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Abstract

Purpose – The purpose of this paper is to identify and understand factors that influence users' acceptance of Software-as-a-Service (SaaS) collaboration tools in organizational settings.
Design/methodology/approach – This paper develops a research model based on the Expectation Confirmation Model (ECM). Using data collected from a field study of Google Docs, the research model and related hypotheses are tested by structural equation modeling.
Findings – Users' confirmation with expectations positively affect their perceived usefulness and satisfaction level; Users' perceived usefulness and satisfaction positively affect their intention to continue using such collaboration tools. Users' prior experience with such tools and their IT skills have a moderating effect on the relationships among confirmation, perceived usefulness, satisfaction, and continuance intention.
Research limitations/implications – This study identifies the theoretical foundations of user acceptance of SaaS collaboration tools in the context of mandatory adoption. This empirical study, based on an established theoretical foundation, will help the research community to gain a deeper understanding of user acceptance of cloud computing technologies, in particular, SaaS collaboration tools.
Practical implications – The findings of this study can provide vendors and implementing organizations with useful strategies and tactics to enhance users' acceptance of SaaS collaboration tools.
Originality/value – With the increasing popularity of cloud computing technologies, there have been ongoing concerns about the effectiveness of SaaS collaboration tools in organizational settings. This study is one of the first empirical research to examine the factors influencing users' acceptance of SaaS collaboration tools.

Keywords Cloud computing, Expectation Confirmation Model, SaaS collaboration tools, User acceptance
Paper type Research paper

I. Introduction

With the advancement in information technologies (IT), such as the internet and wireless communication technologies, organizations across the world have been continuously developing and deploying IT-based solutions to provide various stakeholders with better communication and decision support. In recent years, we have witnessed strong promotions of cloud computing by IT vendors and increasing coverage on this topic in the business media. Cloud computing technologies are capable of delivering IT functionalities, as services, over the internet. It has been labeled as a new paradigm in organizing and managing IT resources for organizations of different sizes, providing benefits like cost saving, improved flexibility and accessibility (Hayes, 2008; Armbrust *et al.*, 2010).

Businesses and government agencies have gradually implemented various cloud computing technologies through such service models as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) (Youseff *et al.*, 2008; Sharif, 2010). While IaaS and PaaS primarily pertain to behind-the-scenes IT functions, SaaS is primarily used by individual end-users. SaaS is a type of cloud

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computing product that hosts software and data on the internet-connected servers. Individual users can access the software and stored data through cloud clients like web browsers. For instance, businesses can subscribe to Salesforce.com for accessing Customer Relationship Management software over the internet. Individual taxpayers can use TurboTax.com to prepare and file tax returns through an internet-connected web browser. Proponents of SaaS technologies summarize the benefits as: reducing IT operational cost by essentially outsourcing hardware and software support to SaaS providers; flexibly updating or upgrading the software that is hosted centrally; giving individual users flexible access to software and data; and allowing for effective collaborations among individual users (Hayes, 2008).

Collaboration tools are found to be central to business value of SaaS in a latest survey of SaaS early adopters (IBM, 2014). With centrally hosted software and data, individual users can use SaaS technologies to share information and collaborate. SaaS can also foster collaboration and closer relationship among businesses and their supply chain partners. Existing literature has documented potential benefits of SaaS collaboration tools. However, those benefits can be realized only if the intended users accept and actually use the collaboration functionalities in SaaS products. Like many other IT products, SaaS products may not be well received by their intended users, and therefore unable to translate into improved collaboration internally and with external parties. For instance, Google Wave was introduced in 2009 as a web-based computing platform to merge key features of e-mail, instant messaging, wikis, and social networking. It was perceived to be a well-designed SaaS product for collaboration and information sharing. Nevertheless, Google Wave did not raise enough interests among users. As Google announced in its official blog, "Wave has not seen the user adoption [Google] would have liked" (Google, 2010). Eventually, Google shut down the service in 2011. A survey of over 500 executives conducted in 2012 (Forbes, 2013) shows that a relatively small portion of companies (ranging from 21 to 39 percent) make extensive use of cloud-based collaboration applications. A better understanding about the user acceptance of SaaS collaboration tools is needed to facilitate the adoption and implementation of such tools in organizational contexts.

While extensive research has been conducted to understand user acceptance of various IT products, such as word processor, decision support systems, e-mail, and social media, it is unknown whether the findings can be applied to explain the acceptance of SaaS-based collaboration tools. In particular, collaboration in organizational settings often takes place in group environments and mandates the use of specific collaboration tools. Prior IS studies have shown different dynamics in user acceptance of IT products in mandatory adoption contexts as compared to voluntary adoption contexts (Bhattacherjee and Premkumar, 2004; Venkatesh *et al.*, 2003; Brown *et al.*, 2002). The research objective of the present study is to investigate factors that influence user acceptance perception on SaaS-based collaboration tools in a mandatory adoption environment. Through reviewing the related IS literature, we identified the Expectation Confirmation Model (ECM) (Bhattacherjee, 2001), a theoretical framework to study IS continuance in the mandatory adoption environment, as the theoretical foundation for this study to investigate user acceptance of SaaS collaboration tools. Survey data were collected from MBA students who had completed a group project using Google Docs, a SaaS collaboration tool. The findings from this research provide empirical evidence to SaaS collaboration tool vendors as well as their clients in effectively managing the implementation of such tools.

This paper is organized as follows. Section II reviews the related works in group support systems (GSS) and emerging cloud computing products to highlight the uniqueness of SaaS collaboration tools pertaining to user acceptance. Section III describes the development of a research model through examining existing theoretical frameworks that can be applied to this research context. Section IV gives details of the research method including measurement development, data collection, and summary of research participants' background. Section V reports the results from the data analysis. Section VI discusses the implications and concludes the paper with future research directions.

II. Literature review

According to Brown *et al.* (2010), collaboration technologies are "designed to assist two or more people to work together at the same place and time or at different places or different times" (p. 11). Such computer-based IT and systems have been employed to support and facilitate collaboration since as early as 1970s (Dennis and Gallupe, 1993; Brown *et al.*, 2010). They provide one or more of functions in: supporting for communication among participants, supporting for information-processing, and supporting participants to adopt and use new technologies (Brown *et al.*, 2010). A variety of collaboration-related systems, including group decision support systems, GSS, electronic meeting systems, groupware, and negotiation support systems have been studied in the IS field (Brown *et al.*, 2010; Dennis *et al.*, 2001). One of the most studied systems in this research stream is GSS. These extensive studies in GSS shed light on our investigation of the emerging SaaS collaboration tools. Fundamental features of collaboration technology found in GSS can be used to identify and evaluate SaaS collaboration tools. On the other hand, cloud computing-based SaaS collaboration tools extend the delivery of collaboration support beyond time and location constraints in such a way that may lead to new dynamics in user acceptance of such tools. In the following sub-sections, the extant literature regarding GSS and SaaS collaboration tools will be reviewed.

GSS

GSS refer to software tools that provide support in information exchange and decision processes during group discussion or other tasks. Dennis *et al.* (2001) identified three primary functions of GSS as: communication support, information processing support, and process structure support. Many published research studies since 1980s have placed their focus on assessing the effectiveness of GSS (Dennis and Gallupe, 1993).

As pointed out by George *et al.* (2008), two camps of theories have been adopted in supporting GSS research: individualistic school and institutionalist school, with individualistic theories taking the prevalence position (DeSanctis, 1993). The individualistic perspective treats technology as "an active tool that works to enhance individual power and overcome human limitations" (George *et al.*, 2008). In the context of collaboration, GSS enhance communication among participants through parallelism and anonymity (Dennis *et al.*, 2001), provide effective ways to gather, aggregate, evaluate, and analyze information (Zigurs and Buckland, 1998), as well as help group members follow the agenda (Wheeler and Valacich, 1996). Despite these technological characteristics, GSS have been found in empirical studies to yield inconsistent results in their effectiveness (Dennis *et al.*, 2001; Fjermestad and Hiltz, 2000). Some researchers applied organizational and behavioral frameworks to identify factors that can be used to explain the conflicting findings (Dennis and Wixom, 2002; Dennis *et al.*, 2001; Fjermestad and Hiltz, 2000). For instance, Zigurs and Buckland (1998) analyzed the different task types and classified the three dimensions of GSS technology. They proposed the Theory of Task/Technology Fit to support the study of GSS performance. Dennis *et al.* (2001) incorporated institutionalist perspective in their study of GSS to suggest that appropriation, i.e., how people use a technology, is "at least as important as its fit with the task." They integrated the Task-Technology Fit Theory with the appropriation theories to propose the Fit-Appropriation Model of GSS performance.

Fjermestad and Hiltz (2000) evaluated 54 case and field studies from published papers of GSS research. They summarized four categories of factors that can affect the effectiveness of GSS: contextual factors, intervening factors, adaptation factors, and outcome factors. A similar approach was more recently applied in (Brown *et al.*, 2010), in which technology characteristics, individual and group characteristics, task characteristics, and situational characteristics are identified as the major factors influencing use and outcomes of collaboration technology.

While early studies on collaboration tools were centered on GSS in decision room environments (Dennis and Gallupe, 1993), the research community has more recently turned to collaboration technologies that support virtual teams and distributed work (Dennis *et al.*, 2001; Fiore *et al.*, 2009; Fjermestad and Hiltz, 2000). The availability of cloud computing products extends the reach of collaboration tools to virtually anywhere in the world. Ubiquitous access to the internet-based software not only brings new functionalities and benefits to collaboration tools, but also leads to risks and challenges unseen in previous generations of GSS.

SaaS collaboration tools

Collaboration used to involve meetings, some of which are supported by dedicated GSS, phone calls, e-mails, and instant messages. SaaS collaboration tools, also known as cloud collaboration tools, are reshaping how people work together over the internet. According to National Institute of Standards and Technology (Mell and Grance, 2011), SaaS refers to "the capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from varioius client devices through either a thin client interface, such as a web browser (e.g. web-based e-mail), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings."

For organizations, such cloud-based tools can lower expenses associated with software acquisition and maintenance. They can also help organizations with limited IT resources to deploy and upgrade software in a timely manner. In addition, cloud service providers are able to deliver collaboration software with high availability, resilience, and scalability. A global survey conducted by Forbes Insights (Forbes, 2013) identified the primary values associated with cloud collaboration: generates profound or disruptive innovation, enables more-efficient business processes, accelerates business results, and provides competitive advantage. Additional benefits include enabling flexible work environments and mobile workforce productivity, enabling greater collaboration with customers and suppliers, enabling new product and services, supporting business scalability, and reducing operating costs.

For individual users, they have flexible access to the needed collaboration services with different devices anywhere anytime. SaaS collaboration tools offer one or more of following functionalities to support collaboration needs: centralized content storage, productivity application software, social media, synchronous or asynchronous communication, and project management (Miller, 2008). Table I summarizes how SaaS collaboration tools, with specific examples, match the functionalities of traditional GSS while offering additional features or attributes.

SaaS collaboration tool vendors are increasingly integrating multiple functions to provide one-stop collaboration services. For instance, Google offers Google Apps, a combination of SaaS collaboration tools like Gmail, Google Docs, Google Drive, Calendars, and Google+, as a subscription-based to businesses and a free service to non-profit organizations and individual users. Similar services can also be found in Apple's iCloud.

SaaS collaboration tools deliver the basic functionalities of traditional GSS through internet connected web browser. In doing so, they represent a case of IT innovation. Compared to traditional GSS, SaaS collaboration tools are innovative in the following ways. First, they reduce the constraints on location to facilitate distributed collaborations. Second, synchronous or asynchronous communication is provided to support flexible collaboration schedule and arrangements. Third, browser-based application is platform independent, allowing for users with heterogeneous devices to easily collaborate. It is reasonable to assume that SaaS collaboration tools, with these new features, will be extensively adopted by individuals and organizations. The dynamics of accepting such an IT innovation should reflect certain uniqueness as compared to traditional GSS.

In the IS literature, some factors are considered to have influence on the adoption of SaaS tools in organizations. Erdogmus (2009) pointed out the trade-off between "the benefits of scalability, reliability, security, ease of deployment, and ease of management for customers" and "the worries of trust, privacy, availability, performance, ownership, and supplier persistence" are widely known. Lee *et al.* (2013) employed this perspective to study the drivers and inhibitors of SaaS adoption in Korea. The research revealed that customer factors in the consumerization phenomenon and economic factors in the PEST analysis were the most important drivers of SaaS adoption, while customer factors as well as supplier and environment factors inhibited SaaS adoption. In an empirical study, Benlian *et al.* (2009) surveyed top and senior IT executives in a random sample of 5,000 German companies. The data were used to test a research model that was derived from three theoretical frameworks: the Transaction-Cost Theory, the Resource-based View, and the Theory of Planned Behavior (TPB). The analysis show that patterns on the decision on SaaS-adoption

SaaS collaboration tool function	GSS function	Examples of SaaS collaboration tool	Additional features or attributes
Centralized content storage	Information processing support	Dropbox.com, Box.com	Syncing among devices, enhanced security
Productivity application software	Information processing support	Google Docs, Microsoft Office 365	Coupled with centralized storage
Social media	Communication support	Socialcast, Yammer	Social networking
Synchronous/asynchronous communication	Communication support	WebEx, GoToMeeting	Recording, desktop sharing
Project management	Process structure support	Wrike, Trello	Shared calendar

Table I. SaaS collaboration tool functions and examples differ across SaaS application types. Social influence, attitude toward SaaS-adoption, adoption uncertainty, and strategic value are found to be the strongest and most consistent determinants across all application types. In a case study, Wu *et al.* (2011) found that the case company concerned more about strategic-oriented benefits than economic-oriented benefits, while concern more about subjective risks than technical risks.

While the existing studies, including GSS research and on SaaS adoption summarized above, provide certain insights into the adoption and acceptance of SaaS collaboration tools, they are unable to directly answer our research question, i.e.:

RQ1. What are important factors that influence individual user acceptance perception on SaaS-based collaboration tools in a mandatory adoption environment.

More specifically, traditional GSS research does not address the uniqueness of SaaS collaboration tools. On the other hand, existing SaaS adoption studies typically investigate the decision makers' adoption behavior. Therefore, we surveyed related IS theoretical frameworks to identify the significant factors, and used empirical data to test the proposed hypotheses.

In the following section, we describe the research model development through reviewing established theories in IS field for explaining or predicting users acceptance of IT.

III. Research model development

The objective of this study is to investigate factors that influence user acceptance of SaaS collaboration tools. It reflects an enduring effort in the IS field to understand how and why individuals adopt and use information systems (Hirschheim, 2007; Hardgrave and Johnson, 2003; Venkatesh *et al.*, 2003).

Theoretical frameworks on IS acceptance

IS literature on user acceptance is closely related to the subject of behavioral intention (BI) within the field of social psychology and organizational psychology. The Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980) and its extension, the TPB (Ajzen 1985, 1991) are social psychology theories that have found widespread applicability in social sciences, including IS. According to the TPB, BI is directly determined by attitude toward the behavior, subjective norm, and perceived behavior control. Actual performance of the behavior is predicted by BI and by the degree of actual control one has over performing the behavior. Among all these theoretical explanations of individual acceptance of information systems, none has been examined in broader range of contexts than the technology acceptance model (TAM) (Davis, 1989). TAM is regarded as "the most influential and commonly employed theory for describing an individual's acceptance of information systems" (Lee *et al.*, 2003, p.752). Derived from TRA, TAM theorizes that an individual's BI to use an IS is determined by two beliefs: perceived usefulness and perceived ease of use. A further synthesis of technology acceptance studies has resulted in a model, the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), which has some resemblance to TPB (Benbasat and Barki, 2007).

Another significant theory that is related to technology acceptance is the influential work by Rogers (1983) – Diffusion of Innovations. In a survey of various innovation studies, Rogers (1983) identified five characteristics of an innovation which affect the rate of diffusion of the innovation. They are relative advantage, compatibility, complexity, observability, and trialability.

IS studies adopting these theoretical frameworks focus on individual user acceptance of IT and systems in either voluntary use settings (e.g. Khalifa and Shen, 2008; Agarwal and Prasad, 1999) or mandatory use settings (e.g. Brown *et al.*, 2002; Buonanno *et al.*, 2005). In studying individual user acceptance of IT in organizational contexts, we concur with the view of some researchers (Hardgrave and Johnson, 2003; Venkatesh *et al.*, 2003) that there is mutual influence between the organizational and individual decision to adopt and use an IT tool in organizational settings. Because the adoption of IT tools is often an organizational decision, individual users may not have the choice of "accepting" or "rejecting" a new IT tool during the initial adoption period. Therefore, it is appropriate to investigate individual users' usage pattern in the post-adoption stage. In IS literature, acceptance is often expressed by one's intention to perform a specific behavior (Venkatesh *et al.*, 2003). Following this norm, in the present study, user acceptance of SaaS collaboration tools is measured by individual user's intention to continue using it.

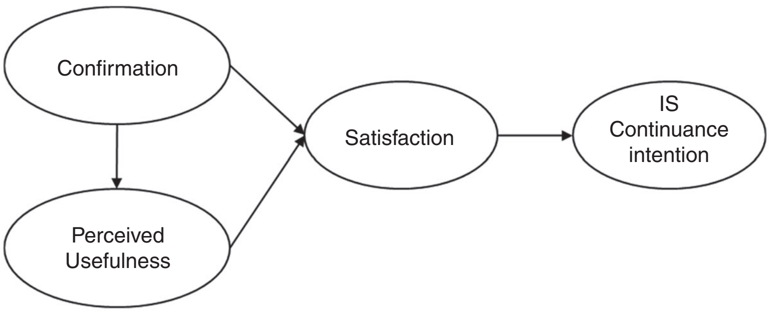
When an organization adopts SaaS collaboration tools, it can be regarded as an IT innovation diffused among various stakeholders. While the initial adoption decisions are typically made by the organization, the usage can transcend conscious behavior and become part of normal routine activity (Bhattacherjee, 2001). In a series of IS studies, Bhattacherjee and colleagues (Bhattacherjee, 2001; Bhattacherjee and Premkumar, 2004) conceptualized and examined users' psychological motivations emerging after their initial use. These emergent motivations can potentially influence users' subsequent continuance decisions. They develop an ECM (Figure 1) to explain post-adoption behavior in IT innovations. Our research model adapted their framework to the context of adopting SaaS collaboration tools.

Research model and hypotheses

By adopting the ECM developed by Bhattacherjee (2001), we thus propose the following hypotheses in the context of studying user acceptance of SaaS collaboration tools:

H1. Confirmation with expectations positively influences perceived usefulness of SaaS collaboration tools.

H2. Confirmation with expectations of SaaS collaboration tools positively influences satisfaction.



Source: Adapted from Bhattacherjee (2001)

Figure 1. Expectation Confirmation Model

H3. Perceived usefulness of SaaS collaboration tools positively influences satisfaction.

H4. Perceived usefulness of SaaS collaboration tools positively influences continuance intention.

H5. Satisfaction positively influences intention to continue using SaaS collaboration tools.

In addition to test the validity of the ECM in the context of SaaS collaboration tools, we are also interested in the other factors that may affect the relationships depicted in the model. This research approach has been adopted in IS studies. For instance, Brown *et al.* (2010) extended UTAUT to the context of collaboration technology through considering the impacts of technology characteristics, individual and group characteristics, task characteristics, and situational characteristics on acceptance. Among these factors, we are particularly interested in the effect of prior experience with collaboration technology and the user's IT skills. This is because cloud computing, representing a paradigm shift from traditional on-premises IT tools, is relatively new to individual users. While some early adopters have used SaaS collaboration tools personally or in organizational settings, there are many individual users who are accustomed to traditional software. This is especially the case in productivity software because of the predominance of Microsoft Office suite in organizational context.

IS research has found prior experience with a specific type of technology can play a role in the one's perceptions of the technology (Brown *et al.*, 2010), as well as in one's appropriation of the technology use (Dennis *et al.*, 2001). Thus, we hypothesize:

H6. Users with different prior experience in SaaS collaboration tools will have different relationships among confirmation, perceived usefulness, satisfaction, and continuance intention.

Resembling traditional software applications, SaaS tools are generally regarded as being easy to use. However, users' understanding of the cloud-based storage and software code delivered to web browsers, as well as use of new features for asynchronous or synchronous communication, require for IT knowledge and skills. We are interested in finding whether users' general IT skills have an impact on their acceptance perceptions. One rationale is that a user's perceived ease of use, as a significant control belief on IS usage intention (Davis, 1989), is affected by his or her general IT skills. In IS literature, IT skills have been studied in the context of user acceptance. For instance, Koufaris (2002) found that web skills directly influence shopping enjoyment and concentration in an online consumer behavior research. Therefore, we hypothesize:

H7. Users with different IT skills will have different relationships among confirmation, perceived usefulness, satisfaction, and continuance intention.

The research model with its seven hypotheses is shown in Figure 2. The constructs in oval shape and firm lines among them are based on the ECM, which will be tested using structural equation modeling (SEM). The impact of individual factors, prior experience and IT skills in the rectangle shape, on the ECM relationships will be tested using multi-group SEM testing.

IV. Research method

While some emergent SaaS collaboration tools are fighting to gain spotlight in media and ultimately the acceptance from businesses and individual users, there are some

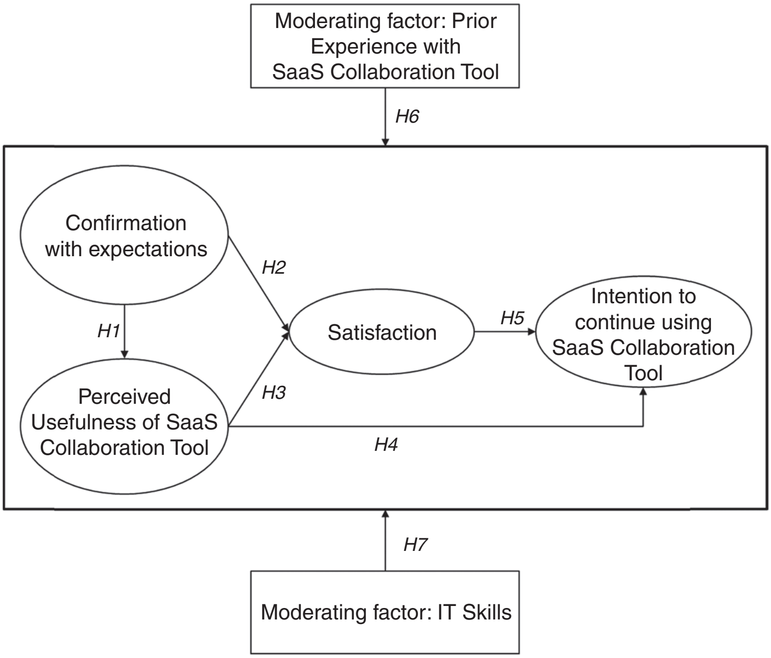


Figure 2.
Research model

tools that have been in existence for years and are being used by millions of users. Google Docs is a good example of such relatively mature SaaS collaboration tools. In this study, we are interested in investigating user acceptance of Google Docs for collaborative tasks. As one of the best known SaaS collaboration tools in market for years, Google Docs is an appropriate collaboration technology that enables us to identify users with a variety of knowledge about this type of software. Thus, the findings from this study can help practitioners and researchers develop a comprehensive understanding about the acceptance of emerging SaaS collaboration tools.

Document-centric collaboration is rapidly gaining traction in organizations. With easy access, low cost, and high reliability, organizations have adopted SaaS productivity tools, like Google Docs, for effective collaboration. This represents a mandatory adoption environment pertaining to a mechanism of user acceptance different from voluntary and individual settings. Google Docs includes word processing, spreadsheet, presentation, drawing, and other features. In addition to provide features common in office productivity software, Google Docs facilitates group or organizational collaboration by allowing multiple users to edit the same document (saved on Google Drive) at the same time or asynchronously.

In this study, MBA students enrolled in MIS courses at a university in the Northeastern USA were required to use Google Docs to complete a group project. The project requires a research paper prepared in Google Document (word processor) and a group presentation using slides in Google Presentation. Before the group project, a simple tutorial of how to log in Google Docs and use simple features was provided to all the students. This research setting fits our research objective in following ways: MBA students with various work experience and industry representation may represent the general population of SaaS collaboration tool users; the use of Google Docs was mandatory for the group project, a typical arrange in organizations' adoption of SaaS collaboration tools; and the duration of project is around two months, giving users enough time to use the technology and form some perceptions on it.

A survey questionnaire was developed through adapting the measurement instrument in (Bhattacherjee, 2001) for this study (see the Appendix). These questionnaire items are used to capture quantitative measures for each construct in Figure 2. In addition, questions about the respondents' demographic information, IT skills, and prior experience with Google Docs are included in the survey. At the end of the course, the survey was conducted to collect data of users' perceptions on Google Docs use for their project. The data collection was conducted through several semesters from 2010 to 2012. In total, 132 MBA students have participated in this study. Table II summarizes the basic information about these research participants.

The diversity in age, gender, IT skills, and prior experience with Google Docs, as well as the absence of an apparent response bias help attenuate concerns about the representativeness of the sample. In other words, the sample of this study sufficiently represents the population of interest.

V. Data analysis and findings

Table III reports the descriptive statistics of the data collected from the survey questionnaire. The average of items measuring the same variable was derived. It can be observed from the descriptive statistics above that MBA students held relatively positive perceptions (a mean of four indicating neutral opinion, lower values representing more positive perception) about using Google Docs for a group project.

Among the 132 surveys collected, two cases were excluded from the model testing procedures. One case was removed because of empty responses to several questionnaire items. The other case was identified as an outlier based on Mahalanobis distance. As a result, 130 cases were used in the following data analysis.

To test the hypotheses associated with our research model, we employed SEM procedures. SEM allows complicated variable relationships to be expressed through hierarchical or non-hierarchical, recursive or non-recursive structural equations. It has been widely used in behavioral science research for the causal modeling

Item	Category	Frequency	%
Age	18-23	32	24
	24-29	49	37
	30-39	33	25
	40+	14	11
	Missing	4	3
Gender	Female	68	51
	Male	60	46
	Missing	4	3
General IT skills (self-reported)	Novice	15	11
	Intermediate	81	61
	Expert	31	24
	Missing	5	4
Prior experience with Google Docs	No experience	52	40
	<1 year	33	25
	Between 1 and 2 years	36	28
	More than 2 years	9	7

Table II.
Profile of research participants

Item	Minimum	Maximum	Mean	SD
Perceived Usefulness1	1	7	2.61	1.306
Perceived Usefulness2	1	7	3.11	1.525
Perceived Usefulness3	1	7	3.10	1.601
Confirmation1	1	7	3.03	1.503
Confirmation2	1	7	2.94	1.271
Confirmation3	1	7	3.39	1.624
Satisfaction1	1	7	2.95	1.389
Satisfaction2	1	7	2.98	1.498
Satisfaction3	1	7	2.39	1.486
Continuance Intention1	1	7	2.93	1.691
Continuance Intention2	1	7	2.90	1.610
Continuance Intention3	1	7	2.89	1.530

Table III.
Descriptive statistics of perceptions on Google Docs

of complex, multivariate data sets in which the research gathers multiple measures of proposed constructs, and widely used in MIS research to validate instruments and test linkages between constructs (Gefen *et al.*, 2000). As suggested by Gefen *et al.* (2000), covariance-based SEM is appropriate for confirmatory research which requires a sound theoretical base. In addition, the sample size of this study (132) meets the requirement for covariance-based SEM: at least 100-105 cases.

Reliability and validity of measurement items

Reliability of measurement items was assessed through obtaining Cronbach's α of each construct. The statistics of each construct (perceived usefulness: 0.914, confirmation: 0.844, satisfaction: 0.898, and continuance intention: 0.975) is above 0.700, a recommended cut-off value for satisfactory reliability (Nunnally and Bernstein, 1994). The confirmatory factor analysis was conducted using SEM for the following measurement model (Figure 3).

The measurement model was tested in Lavaan, an R package for SEM. The model fit indices are displayed in Table IV, which are below or close to the cut-off values

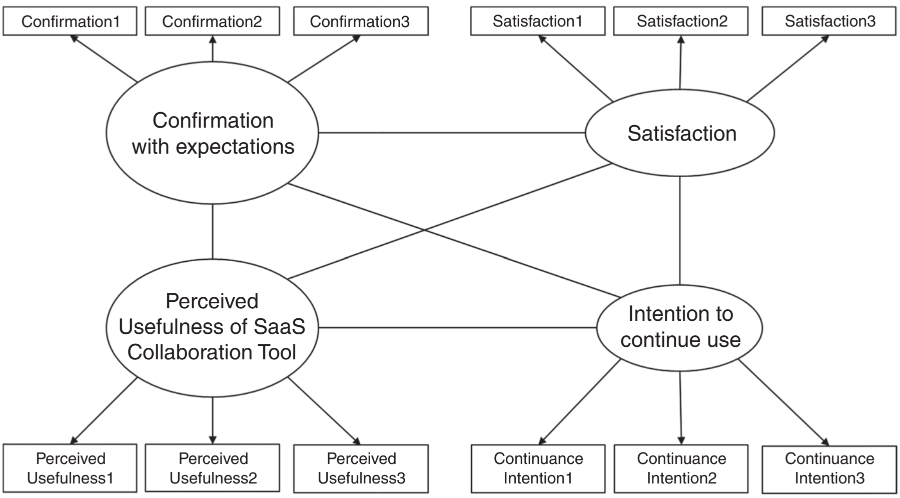


Figure 3.
Measurement model for CFA

(CFI > 0.95, RMSEA < 0.08, SRMR < 0.09), indicating that the measurement model has a relative good fit with the data. Thus, the reliability and validity of measurement items are established.

Path analysis of the research model

The first five hypotheses proposed in the previous section were tested through SEM path analysis of the full model (Figure 4).

The measurement model was tested in Lavaan, an R package for SEM. The model fit indices are displayed in Table V, which are below or close to the cut-off values (CFI > 0.95, RMSEA < 0.08, SRMR < 0.09), indicating that the measurement model has a relative good fit with the data.

The standardized path coefficients among the constructs are shown in Figure 5 (simplified from the full SEM model). It can be seen that most of path coefficients, except for the one from perceived usefulness to satisfaction, are statistically significant, showing support for the proposed hypotheses.

Table IV. Goodness-of-fit indices of the measurement model

df	χ^2	χ^2/df	CFI	RMSEA	SRMR
48	87.5***	1.82	0.979	0.08	0.03

Notes: $n = 130$. CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual. ***$p < 0.001$

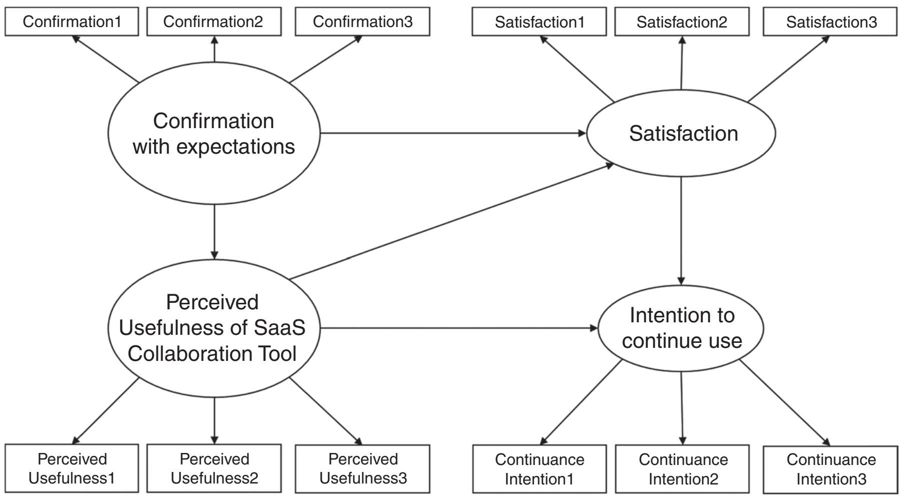
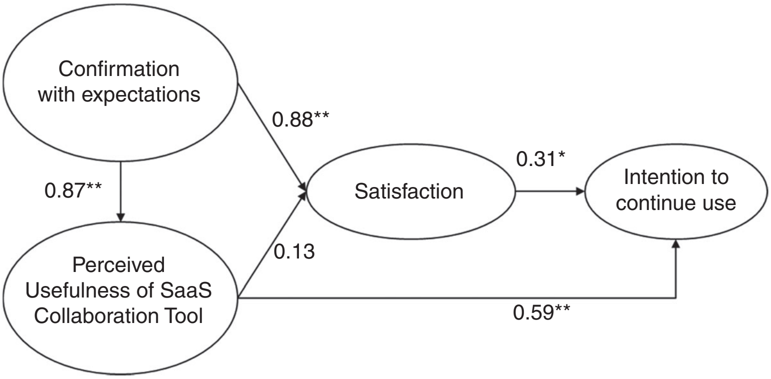


Figure 4. Full model for SEM

Table V. Goodness-of-fit Indices of the measurement model

df	χ^2	χ^2/df	CFI	RMSEA	SRMR
49	96.1***	1.96	0.976	0.086	0.031

Notes: $n = 130$. CFI, Comparative fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual. ***$p < 0.001$



Notes: $^{*}p<0.05$; $^{**}p<0.01$

Figure 5.
Path coefficients of full model

Moderating effects of prior experience

To test the moderating effects using SEM, it is suggested to divide the data set into groups based on the values of the candidate moderating variable. Then, a comparison of modeling fit can be done across the groups to determine the significance of the moderating effect (Cortina *et al.*, 2001; Dabholkar and Bagozzi, 2002). For example, to test the moderating effect of gender, the data set can be divided into two sub-sets, one for male and the other for female. Then, the full structural model will be tested twice using multi-group testing in SEM. First, model parameters will be estimated separately for all groups (male and female). Second, an additional model testing will be done with regression coefficients constrained to be equal across groups. A χ^2 difference test should be done afterwards to examine the relative fit of the two models. If the second model (invariant path coefficients) fits significantly worse than the first, it can be concluded that the moderating effect is statistically significant.

In this study, the research participants are grouped based on their prior experience with Google Docs by the time of the research. Four groups are identified: 52 participants had no prior experience; 33 participants had less than one year prior experience; 36 had one-to-two years prior experience; and nine participants had more than two years prior experience. Following similar procedures in existing literature (Dabholkar and Bagozzi, 2002), we used multi-group testing in SEM to run two analyses, one for free estimate across groups, the other for constraining equal path coefficients across groups. To assess the moderating effect of prior experience, we did a χ^2 difference test between the two models. The χ^2 change is 27.7 ($=503.9-476.2$), and the change in degree of freedom is 15 ($=211-196$). The p-value of this χ^2 difference is 0.02, indicating that the model fit with coefficients constrained as the same across groups is significantly worse than the model fit with no constraints. In other words, the moderating effect of prior experience on the ECM relationships is statistically significant. The path coefficients for each group are reported in Table VI.

Moderating effects of IT skills

To test the moderating effects of IT skills, we divided the research participants into three groups (novice: 14, intermediate: 81, expert: 30) based on their self-reported IT skill level. Following the similar procedures above, we used multi-group testing in SEM to run two analyses, one for free estimate across groups, the other for constraining

Table VI.
Path coefficients for groups of different prior experience

Path in the ECM	No experience	Less than one year experience	Between one and two years experience	More than two years experience
Confirmation to perceived usefulness	0.82**	0.91**	0.90**	0.15
Confirmation to satisfaction	0.67**	0.72**	0.71**	0.69**
Perceived usefulness to satisfaction	0.40*	0.01	0.30	0.67**
Perceived usefulness to continuance intention	0.04	0.53**	0.28	0.93**
Satisfaction to continuance intention	0.91**	0.47*	0.53*	0.47*

Notes: $*p < 0.05$; $**p < 0.01$

equal path coefficients across groups. The χ^2 change is 23.4 (= 321.4–298.0), and the change in degree of freedom is ten (= 157–147). The p-value of this χ^2 difference is 0.009, indicating that the moderating effect of IT skills on the ECM relationships is statistically significant. The path coefficients for each group are reported in Table VII.

VI. Research synthesis

We summarize the hypotheses testing result in Table VIII. Except for *H3*, all research hypotheses are supported by the data collected from this Google Docs study.

Discussion of the findings

This study investigated factors that affect user acceptance of SaaS collaboration tools. As shown in Figure 5 and Table VIII, while most relationships in the ECM are supported by our data, the direct link between perceived usefulness and satisfaction is

Table VII.
Path coefficients for groups of different IT skills

Path in the ECM	Novice	Intermediate	Expert
Confirmation to perceived usefulness	0.88**	0.86**	0.88**
Confirmation to satisfaction	0.90**	0.71**	0.51*
Perceived usefulness to satisfaction	0.13	0.31*	0.50*
Perceived usefulness to continuance intention	0.36*	0.38*	0.30
Satisfaction to continuance intention	0.88**	0.53*	0.50*

Notes: $*p < 0.05$; $**p < 0.01$

Table VIII.
The list of hypotheses testing

Hypothesis	Independent variable	Impact on	Supported?
H1	Confirmation	Perceived usefulness	Yes
H2	Confirmation	Satisfaction	Yes
H3	Perceived usefulness	Satisfaction	No
H4	Perceived usefulness	Continuance intention	Yes
H5	Satisfaction	Continuance intention	Yes
H6	Prior experience	ECM relationships	Yes
H7	IT skills	ECM relationships	Yes

not significant. In other words, our study shows that perceived usefulness has no direct impact on user's satisfaction with using SaaS collaboration tools for team projects. This finding is not totally inconsistent with the original ECM study (Bhattacherjee, 2001), in which the perceived usefulness to satisfaction link is weaker than any of the other relationships. In a related study (Bhattacherjee and Premkumar, 2004), the link between perceived usefulness and satisfaction is weak in one case and non-significant in another case. Recent studies that adopted the ECM as theoretical foundation also show non-significant relationship between perceived usefulness and satisfaction (Kim, 2010; Hong *et al.*, 2005). This finding may be caused by the fact that the majority (85 out of 130) of respondents in this study have limited or no prior experience with Google Docs. As shown in a longitudinal study (Bhattacherjee and Premkumar, 2004), the impact of perceived usefulness on satisfaction is weak in initial technology use. In this situation, confirmation is a more salient belief driving satisfaction. On the other hand, perceived usefulness is a more salient belief driving continuance intention (Bhattacherjee and Premkumar, 2004).

With regard to *H6*, we did find the moderating effect of prior experience on the relationships as depicted in the ECM in this study of user acceptance of SaaS collaboration tools. This finding is consistent with existing research that considers experience as one individual characteristic affecting user acceptance of technology. For instance, Brown *et al.* (2010) found that technology experience moderates the relationships in the UTAUT. Khalifa and Liu (2007) assessed and found significant mediating and moderating effects of online shopping experience in predicting repurchase intention. Deng *et al.* (2010) adapted the concept of cognitive absorption to investigate the effects of user experience with IT on user satisfaction and continual usage intention of the technology.

H7 is also supported by the data analysis. The moderating effect of IT skills on the relationships in the ECM is found to be statistically significant in the context of SaaS collaboration tools acceptance. As shown in Table VII, while the link from confirmation to perceived usefulness is largely consistent across the groups, the impact of confirmation on satisfaction decreases as the IT skills increase. The IT skills level also positively correlates with the impact of perceived usefulness on satisfaction. This may be because the users with higher IT skills derive their satisfaction mainly from the perceived usefulness of SaaS collaboration tools. On the other hand, the users with lower IT skills base their satisfaction on the confirmation with their expectations.

In summary, this study found that users' confirmation belief positively affects their perceived usefulness and satisfaction, which in turn influences their intention to continue using SaaS collaboration tools. User's prior experience and IT skills have significant moderating effect on the relationships among confirmation, perceived usefulness, satisfaction, and continuance intention in the context of SaaS collaboration tools.

Implications for research and practice

Our research aims to better understand factors that influence users' intention to continue using SaaS collaboration tools in a mandatory adoption environment. While some prior studies have been done to examine user acceptance of GSS as collaboration technology, the goal of our study is to empirically evaluate direct factors of the ECM in the context of emerging SaaS collaboration tools. Existing IS literature on the issue of SaaS tools adoption largely examine the issue from organizational perspectives by surveying and interviewing executives and top managers. Our study aims to understand end user acceptance of SaaS collaboration tools. Through analyzing the adoption context of such emerging tools, we identified the ECM as the theoretical foundation for this study. As reported in the discussion section, the findings from this study are consistent with latest studies that adopt the ECM as the theoretical framework. In addition to testing the direct impact of antecedents of continuance intention, this study also examined the moderating effect of prior experience and IT skills in the context of SaaS collaboration tools. These two factors are of significance in the context of introducing SaaS collaboration tools in modern organizations. Therefore, this study provides additional insights into the dynamics of user acceptance of these emerging technologies. The research community may build upon the findings of the present study to investigate other related variables, such as task-technology fit, appropriation, and other technological characteristics, as they are related to SaaS collaboration tools acceptance.

Aside from its theoretical value, our research results have significant practical implications. The findings may provide SaaS collaboration tool venders with a deeper understanding of how to augment user acceptance of a particular application. First, confirmation with expectations is found to have significant impact on user's perceived usefulness and satisfaction, which in turn affect user acceptance. For SaaS collaboration tool vendors and managers in charge of implementations, it is important to provide an appropriate expectation to end users. It is not plausible to raise users' expectations to an unrealistically high level through marketing hypes or managerial tactics. Second, perceived usefulness and satisfaction are found to be important determinants of user acceptance of SaaS collaboration tools. Implementation managers and venders can develop strategies to promote the positive perceptions among end users. For example, an internal wiki can be adopted to share the useful features of SaaS collaboration tools. User's satisfaction and perceived usefulness level can be surveyed and tallied for finding ways of improvement. Third, the significant impact of prior experience and IT skills on user acceptance of SaaS collaboration tools may help vendors and managers develop strategies to give potential users more exposure to the SaaS collaboration tools and provide training. For instance, free service to educational institutes may be an effective way to motivate potential users to experiment with new tools, and thus improve their perceptions in the future use. Video-based tutorials can help intended users improve their understanding of SaaS related terms and benefits. Live demonstration from colleagues may be another effective way to train new users to be more knowledgeable about the new SaaS collaboration tools.

Potential limitations

There are several limitations to our study. First, even though the sample size is large enough for a regular SEM testing, the group sizes for multi-group SEM testing are not even. With SaaS tools seeing more adoption, future research may be conducted with larger and evenly distributed group sizes. Second, potential SaaS collaboration tool users are located in different countries across the world. Different cultures may have different impacts on the usage pattern of SaaS collaboration tools. The research respondents of the present study are primarily American natives. Thus, the impact of culture was not examined in this study. Third, this study focussed on assessing the impact of confirmation, satisfaction, and perceived usefulness on user acceptance of SaaS collaboration tools. It did not investigate the sources of such factors. Additional research that can adopt an exploratory approach to identify the determinants of confirmation and perceived usefulness in the same context may provide valuable knowledge to SaaS tools operators, implementation managers, and other parties.

Finally, the group project completed by the research respondents may not represent complex projects in business settings. It is found that the fit between technology and task may affect user's perceptions (Zigurs and Buckland, 1998). Future research may investigate such task-related relationships.

VII. Conclusion

In this research, we reviewed the use of SaaS collaboration tools in organizational context, and focussed on understanding the acceptance of such tools in mandatory adoption environments. The key findings include:

- ECM (Bhattacherjee, 2001) was identified as the theoretical framework for us to study user acceptance of SaaS collaboration tools.
- The derived research model was tested using data collected from a field study. Results from statistical analysis support the majority of research hypotheses. In particular:
  - Users' confirmation with expectations positively affect their perceived usefulness and satisfaction level.
  - Users' perceived usefulness and satisfaction positively affect their intention to continue using such collaboration tools.
- The relationships among the ECM construction are different based on user's prior experience with such tools and IT skills.

The findings will provide directions for organizations to plan and implement SaaS collaboration tools to support communication, information processing, and process structuring among collaborators.

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Appendix. Survey questionnaire

On a scale of 1 to 7 (1: strongly agree, 2: agree, 3: somewhat agree, 4: neutral, 5: somewhat disagree, 6: disagree, 7: strongly disagree), please rate each of the following statements.

Confirmation:

(Confirmation1) My experience with using Google Docs in the team project was better than what I expected

(Confirmation2) Overall, most of my expectations from using Google Docs in the team project were confirmed.

(Confirmation3) The functionalities provided by Google Docs for team projects was better than what I expected

Perceived Usefulness:

(Perceived Usefulness1) Using Google Docs enhances my effectiveness in doing the team project

(Perceived Usefulness2) Using Google Docs improves my performance in doing the team project

(Perceived Usefulness3) Using Google Docs increases my productivity in doing the team project

Satisfaction:

(Satisfaction1) I am very satisfied with using Google Docs in the team project

(Satisfaction2) I am very pleased in my experience with using Google Docs in the team project

(Satisfaction3) My overall experience of using Google Docs in the team project is terrible.

Continuance Intention:

(Continuance Intention1) I intend to continue using Google Docs in team projects

(Continuance Intention2) I intend to use Google Docs for team projects in the future.

(Continuance Intention3) It is my intention to use Google Docs for team projects in the future.

Note: The responses to the reverse-worded Satisfaction3 was re-coded in data analysis

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