-documented technology acceptance model (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989), which postulates that acceptance and usage of technology are affected by users' attitudes and beliefs. In this section, we first describe the TAM model, and subsequently build and present our hypothesized model.

2.1. TAM model: Core constructs

The TAM, developed by Davis (1989), has been employed in various fields to investigate a plethora of technology-acceptance related questions. It is one of the most widely cited models in information systems research. As illustrated in the common operationalization of TAM in Fig. 1, the TAM posits that users' behavioral intentions predict actual use (Davis et al., 1989). Thus, investigations are geared toward unearthing constructs which could act as determinants of intentions.

An immediate determinant of intentions is users' attitudes toward technology use, which in turn are influenced by the users' beliefs (subjective appraisal of the technology). The two personal beliefs in the TAM that exert influence on attitudes towards use include: perceived ease of use and perceived usefulness. Perceived ease of use is defined as "the

degree to which a person believes that using a particular system would be free of effort" (Davis et al., 1989, p. 320). In contrast, perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). As the model (Fig. 1) demonstrates, perceived usefulness is directly related to behavioral intention, and perceived ease of use affects behavioral intention indirectly through perceived usefulness and attitude (Davis, 1989).
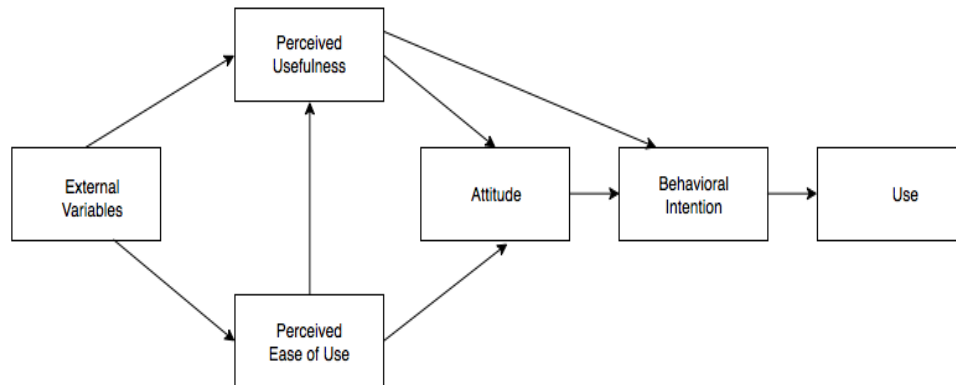
Fig. 1. Technology acceptance model. Adapted from Davis et al. (1989)

2.2. Moderating factors

Schepers and Wetzel (2007) found moderating effects for type of respondent, type of technology, and cultural setting. In their meta-analysis, they found significant effects for respondent type, technology type, and cultural setting. Students showed stronger effects for 12 of 15 pairwise comparisons than non-students. Microcomputer adoption studies showed lower effects in general. These findings are in alignment with Gefen, Karahanna, and Straub (2003) who found that consumer habits account for up to 40% of variance in intentions to use. As Schepers and Wetzel (2007) write, "[i]n these cases, repeated previous behavior dictates current behavior independently of rational assessments (Triandis, 1971)" (p. 100). They also found that cultural setting affected 7 of 15 relationships by comparing Western and non-Western studies, however, not in the direction that one would expect given that in collective societies, subjective norm would be expected to have a stronger influence on intentions to use but that does not appear to be the case. The authors interpret this as supporting findings by Straub, Keil, and Brenner (1997) and McCoy, Everard, and Jones (2005) that TAM might be specific to Western societies.

2.3. TAM model: Original formulations of the TAM

While the original TAM has been empirically tested and validated in a number of studies and contexts (Venkatesh & Davis, 2000), researchers have pushed for a need to include additional variables in the original TAM (Venkatesh & Davis, 1996). In studies extending the TAM, researchers have included a number of domain-specific constructs to fit their research context. For the present study, we employ an extended TAM incorporating six plausible constructs drawn from the literature on technology acceptance representing antecedents to the TAM, namely: trust, risk, peer influence, relative advantage, perceived self-efficacy, and perceived enjoyment. Since the study aimed to identify factors that influence acceptance and use of Facebook by CEGEP students, we chose these added

constructs as they appeared salient to understanding social network use among a youthful college-age population.

The constructs in the original TAM include: perceived usefulness, perceived ease of use, attitude toward use, behavioral intentions, and use. Based on prior research, the causal linkage flows of the conventional relationships of the TAM are formulated as follows:

H1: Perceived usefulness is positively related to behavioral intention

H2: Perceived usefulness is positively related to attitude toward use

H3: Perceived ease of use is positively related to attitude toward use

H4: Perceived ease of use is positively related to perceived usefulness

H5: Attitude toward use is positively related to behavioral intention

H6: Behavioral Intention is positively related to use

Along with the baseline formulations, our expanded TAM included the causal linkage flows of the additional constructs, trust, risk, peer influence, relative advantage, perceived self-efficacy, and perceived enjoyment, which are formulated below. In the section that follows, we turn our attention to the extended constructs and the relationship formulations.

3. TAM model: Extended constructs and relationship formulations

In this section, we introduce the additional salient constructs considered for inclusion in our proposed research model. Additionally, we also enumerate the hypotheses constructed based on the previous studies.

3.1. Peer influence

Subjective norm, a social influence variable, is defined as "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991, p. 188) and has been shown to affect user commitment toward technology use. Subjective norms reflect how users are influenced by others' perceptions. Venkatesh and Davis (2000) propose the inclusion of subjective norm in an extension to the technology acceptance model (TAM2). Peer influence, a specific form of subjective norm, has been studied in the social and behavioral psychology domain (MacCallum, 2011; Ryan, 2000), and, according to Taylor and Todd (1995), peer influence is considered to be a determinant in technology acceptance. Moreover, others have also acknowledged the importance of social norms on perceived usefulness (Yi, Jackson, Park, & Probst, 2006). Schepers and Wetzels (2007), who conducted a meta-analysis of the technology acceptance model, investigated the subjective norm antecedent and moderation effects of respondent type, technology type, and cultural setting. In their analysis, a total of 51 articles reporting on a total of 63 studies met the criteria and were included. Their analysis largely confirmed the TAM2 model but also discovered two additional relationships: (1) perceived ease of use → behavioral intention and (2) subjective norm → attitude towards use.

Social norms are broader and usually cover the influence of schools, professors, higher authority, and other aspects of the social context. Since Facebook is a medium where you are generally dealing with your peers, we decided to focus on peer influence

instead. In today's age, peers exert an important influence on adolescents (Neufeld & Maté, 2006). Peer opinion could influence users to conform to the behaviors or suggestions of their friends, thus increasing the perceived usefulness of technology through a kind of virtuous cycle or feedback loop. This leads to the hypothesis:

H7: *Peer influence is positively related to perceived usefulness*

3.2. Relative advantage

Rogers (2003) defined relative advantage as the "degree to which an innovation is perceived as being better than the idea it superseded" (p. 212). While the constructs of relative advantage and perceived usefulness have been used interchangeably in the literature (Venkatesh et al., 2003), others consider the two constructs to be conceptually different. For example, Lok (2015) presents the differences between the two constructs as: "relative advantage is in relative sense whereas perceived usefulness is in absolute sense" (p. 406). Further, Lok (2015) suggests that if users do not see the relative advantage of a technology, they are less likely to assess it as useful. Thus, if a user perceives a relative advantage in using one technology over another, then he/she will likely perceive its usefulness. This leads to the hypothesis:

H8: *Relative advantage is positively related to perceived usefulness*

3.3. Perceived self-efficacy

Users' confidence in their ability to efficiently make use of a technology can affect acceptance behaviors. Bandura's (1995) concept of self-efficacy beliefs has been invoked to provide a potential explanation for this relationship. According to Bandura (1995), perceived self-efficacy "refers to beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (p. 2). Over the years, self-efficacy has been operationalized at situation or context specific levels (Agarwal, Sambamurthy, & Stair, 2000). For example, computer self-efficacy, a context-specific form of self-efficacy, has been defined as the belief of user's capability to use computers in completing a task (Compeau & Higgins, 1995). Research examining computer self-efficacy in the context of technology use has documented the positive influence of self-efficacy on perceived ease of use (Agarwal et al., 2000; McFarland & Hamilton, 2006; Venkatesh, 2000). This leads to the hypothesis:

H9: *Self-efficacy is positively related to perceived ease of use*

3.4. Perceived enjoyment

Venkatesh (2000) defines perceived enjoyment as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (p. 351). The literature on technology use and adoption has considered perceived enjoyment as a type of intrinsic motivation (Davis, Bagozzi, & Warshaw, 1992; Teo, Lim, & Lai, 1999; Venkatesh, 2000). Research examining determinants of perceived ease of use has shown that perceived enjoyment exerts a positive influence on perceived ease of use (Venkatesh, 2000). This leads to the hypothesis:

H10: *Perceived enjoyment is positively related to perceived ease of use*

3.5. Risk and trust

Risk and trust, two interrelated variables (Mayer, Davis, & Schoorman, 1995), are salient beliefs involved in relationships and/or transactions. Risk and trust have been shown to be influencing constructs in technology use in the information systems literature (Gefen et al., 2003; Pavlou, 2003), particularly in the domains of e-commerce and online banking. However, these constructs have received scarce coverage in the computer-mediated communications literature. Since online social networks are built around online behaviors and information transactions, the notion of risk and trust are likely to be influencing factors in the use of a social network such as Facebook. Hence, research is needed on the nature and specific influence of risk and trust on social network use.

Appropriating the tested roles of risk and trust from the information systems literature, we propose the following links between these two variables and our expanded TAM. In online transactions, users' lack of trust can be an obstacle to both adoption and acceptance of technology (Pavlou, 2003; Yousafzai, Foxall, & Pallister, 2010). Although numerous definitions of trust exist, for the purposes of this paper, trust is viewed in terms of transactions in a social network and the social network as a transacting entity. Trust has been shown to positively impact attitudes (Jarvenpaa, Tractinsky, & Vitale, 2000). Trust has also been shown to reduce risk beliefs about transactions with entities (Pavlou, 2003; Yousafzai et al., 2010). Thus, trust and risk appear to be inversely related. Further, trust positively influences behavioral intentions since it reduces uncertainty (Pavlou, 2003). This leads to the hypotheses:

H11: Trust is positively related to attitudes

H12: Trust is negatively related to risk

H13: Trust is positively related to behavioral intentions

Being online inherently poses a level of uncertainty and risk for users (Pavlou, 2003; Yousafzai et al., 2010), as actions can have unanticipated consequences. Users' willingness to engage in the use of technology is negatively impacted by risk perceptions since perceived risk has been shown to negatively impact behavioral intentions (Pavlou, 2003). Indeed, the theory of reasoned action (Fishbein & Ajzen, 1975) posits that a users' willingness is affected by his/her risk perceptions. This leads to the hypothesis:

H14: Risk is negatively related to behavioral intention

3.6. Research model

Based on the above discussion accounting for the additional constructs and relationship formulations, we conceptualize and present the following augmented research model (Fig. 2) to explicate students' Facebook usage.
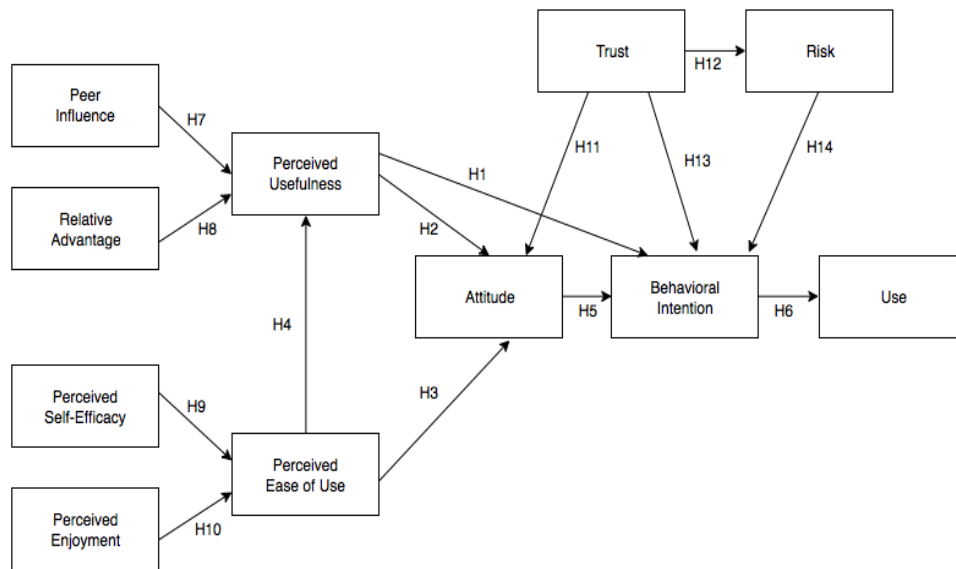
Fig. 2. Proposed model

4. Methodology

Survey measures were adapted to the context of Facebook to test our proposed model. The multiple-item questionnaire on Facebook use was administered to students at an English-language CEGEP in Montreal, Quebec.

4.1. Instruments

For this study, existing scales (Davis et al., 1989; Gefen, 2002; Lai & Chen, 2011; Moore & Benbasat, 1991; Taylor & Todd, 1995) were adapted to fit the study context and purpose. The questionnaire consisted of 40 items to measure the 11 constructs in the proposed research model. The constructs were measured on a 7-point Likert scale (*from 1 = strongly disagree to 7 = strongly agree*) because it is considered a more accurate measure of a participant's true evaluation (Jamieson, 2004; Finstad, 2010).

4.2. Data collection and participant profile

Participants were volunteers drawn from class sections at an English-language CEGEP in Montreal, Quebec. A total of 214 usable responses (after removal of invalid responses such as responses with multiple selections for a single item) were included in the final analysis. Of the 214 participants, 100 were female and 114 were male; thus, gender was relatively evenly distributed. The average age of participants was 18.173 (*SD*: 1.354).

5. Data analysis and findings

Structural equation modeling was employed to construct and test our proposed model. Several factors affect sample size requirements in conducting structural equation modeling. The sample size in this study meets the general guidelines suggested in the

PLS-SEM literature: "(1) ten times the largest number of formative indicators used to measure one construct or (2) ten times the largest number of structural paths directed at a particular latent construct in the structural model" (Hair, Ringle, & Sarstedt, 2011, p. 144). The present study used a partial least squares (PLS) path modeling approach to build the structural model and test the proposed hypotheses. PLS modeling (Wold, 1982) is a second-generation statistical technique that belongs to the class of variance-based structural equation modeling. PLS is suitable for analyses that have small sample size and less stringent assumption requirements (Chin, 1998; Hulland, 1999). In this study, the SmartPLS software (Ringle, Wende, & Becker, 2015) was used for generating and evaluating the measurement and, subsequently, the structural model. Our analysis follows the general two-step approach to PLS-SEM: a test of the measurement model and then an estimation of the structural part of the SEM (Hair et al., 2011).

5.1. Measurement model

The first step of the analysis involved assessing the measurement model by means of factor analysis using the PLS algorithm. Measurement model assessment is required to evaluate the psychometric properties, i.e., consistency and validity of the variables. The adequacy of the measurement model was assessed using factor loadings, internal consistency reliability, convergent validity, and discriminant validity statistics. In Table 1, the endogenous and exogenous constructs are abbreviated to ease readability.

Table 1
Endogenous and exogenous constructs

Endogenous constructs	Abbreviation	Exogenous constructs	Abbreviation
Perceived Usefulness	PUS	Trust	TRU
Perceived Ease of Use	PEU	Peer Influence	PIN
Attitude	ATT	Relative Advantage	RAD
Risk	RIS	Perceived Self-Efficacy	PSE
Behavioural Intention	BIN	Perceived Enjoyment	PEN
Use	USE		

The reliabilities for items are measured via the factor loadings. It is generally recommended that the factor loadings should exceed the threshold value of 0.70 (Chin, 1998); however, others consider a cut-off value of 0.50 to be sufficient (Hulland, 1999). As presented in Table 2, all loadings were greater than 0.50, with majority of loadings exceeding 0.70. Thus, reliabilities for all items were assured. To verify the reliability of the constructs, composite and Cronbach's alpha are conventionally reported. However, composite reliability is generally considered a better measure of internal consistency (Fornell & Laker, 1981; Teo & Fan, 2013). The composite reliabilities of the different measures ranged from 0.796 to 0.958 (Table 2). All composite reliability values exceeded the recommended threshold value of 0.70 (Gefen, Straub, & Boudreau, 2000), suggesting adequate composite reliabilities. Convergent validity was assessed through the Average Variance Extracted (AVE) test on the variables. The average variance extracted of the different measures ranged from 0.505 to 0.885 (Table 2); these values are greater than the recommended threshold value of 0.50 (Fornell & Laker, 1981).

Table 2
Factor loadings, internal consistency reliability, & convergent validity

Construct	Items	Loading	Composite Reliability	AVE
Perceived Usefulness	PUS1	0.717	0.857	0.505
	PUS2	0.700		
	PUS3	0.544		
	PUS4	0.776		
	PUS5	0.653		
	PUS6	0.836		
Perceived Ease of Use	PEU1	0.853	0.918	0.690
	PEU2	0.871		
	PEU3	0.853		
	PEU4	0.783		
	PEU5	0.790		
Attitude	ATT1	0.769	0.888	0.614
	ATT2	0.776		
	ATT3	0.783		
	ATT4	0.742		
	ATT5	0.845		
Trust	TRU1	0.784	0.939	0.794
	TRU2	0.923		
	TRU3	0.931		
	TRU4	0.917		
Risk	RIS1	0.836	0.923	0.749
	RIS2	0.861		
	RIS3	0.874		
	RIS4	0.889		
Peer Influence	PIN1	0.830	0.796	0.567
	PIN2	0.703		
	PIN3	0.721		
Relative Advantage	RAD1	0.877	0.873	0.696
	RAD2	0.805		
	RAD3	0.819		
Perceived Self-Efficacy	PSE1	0.935	0.950	0.863
	PSE1	0.959		
	PSE1	0.892		
Perceived Enjoyment	PEN1	0.946	0.958	0.885
	PEN1	0.948		
	PEN1	0.928		
Behavioural Intention	BIN1	0.947	0.934	0.875
	BIN1	0.924		
Use	USE1	0.908	0.910	0.834
	USE1	0.918		

To assess discriminant validity, traditionally two approaches have been used: The Fornell-Larcker criterion (Fornell & Larcker, 1981) and cross-loadings. Following the Fornell-Larcker criterion, the square roots of the AVEs for two latent variables must each be greater than the correlations between those two variables (Fornell & Larcker 1981). In Table 3, the square roots of the AVEs are highlighted in bold along the diagonal. It can be observed that the Fornell-Larcker criterion is met by applying the methodology suggested by Fornell & Larcker (1981), i.e., all the diagonal values are greater than the off-diagonal numbers in the corresponding rows and columns. Thus, the data present adequate discriminant validity. Recently, Henseler, Ringle, and Sarstedt (2015) proposed an alternate approach, the heterotrait-monotrait ratio of correlations (HTMT) as an alternative to assess discriminant validity. We supplement the previous discriminant validity assessment using the HTMT criterion. According to Henseler et al. (2015), if the HTMT value is below 0.90 for two constructs and the HTMT confidence intervals does not contain 1 then discriminant validity is established. In Table 4, all HTMT values are below the 0.90 cut-off value, and in Table 5 none of the intervals contains 1, thus ensuring discriminant validity.

Table 3
Discriminant validity check

	ATT	BIN	PEN	PEU	PIN	PSE	PUS	RAD	RIS	TRU	USE
ATT	**0.784**										
BIN	0.640	**0.935**									
PEN	0.677	0.647	**0.941**								
PEU	0.432	0.336	0.380	**0.831**							
PIN	0.423	0.458	0.375	0.256	**0.753**						
PSE	0.300	0.271	0.347	0.683	0.362	**0.929**					
PUS	0.709	0.551	0.563	0.320	0.428	0.206	**0.711**				
RAD	0.643	0.540	0.507	0.276	0.417	0.159	0.626	**0.834**			
RIS	0.076	0.092	0.113	0.104	-0.077	0.007	-0.006	-0.007	**0.865**		
TRU	0.500	0.430	0.410	0.417	0.279	0.325	0.332	0.244	0.438	**0.891**	
USE	0.510	0.421	0.334	0.216	0.402	0.303	0.371	0.300	0.006	0.270	**0.913**

Table 4
Discriminant validity check- HTMT

	ATT	BIN	PEN	PEU	PIN	PSE	PUS	RAD	RIS	TRU	USE
ATT											
BIN	0.733										
PEN	0.746	0.721									
PEU	0.493	0.383	0.419								
PIN	0.590	0.623	0.486	0.346							
PSE	0.342	0.309	0.376	0.752	0.486						
PUS	0.854	0.648	0.638	0.383	0.601	0.254					
RAD	0.788	0.655	0.583	0.341	0.607	0.203	0.779				
RIS	0.131	0.106	0.128	0.119	0.111	0.047	0.082	0.072			
TRU	0.561	0.484	0.445	0.465	0.364	0.357	0.386	0.288	0.482		
USE	0.623	0.501	0.384	0.256	0.592	0.356	0.467	0.380	0.048	0.313	

Table 5
Discriminant validity check- HTMT confidence intervals

	Original Sample	2.5%	97.5%		Original Sample	2.5%	97.5%
BIN → ATT	0.733	0.635	0.818	RIS -> ATT	0.131	0.091	0.275
PEN → ATT	0.746	0.648	0.827	RIS -> BIN	0.106	0.040	0.296
PEN → BIN	0.721	0.604	0.817	RIS → PEN	0.128	0.051	0.296
PEU → ATT	0.493	0.357	0.619	RIS → PEU	0.119	0.066	0.296
PEU → BIN	0.383	0.256	0.504	RIS → PIN	0.111	0.082	0.325
PEU → PEN	0.419	0.277	0.557	RIS → PSE	0.047	0.044	0.189
PIN → ATT	0.590	0.439	0.740	RIS → PUS	0.082	0.085	0.249
PIN → BIN	0.623	0.470	0.771	RIS → RAD	0.072	0.071	0.245
PIN → PEN	0.486	0.313	0.648	TRU → ATT	0.561	0.436	0.671
PIN → PEU	0.346	0.230	0.525	TRU → BIN	0.484	0.352	0.597
PSE → ATT	0.342	0.206	0.483	TRU → PEN	0.445	0.304	0.568
PSE → BIN	0.309	0.183	0.432	TRU → PEU	0.465	0.341	0.575
PSE → PEN	0.376	0.244	0.505	TRU → PIN	0.364	0.195	0.539
PSE → PEU	0.752	0.626	0.859	TRU → PSE	0.357	0.235	0.468
PSE -> PIN	0.486	0.333	0.637	TRU → PUS	0.386	0.259	0.522
PUS -> ATT	0.854	0.770	0.936	TRU → RAD	0.288	0.136	0.443
PUS -> BIN	0.648	0.521	0.764	TRU → RIS	0.482	0.278	0.670
PUS -> PEN	0.638	0.519	0.743	USE → ATT	0.623	0.484	0.751
PUS -> PEU	0.383	0.237	0.540	USE → BIN	0.501	0.341	0.655
PUS -> PIN	0.601	0.449	0.769	USE → PEN	0.384	0.223	0.535
PUS -> PSE	0.254	0.140	0.417	USE → PEU	0.256	0.119	0.419
RAD -> ATT	0.788	0.690	0.881	USE → PIN	0.592	0.415	0.760
RAD -> BIN	0.655	0.536	0.759	USE → PSE	0.356	0.221	0.488
RAD -> PEN	0.583	0.447	0.707	USE → PUS	0.467	0.328	0.598
RAD -> PEU	0.341	0.178	0.516	USE → RAD	0.380	0.213	0.544
RAD -> PIN	0.607	0.434	0.792	USE → RIS	0.048	0.042	0.203
RAD -> PSE	0.203	0.100	0.358	USE → TRU	0.313	0.163	0.458
RAD -> PUS	0.779	0.669	0.888				

5.2. Structural model

After checking the individual reliability for each item, and assessing the convergent and discriminant validity of the constructs, the structural model was examined to test the hypotheses by examining the path coefficients and coefficient of determination values. In this study, the structural model was comprised of endogenous constructs (PUS, PEU, ATT, RIS, BIN, & USE) and exogenous constructs (PIN, RAD, PSE, PEN, and TRU). To assess the structural model, both the PLS algorithm and bootstrapping technique were employed.

The PLS path modeling estimation (generated by the PLS algorithm) is illustrated in Fig. 3, and the bootstrapping results (t-values computed by creating pre-specified samples) are presented in Fig. 4. The properties of the resulting path coefficients (β), path significance (*t*-statistic), and the coefficient of determination (R^2) were used to assess the model. The model was assessed at the 0.05 significance level using two-tailed t-tests. The R^2 values of endogenous latent variables are assessed using the criterion suggested by (Hair et al., 2011): 0.75 is substantial, 0.50 is moderate, and 0.25 is weak. The structural model was examined to judge whether each of the hypotheses was either supported or rejected.

Predictive relevance was also assessed. Hair et al. (2011) suggest examining Stone-Geisser's Q^2 values as a criterion of predictive relevance. According to their criteria, Q^2 values greater than zero indicate that the exogenous constructs have predictive relevance for the endogenous construct. Following the blindfolding procedure, an omission distance was specified as suggested by Hair et al. (2011). All Q^2 values in Table 6 are greater than zero, indicating that the model had acceptable predictive relevance.

Table 6
Blindfolding results

Construct	SSO	SSE	Q^2 (=1-SSE/SSO)
ATT	1,070.000	683.974	0.361
BIN	428.000	265.558	0.380
PEN	642.000	642.000	---
PEU	1,070.000	711.071	0.335
PIN	642.000	642.000	---
PSE	642.000	642.000	---
PUS	1,284.000	1,007.897	0.215
RAD	642.000	642.000	---
RIS	856.000	737.972	0.138
TRU	856.000	856.000	---
USE	428.000	367.050	0.142

Fig. 3. PLS-SEM results

Fig. 4. Bootstrapping results
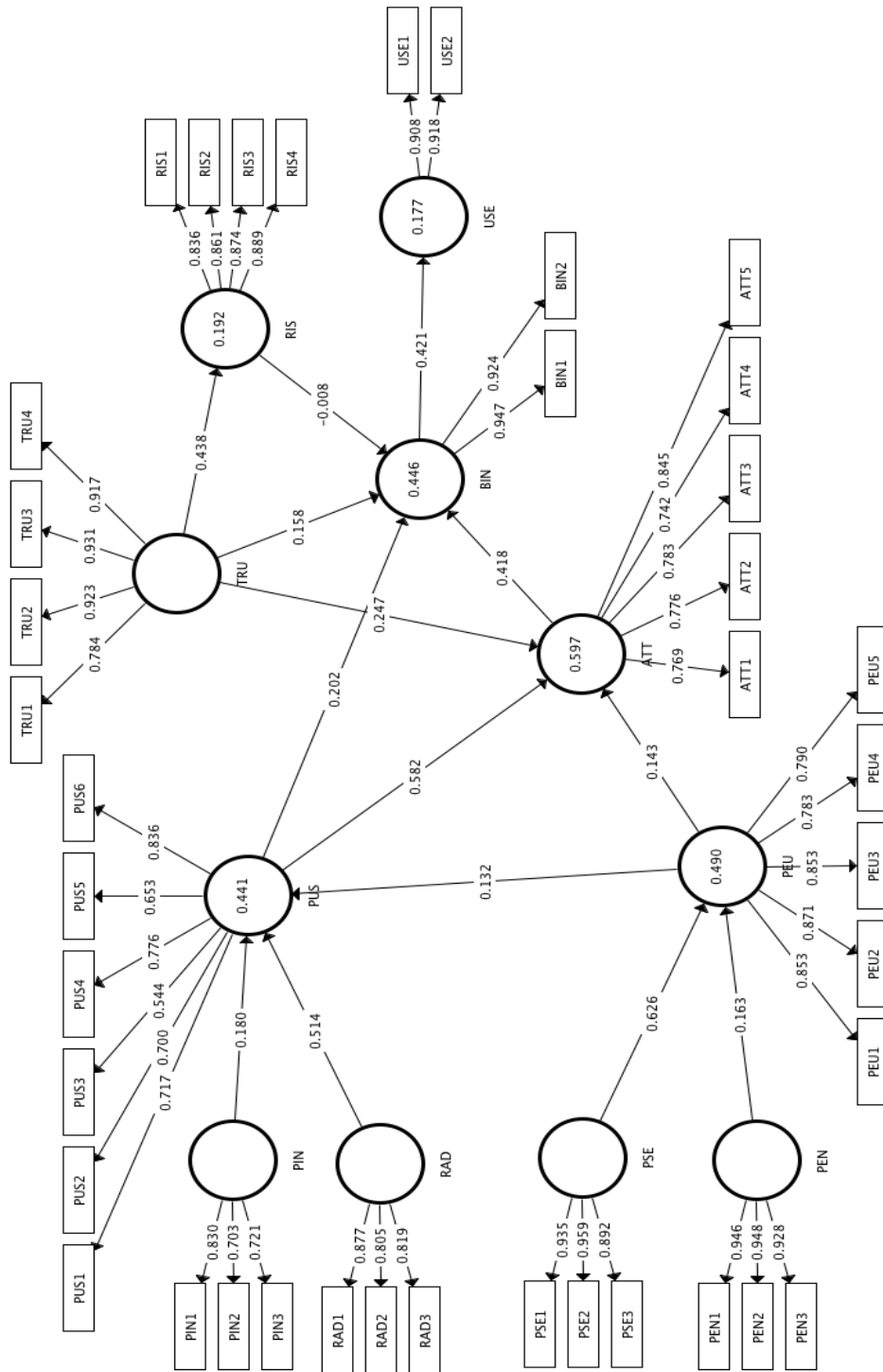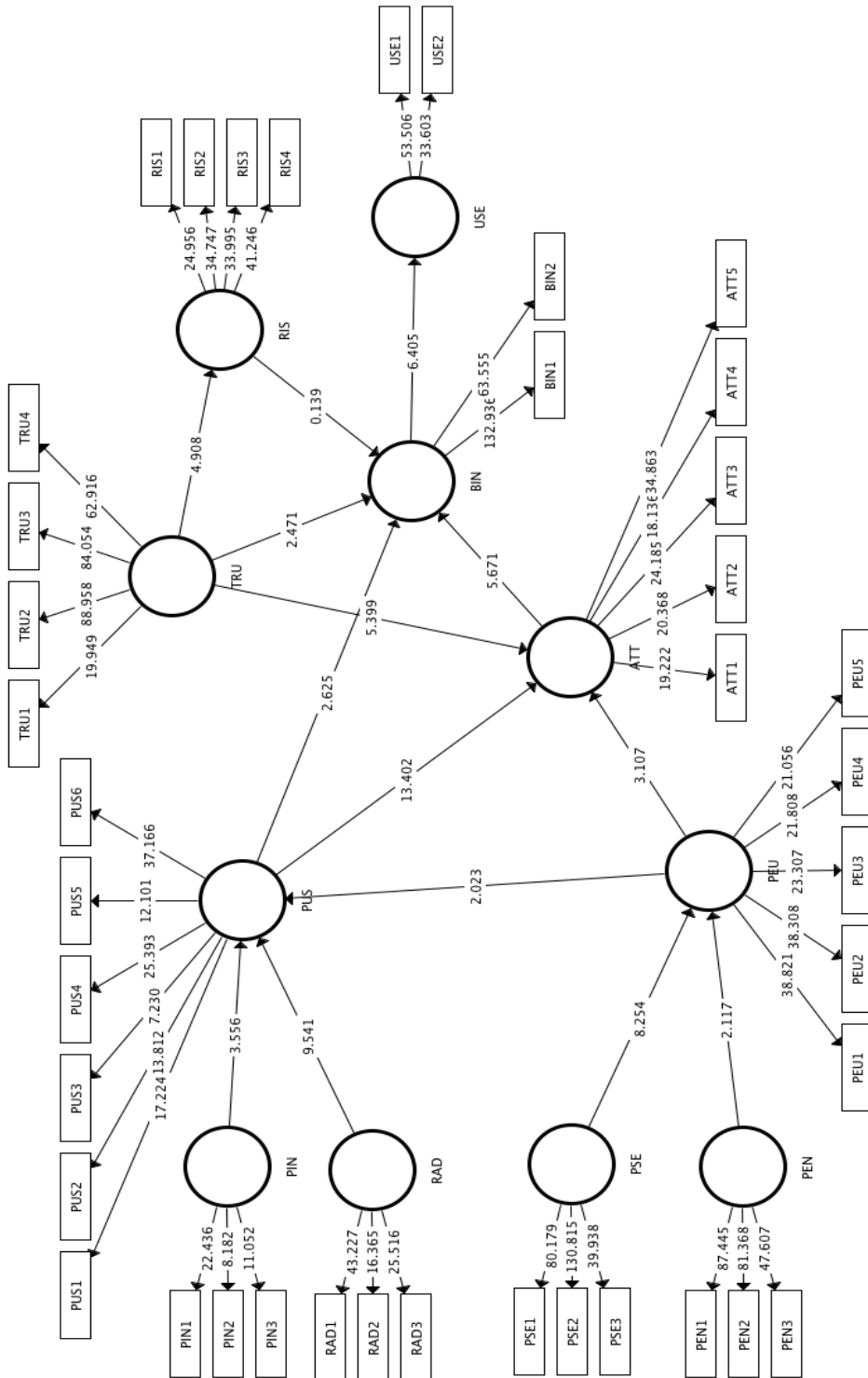
From the results, the following observations can be made:

A) Endogenous variable variance

- The R^2 is 0.177 (weak) for the USE latent variable. The BIN latent variable helped explain 17.7% of the variance in USE.
- The R^2 is 0.446 (close to moderate) for the BIN latent variable. The four latent variables (PUS, ATT, TRU, and RIS) explain 44.6% of the variance in BIN.
- The R^2 is 0.597 (moderate) for the ATT latent variable. The three latent variables (PUS, PEU, and TRU) explain 59.7% of the variance in ATT.
- The R^2 is 0.441 (close to moderate) for the PUS latent variable. The three latent variables (PIN, RAD, and PEU) explain 44.1% of the variance in PUS.
- The R^2 is 0.490 (moderate) for the PEU latent variable. The two latent variables (PEN and PSE) explain 49.0% of the variance in PEU.
- Finally, the R^2 is 0.192 (weak) for the RIS latent variable. The TRU latent variable helped explain 19.2% of variance in RIS.

B) Inner model path coefficients

Bootstrapping was used to assess the path coefficients' significance. From Fig. 4, we can check for the significance of the path coefficients of the inner model. Using a two-tailed *t*-test with a significance level of 0.05, the path coefficient is considered significant if the *t*-statistic exceeds 1.96 (Hair et al., 2011). The results of the hypothesis testing are presented in Table 7.

Table 7
Hypotheses testing

Hypothesis	Path	β	*t*-statistic	Result
H1	PUS → BIN	0.202	2.625**	Supported
H2	PUS → ATT	0.582	13.402**	Supported
H3	PEU → ATT	0.143	3.107**	Supported
H4	PEU → PUS	0.132	2.023*	Supported
H5	ATT → BIN	0.418	5.671**	Supported
H6	BIN → USE	0.421	6.405**	Supported
H7	PIN → PUS	0.180	3.556**	Supported
H8	RAD → PUS	0.514	9.541**	Supported
H9	PSE → PEU	0.626	8.254**	Supported
H10	PEN → PEU	0.163	2.112*	Supported
H11	TRU → ATT	0.247	5.399**	Supported
H12	TRU → RIS	0.438[†]	4.908**	Not Supported
H13	TRU → BIN	0.158	2.471*	Supported
H14	RIS → BIN	-0.008	0.139	Not Supported

Note. *$p<.05$. **$p<.01$. †Direction of path relationship not supported

Of the 14 hypotheses tested, only two were unsupported (H12 and H14). Overall, the results confirmed the conventional relationships in the original TAM. Specifically, perceived usefulness will have a positive effect on behavioral intention and attitude toward use; perceived ease of use will have a positive effect on attitude toward use and perceived usefulness; attitude toward use will have a positive effect on behavioral intention; and, behavioural intentions will have a positive effect on use.

For the additional linkages tested, two linkages were not supported (TRU → RIS and RIS → BIN). Contrary to our hypothesized link between TRU and RIS, we found a positive relationship between the two constructs. One possible explanation for this can be made via Luhmann's double contingency theory (Holmström, 2007; Vanderstraeten, 2002), which we elaborate on in the discussion below. Though the relationship between RIS and BIN was found to be negative as hypothesized, there was no statistical support for this link.

6.   Discussion

Our findings are largely in line with other models which have integrated subjective norm and/or other moderating factors (Burton-Jones & Hubona, 2006; King & He, 2006; Sun & Zhang, 2006; Schepers & Wetzels, 2007). One problem that is consistently raised is the large variability in correlations and model inclusions (King & He, 2006). Although the number of moderating variables and the exact relationships are not consistent across each study discussed here, all find support for the effect of moderating variables on the TAM construct.

Findings in this study support Schepers and Wetzels' (2007) meta-analysis results. We found a moderate effect ($R^2 = 0.441$) for PUS where the three latent variables (PIN, RAD, and PEU) explained 44.1% of the variance in PUS. There are conceptual similarities between TAM and IDT, namely perceived usefulness and perceived ease of use in TAM are similar constructs to relative advantage and complexity in IDT (Yi et al., 2006, p.351). Our analysis suggests that RAD and PUS are closely related constructs.

Our findings are in line with King and He's (2006) meta-analysis of 88 empirical studies, which supported the TAM model finding that perceived usefulness mediated perceived ease of use and behavioral intention. According to them, the only context where perceived ease of use has a direct influence was in Internet applications. They also examined moderating effects of type of user and type of usage, concluding that students could be substituted for professionals but not general users, and task and office applications could be considered a single category in TAM research. King and He's (2006) findings on type of user contrast with those of Schepers and Wetzel (2007), however, this could be attributed to the different ways the variables are categorized (in the first, student vs. non-student, and in the second, student, professional, and general user).

Burton-Jones and Hubona (2006) found that external variables could have a direct effect on usage behaviors over and above their mediated effect. However, most TAM research focuses on the core constructs' mediating effects and have not explored whether antecedents such as subjective norm and peer influence have unmediated effect on behavioral intentions (Teo, 2009). Further, McFarland and Hamilton (2006) found that contextual specificity variables such as computer anxiety, prior experience, others' use, organizational support, task structure, system quality, strongly influenced system usage. This is of interest since we did not test for direct effects of our exogenous constructs on usage behaviors and would potentially warrant further study. However, the results show

the strongest relationships between the core constructs, and furthermore, among those factors which are conceptually related to the core constructs, i.e., RAD → PUS, and PSE → PEU, which we interpret as the potential evidence for the mediating effect of the PUS and PEU constructs.

Sun and Zhang (2006) summarize their review in a model which largely corresponds with that resulting from Schepers and Wetzel's (2007) meta-analysis. However, they point out that while most of the relationships are statistically significant, they are not entirely consistent between studies. They also reviewed the literature on moderating effects and identified ten moderating factors which they categorize into organizational (voluntariness, task/profession), technological (individual/group, purpose, complexity), and individual factors (intellectual capability, cultural background, gender, age, and experience). Similarly, our model found significant effects for self-efficacy, relative advantage, trust and risk, and subjective norm on perceived ease of use, perceived usefulness, attitude, and behavioral intention. Our results corroborate the direct relationship between perceived usefulness and behavioral intention but also find support for a mediating effect of attitude from perceived ease of use to behavioral intention, which is not included in the meta-analyses discussed above. Unlike these meta-analyses we did not test for direct relationships between subjective norm and attitude, perceived ease of use, or behavioral intention.

6.1. The counter-intuitive link between trust and perceived risk

We found a positive relationship between trust and perceived risk contrary to our hypothesizing and contrary to earlier findings by Pavlou (2003) and other studies examining mitigation strategies of perceived information risks among telecommunication services (Libaque-Saenz, Wong, Chang, Ha, & Park, 2014). We interpret this finding using Luhmann's double contingency theory (Holmström, 2007; Vanderstraeten, 2002 for relevant discussions). In his development of Talcott Parson's problem of double contingency, i.e., how communication is possible between two actors whose understanding is contingent on the recognition of the other, Luhmann examined the way that social systems evolve reflexively in complex and non-linear fashion.

In the context of Facebook, the problem can be formulated as why agents act in ways that appear contrary to their interests even when the anticipated benefits may not outweigh the perceived risks. In Luhmann's analysis, the answer lies in the differential and evolving meaning of risk and trust for the agents involved. In the case of Facebook, the social media company has faced increasing scrutiny of its privacy policy even as people have increasingly moved their social lives online. As Turkle (2011) describes, we have grown accustomed to sharing a great deal of information about ourselves and have become inured to airing our personal lives in public. We don't consider this strange even though a few years ago many would have found the same actions as unwarranted encroachment on our private lives. We may indeed doubt the security of online participation in social networks or otherwise be fully apprised of the risks inherent in such activity, and decide to participate despite such risks. Indeed, Gefen et al. (2003) report that e-vendor customers' estimations of trust, usefulness, and ease of use have been shown to change over time. The authors found in their study that repeat customers were influenced in their purchase intentions both by trust and perceived usefulness in the e-vendor, whereas potential customers were only influenced by trust and not perceived usefulness. Gefen et al's (2003) findings are in alignment with our findings that trust is correlated with risk. Proficient users of social networks like Facebook have a better understanding of how to use the social network and are likely influenced both by trust

and perceived usefulness, while still being wary of the risks inherent to sharing personal information online. Thus, it appears that users' risk tolerance might differ depending on their familiarity with the platform. However, this question requires further study.

6.2. Contributions of the study

This study is original in that it is the first to explore Facebook acceptance among CEGEP students. A better understanding of CEGEP students' technology acceptance can inform educators and technologists design of instructional applications and of development of information technologies targeting this population.

6.3. Limitations and future directions

Notwithstanding the strengths of the present study, there are some limitations that need to be addressed. First, the findings of the study are limited to the sample tested, which places restrictions on the generalizability of the results. There is a need to replicate the model in additional samples at different college levels, countries, and cultural contexts, in order to further test and evaluate the level of generalizability. Second, the research design employed in the study introduces some inherent limitations such as the issues associated with use of self-reported data. Further the cross-sectional design does not allow for causal interpretations, rather our findings are limited to general relatedness; this can be ameliorated in the future with longitudinal research. Finally, there are other constructs that could be related to the acceptance process, which future efforts could augment the model with additional salient constructs.

We did not test for the moderating influences of demographic factors such as age and gender; we leave such extensions to future research. A particularity of the study was the focus on Facebook as a platform but Facebook is now a rather ubiquitous part of everyday life. Therefore, generalizations to other populations and to other social networking sites are not advised. It would be interesting to apply the model for understanding acceptance and use of other social networking platforms among college-age student populations as well.

6.4. Conclusion

The present study investigated the antecedents of Facebook use among CEGEP students. Using a PLS modeling approach, the hypothesized model was shown to be a good fit with our sample data. Our findings support the usefulness of TAM as a framework for investigating technology acceptance among college-age student populations.

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