A web-based crowd sourcing data application in exploring the effect of collaborative we-intention on adoption of cloud-multimedia drive

You-Shyang Chen
Department of Information Management,
Hwa Hsia University of Technology,
111, Gong Jhuan Road, Chung Ho District,
New Taipei City 235, Taiwan
Email: ys_chen@cc.hwh.edu.tw

Jerome Chih-Lung Chou*
Department of Information Management,
Hwa Hsia University of Technology,
111, Gong Jhuan Road, Chung Ho District,
New Taipei City 235, Taiwan
Email: jerome@go.hwh.edu.tw
*Corresponding author

Chienwen Wu
Department of Information and Finance Management,
National Taipei University of Technology,
1, Sec. 3, Zhongxiao E. Rd.,
Taipei 106, Taiwan
Email: xcwwu@ntut.edu.tw

Heng-Hsing Chu
College of Management Ph.D. program in Management,
National Taipei University of Technology,
1, Sec. 3, Zhongxiao E. Rd.,
Taipei 106, Taiwan
Email: t8749004@ntut.edu.tw

Abstract: In modern multimedia data management, crowd sourcing and online collaboration are emerging ways of innovation and implementation for projects. Knowing why a group of people adopts a certain cloud-multimedia drive is the purpose of this research. In this research, besides the effect of usability which is the traditional cause of system adoption, the authors designed an 18 week long experiment to explore the effect of we-intention on adoption of cloud-multimedia drive. The result shows that we-intention is a cause of adoption, but if the effect of usability on adoption is controlled, we-intention
seems to have little effect on adoption. Although usability remains the dominant factor, the exploration finds that we-intention can weaken the relationship between usability and adoption. The implication of this research is collective intention might substitute usability to some degree in system adoption, and managers could find ways more of social perspective to help system adoption.

**Keywords:** collaboration; we-intention; usability; cloud drive; system adoption.


**Biographical notes:** You-Shyang Chen is now an Associate Professor in Hwa Hsia University of Technology and majors in information management. He was a practitioner in the field of financial industry and manufacturing industry for over 20 years. He received his Bachelor’s degree in Industry Management from National Taiwan University of Science and Technology in 1988, and Master’s degree and PhD in Information Management from National Yunlin University of Science & Technology in 2006 and 2009, respectively. His major research interests are financial analysis, medical management, organisational management, soft computing, fuzzy time series, rough set theory, and behaviour analysis. He has published over 120 journal and conference papers.

Jerome Chih-Lung Chouis is an Assistant Professor at Hwa-Hsia University of Technology inTaiwan. He was awarded his MBA at A. Gary Anderson Graduate School of Management at the UC Riverside School of Business Administration in 1997, and PhD at Program of Technology and Innovation Management of College of Management at National Taiwan University in 2005. His recent research covers electronic commerce, entrepreneurship, and management of innovation and technology. In addition, he is a consultant servicing the industry in innovation project management, and his service and research work has been published in *Asia Pacific Management Review, Evaluation and Program Planning, International Journal of Information Management*, and *Project Management Journal*.

Chienwen Wuis is now an Associate Professor in National Taipei University of Technology and interested in the fields of information management, data mining, computer algorithms and meta-heuristics. He has published many journal and conference papers.

Heng-Hsing Chuis is now a doctoral candidate in National Taipei University of Technology and interested in the fields of information management, data mining, combinational optimisation and meta-heuristics. He has published some journal and conference papers.

This paper is a revised and expanded version of a paper entitled ‘Effect of we-intention on adoption of information system embedding social networking technology: a case of cloud drive’ presented at The 4th International Conference on Frontier Computing, Bangkok, Thailand, 9–11 September 2015.


1 Introduction

Crowd sourcing has emerged in recent years as a potential strategy to enlist the general public to solve a wide variety of tasks including multimedia problems. Applying crowd sourcing to solve multimedia problems is full of challenges: Who are the crowd? What motivates them? How well can they collaborate? Crowd sourcing quickly becomes a fashionable solution for all kinds of challenges faced by multimedia researchers. Recently, due to the wide spread of computing capacity and internet bandwidth, many social technology-incorporated multimedia information systems are emerging in forms of cloud services, such as network album, audio and video station, cloud-multimedia drive, and so forth. Social technology-incorporated systems enable users collaborate over the internet, promoting effective and productive activities such as problem solving, idea generation, and cooperative learning. Many systems that were formerly designed for personal use such as hard drive and multimedia editing tools thus have been redesigned into collaborative tools in the cloud service era. More and more applications are transformed into cloud services. As software vendors shift their business models from on-premises licensed software to public cloud-based offerings, this trend will continue. According to Gartner Inc., cloud application services (software as a service, SaaS) was forecast to grow 20.3% in 2016. Because the adoption of such systems relate to the decision of a group of people, the collective intention (we-intention) resulted from the perception of others’ behaviour or social influencing processes may play a role in the adoption. Different from the individual action, social behaviour is a mutually interdependent effort in which the goal is to benefit all participants. In this aspect, decision making involves joint processes among a group of people, and thus requires different frameworks to understand such actions. The success of collaborative technology requires simultaneous usage behaviour, which is a joint action resulted from we-intention. In the past, most studies on information system adoption took personal intention approach, neglecting the effect of we-intention. In this research, the authors assert we-intention should have an effect on adoption of cloud services, and we take the adoption of cloud hard drive as a representative example to explore the effect of we-intention. The authors designed an experiment in which the cloud hard drive is a collaborative tool for students to finish their group project, and the students are required to jointly make the decision to adopt a certain cloud drive. Since it is obvious that the purpose of adoption and use of the cloud drive is to accomplish the group project, individual intention thus may not provide enough unique insights in explaining the joint action. In this research, the use of cloud drive in group project is conceptualised as an action of social behaviour, and we-intention is the focus of our interest. System usability is the controlled variable. The authors first examine the direct effect of we-intention, and then examine the moderation effect of it, speculating we-intention has some effect on system adoption.

2 Literature review

2.1 Definition of usability

The conceptual definition of usability by International Organization for Standardization (ISO) 9241-11 is the extent to which a product can be used to achieve specified goals
with effectiveness, efficiency, and satisfaction in a specified context of use (Agarwal and Venkatesh, 2002; Peevers et al., 2008). Usability means the use quality of a system for a user to achieve his/her own purpose after a series of tasks. Higher system usability helps users attain their challengeable objectives. The operational definition of usability by Nielsen dominates (Gray and Salzman, 1998) in this area. This definition includes visibility of system status, match between the system and the real world, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, and helping users recognise, diagnose, and recover from errors (Nielsen, 1994). In short, five usability goals could be identified as a measurement framework: learnability, efficiency, memorability, error prevention, and satisfaction (Nielsen, 1993). Usability has a positive effect on adoption, and this study uses Nielson's framework to measure usability. The question items are listed below:

Table 1  Question items of usability

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning how to use the cloud drive is easy</td>
</tr>
<tr>
<td>2</td>
<td>The cloud drive increases our efficiency to accomplish our assignment</td>
</tr>
<tr>
<td>3</td>
<td>I can remember how to use the cloud drive</td>
</tr>
<tr>
<td>4</td>
<td>The cloud drive’s error prevention function is good</td>
</tr>
<tr>
<td>5</td>
<td>I am satisfied by the cloud drive</td>
</tr>
</tbody>
</table>

Source: Nielsen (1993)

2.2 Definition of we-intention

We-intention is often regarded as an individual’s intention to perform a collective action with a group of people who are jointly committed to doing something as a body (Bagozzi and Lee, 2002). Different from the traditional individual intention, the concept of we-intention relies more on one’s perception as a group member or an agent of a group, and taking the group as the target for intention formation. The concept of we-intention was initially explored by philosophic scholars who primarily focused on the conceptual and logical aspects (Tuomela, 2005). Later, some studies in social psychology and marketing started to concentrate on measurement and hypothesis testing, and adopted this concept to explain online social behaviours (Dholakia et al., 2004; Bagozzi et al., 2006; Bagozzi et al., 2007). Prior studies have suggested that social influence is especially important in predicting the successful adoption and use of interactive communication technology (Koo et al., 2011; Cho, 2011; Dholakia et al., 2004). On this thread of research, Kelman’s (1958) social influence processes are often used as a theoretical base for developing knowledge in this area. Kelman has distinguished three aspects social influence processes, including compliance, internalisation and identification. This study adopts Kelman’s framework to measure we-intention. The question items are listed in Table 2.

Table 2  Question items of we-intention

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My team members think I should learn the cloud drive for team collaboration on the project</td>
</tr>
<tr>
<td>2</td>
<td>Using the cloud drive to collaborate with my team members is important to me</td>
</tr>
<tr>
<td>3</td>
<td>Using the cloud drive enables me contribute more to my team</td>
</tr>
</tbody>
</table>

Source: Kelman (1958)
3 Experiment design

This study uses a convenient sample of university students who take courses of electronic commerce and project management instructed by the author. The age range of them is from 20 to 22, and they are potential users of various cloud services for enhancing both personal and organisational productivity. Studying this sample could provide insights of future cloud service adoption. The total number of participating students is 58.

3.1 Treatment of we-intention

In order to cultivate we-intention among students, the author assigned term projects to students and strongly encouraged them to use cloud drive as a tool to do their projects. Those teams who could manage their collaboration with cloud drive and provide relating working diary and peer evaluation in the end could get better grades on team basis. The award for using cloud drive to collaborate and finish term project was 30% more of their original points.

In order to cultivate sense of compliance, the author asked students to prepare peer evaluation for their group. On week basis, each student must evaluate his/her team members on the basis of contribution and proficiency of using the cloud drive to collaborate with others.

In order to cultivate sense of internalisation, the author asked students to prepare a self-report alongside the group report. The format of self-report is itemised lessons learned from the project experience, including the skill of using the cloud drive.

In order to cultivate sense of identification, the author asked students to name their project team, use the name for each progress report, prepare the final group report online, and put their names on the front page of online report. In addition, a policy that the online group reports will be open to students in the class of next semester was announced.

The duration for students to form we-intention is whole semester, that is, 18 weeks.

3.2 Treatment of usability

The sample consisted of university students of department of Management Information Systems. In their traditional courses such as system analysis and software engineering, they have learned the concept of system usability. The author also explained again the sub-concepts of learnability, efficiency, memorability, error prevention, and satisfaction, and made assessing a cloud drive for the team to use for the project a part of the assignment.

Google Drive, OneDrive, and Dropbox were introduced briefly and equally in the class, and the author encouraged students to find more alternatives for their team to assess with Nielson’s framework.

3.3 Treatment of adoption

We asked two questions:

1. I would further learn to master the cloud drive of my team’s choice.
2. I would continue to use the cloud drive after the project is finished.
These two questions could measure the students’ intention of adopting the cloud drive used in their project.

At the end of semester, students were tested for their evaluation of usability, adoption and we-intention of the cloud drive their group adopted for the term project.

The authors applied hierarchical regression to test the direct effect of we-intention on adoption. Furthermore, in order to examine the interaction effect of usability and we-intention, the scores of variables of usability, we-intention and the interaction term were centred and standardised before entering the model.

### 4 Analytical results

The descriptive statistics are shown in Table 3 and Table 4. The standard deviation of we-intention is higher than those of usability and adoption, indicating we-intention is more diverse among students. We-intention is highly correlated with usability and moderately correlated with adoption, showing it is a candidate factor of adoption.

**Table 3** Descriptive statistics of usability, we-intention and adoption

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability</td>
<td>3.1897</td>
<td>0.64609</td>
</tr>
<tr>
<td>We-intention</td>
<td>3.1839</td>
<td>0.70965</td>
</tr>
<tr>
<td>Adoption</td>
<td>3.2672</td>
<td>0.74466</td>
</tr>
</tbody>
</table>

The Cronbach’s Alpha of usability, we-intention, and adoption are 0.881, 0.885, and 0.913 respectively, showing good reliability of question items.

**Table 4** Correlations between usability, we-intention and adoption

<table>
<thead>
<tr>
<th></th>
<th>Usability</th>
<th>We-intention</th>
<th>Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability</td>
<td>1</td>
<td>0.752**</td>
<td>0.804**</td>
</tr>
<tr>
<td>We-intention</td>
<td>0.752**</td>
<td>1</td>
<td>0.674**</td>
</tr>
<tr>
<td>Adoption</td>
<td>0.804**</td>
<td>0.674**</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: **p < 0.01

The hierarchical regression result is shown in Table 5. Model 1 uses usability and we-intention as independent variables, and its R square is 0.658, indicating good predictive power. Model 2 adds the mean centralised product of usability and we-intention to independent variables, but the increase of R square is small and insignificant, so the moderation effect is not obvious.

**Table 5** Summary of model 1 and model 2

<table>
<thead>
<tr>
<th>Model</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>$F$ change</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.658</td>
<td>0.658</td>
<td>52.981</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>0.659</td>
<td>0.000</td>
<td>0.044</td>
<td>0.835</td>
</tr>
</tbody>
</table>

Read from Table 6, the coefficient of we-intention in model 1, representing the direct effect on adoption, is small and insignificant while usability is already in the model.
Table 6  Coefficients of model 1 and model 2

<table>
<thead>
<tr>
<th>Model</th>
<th>B estimate</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.267</td>
<td>56.151</td>
<td>0.000</td>
</tr>
<tr>
<td>Usability</td>
<td>0.509</td>
<td>5.722</td>
<td>0.000</td>
</tr>
<tr>
<td>We-intention</td>
<td>0.120</td>
<td>1.343</td>
<td>0.185</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.267</td>
<td>55.661</td>
<td>0.000</td>
</tr>
<tr>
<td>Usability</td>
<td>0.505</td>
<td>5.497</td>
<td>0.000</td>
</tr>
<tr>
<td>We-intention</td>
<td>0.116</td>
<td>1.261</td>
<td>0.213</td>
</tr>
<tr>
<td>Interaction</td>
<td>-0.014</td>
<td>-0.209</td>
<td>0.835</td>
</tr>
</tbody>
</table>

Note: Dependent variable: adoption

However, if we only consider we-intention as independent variab le in model 3, the regression result shows a significant effect of we-intention on adoption with R square 0.455, showing we-intention might alone count for 45.5% of adoption variance. That means we-intention is a possible cause of adoption.

Table 7  Coefficients of model 3

<table>
<thead>
<tr>
<th>Model</th>
<th>B estimate</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.267</td>
<td>44.860</td>
<td>0.000</td>
</tr>
<tr>
<td>We-intention</td>
<td>0.502</td>
<td>44.860</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: Dependent variable: adoption

For further exploring the moderation effect of we-intention in another angle, the authors split the sample into high we-intention group and low we-intention group, and calculated the coefficient of usability respectively in Table 8.

Table 8  Coefficients of usability in high and low we-intention groups

<table>
<thead>
<tr>
<th>Group</th>
<th>We-intention</th>
<th>N</th>
<th>B estimate</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low</td>
<td>32</td>
<td>0.887</td>
<td>6.022</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>High</td>
<td>26</td>
<td>0.701</td>
<td>4.508</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: Independent variable: usability dependent variable: adoption

In high we-intention group, the coefficient of usability is lower, meaning when we-intention is once built, the importance of usability for adoption might drop. Furthermore, after Fisher’s Z-transformation, the coefficient difference between the two groups is found significant with p-value 0.013, shown in Table 9. The significant difference between two groups indicates we-intention might substitute usability in causing adoption.

Table 9  Z test of coefficient difference of usability

<table>
<thead>
<tr>
<th>Group</th>
<th>We-intention</th>
<th>B estimate</th>
<th>Zr</th>
<th>Z</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low</td>
<td>0.887</td>
<td>1.408</td>
<td>2.216</td>
<td>0.013</td>
</tr>
<tr>
<td>2</td>
<td>High</td>
<td>0.701</td>
<td>0.869</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 Discussion

The purpose of this study is to explore we-intention’s effect on adoption, the mean score and standard deviation of variables indicate the sample data is scattered enough to provide information, and the correlation coefficient between we-intention and adoption 0.674 indicates we-intention is a candidate factor to explain adoption. Model 3 exhibits that we-intention alone still could explain 45.5% of adoption variance. The moderation effect of we-intention is not significant in model 2. This is probably because the three industry leading cloud drives the author introduced to students in this experiment are of good performance, therefore usability is a strong determinant factor of adoption. In addition, the high correlation between we-intention and usability implies that the good usability of the cloud drives may make students tend to give favourable scores in answering question items of we-intention. Due to collinearity between we-intention and usability, we-intention was excluded in the regression model.

However, the result of split sample test indicates that high we-intention group is significantly less influenced by usability than the low we-intention group. That means we-intention is not neglectable in predicting adoption of cloud drives. In other researches such as (Shen et al., 2009; Shen et al., 2010; Shen et al., 2012), we-intention was taken granted as the antecedent of adoption and use of instant messaging. Moreover, shared intentionality, a more general term of we-intention, was reported as a facilitator of computer supported cooperative work in Tenenberg et al. (2015). Although the conceptualisation of we-intention is still evolving (Pacherie, 2011; Pacherie, 2013; SchweikardDSchmid, 2013), the sub-concepts of we-intention, which are compliance, internalisation and identification, are studied in researches of performance of service people (Baker et al., 2014), branding (Lam et al., 2011) and marketing relationships (Lam, 2012), which are all trying to build a ‘we’ consciousness as a resort of management. We-intention also could be a resort of managing the acceptance of cloud services.

6 Comparison with relative researches

Compared with prior researches on we-intention such as Shen et al. (2009), Shen et al. (2010) and Shen et al. (2012), although the number of question items and sample size are smaller, the reliability of concept of we-intention in this study still achieves a satisfactory level with Cronbach’s Alpha 0.885. This result confirms that social influence theory could provide a framework for more future researches to study we-intention. Shen’s series of works took we-intention as the reason of a group to adopt social media platforms like instant messaging for granted, and studied other possible factors that may affect the formation of we-intention, such as gender, user experience, desire, and gratification. In this study, we designed an experiment of 18 weeks long to simulate the social influence process to form we-intention in student groups to adopt cloud drive to share files and reports in their group project collaboration. Compared with Shen’s works, our study deemed the idea of we-intention as the explanation of group adoption of a collaborative technology more conservatively, tried to build the context where we-intention matters, encouraged participants to form we-intention, and found we-intention is a competitive alternative explanation to usability.
However, our study also found we-intention has not been a paradigm shifting explanation of group adoption of collaborative information and communication technologies like Shen has claimed. Although the adoption and use of instant messaging or cloud drive requires collective efforts and interdependence among a group of users, individual’s judgement of system usability may still remain an unneglectable explanatory factor of adoption.

7 Conclusion and suggestion

In this exploratory research, the authors found that when controlling usability, we-intention has a small direct effect on adoption, and no moderation effect. However, we-intention alone is a cause of adoption, and we-intention can weaken the relationship between usability and adoption. In other words, for those who have formed strong we-intention to adopt cloud drive in the group project, they care about the cloud drive’s usability less.

In theory, this research proves that the three question items (compliance, internalisation and identification) can catch the essence of we-intention, and we-intention may influence system adoption. Future research could study the antecedents and subsequences of compliance, internalisation and identification.

In practice, this research shows the system adoption process of some cloud services is a social influence process, and trying to influence user’s mental state of compliance, internalisation and identification is helpful to achieve some marketing objectives. The managerial implication is that we-intention is correlated with adoption and could be a significant factor of adoption of information system embedding social networking technology. For managers, in addition to allocating resources in improving system usability, finding ways of social influence perspective to increase we-intention might be an alternative to improve system adoption.

7.1 Conflict of interest statement

No conflicts of interest reported.

References


