A Bibliometric Analysis of the Technology Acceptance Literature (1989-2014)

Kai-Yu Tang, Graduate Institute of Digital Learning and Education,
National Taiwan University of Science and Technology, Taiwan
Mei-Chun Chen, Department of Information Management,
Vanung University, Taiwan
Chun-Hua Hsiao, Department of Marketing, Kainan University, Taiwan

The Asian Conference on Literature, Librarianship & Archival Science 2016
Official Conference Proceedings

Abstract
The technology acceptance model (TAM) has generated a long-term impact on management research and recent education literature. However, only little attention was given to bibliographically review the literature development on the ideas of technology acceptance. While many research reviews focused on reexamining the interrelationships among TAM constructs through meta analysis, only few provided systematic overview for the TAM literature development and progression based on overall citation network. In this paper, we present a key-route main path analysis to demonstrate the trajectory of the TAM literature. To include the most representative research papers, multi-keyword queries were adopted to conduct the initial search in the Web of Science. The data was retrieved on October 1, 2014. Accordingly, a total of 1,038 journal articles with 33,634 citation times were obtained and used for main path analysis. The result of most critical 20 routes using key-route main path analysis was mapped in a directed network graph. This is the very first attempt to profile the TAM development trajectories, providing a platform for further scholarly discussion.

Keywords: technology acceptance model; main path analysis; citation network; bibliometrics; literature review

Introduction

The technology acceptance model (TAM) was originally developed to study technologies in the context of organizations (Davis, 1989; Davis et al., 1989), which hypothesized that actual use of a certain technology is directly influenced by a person's behavioral intention to use, which in turn, is determined by perceive usefulness (PU) and attitude toward the technology. In addition, PU and attitude are affected by perceived ease of use (PEOU). Previous researchers have suggested that the main strengths of TAM are its parsimony and the strong generalizability (Lee et al., 2003; Plouffe, et al., 2002; Hsiao & Yang, 2011). The model, therefore, has evolved and been widely applied to various technology-related adoption behaviors such as utilitarian systems (e.g. decision support systems, hospital information systems) (Venkatesh & Davis, 1996; Wilson & Lankton, 2004) and hedonic systems (e.g., video games, social media) under different situations (e.g., time and culture) with different control variables (e.g., gender, voluntarily, organizational type and size) (Venkatesh et al., 2007).

Currently, a significant number of researches have endeavored into refining and expanding TAM for many consider TAM to be one of the most widely researched domains in the field of Information Systems (IS) research. However, researchers have concerned the following question "Does merely replication and minor extensions of without substantial theoretical advance contribute to the academic development?" The *Journal of the Association for Information Systems* (JAIS) issued a special issue in 2007, entitled: "Quo Vadis TAM - Issues and Reflections on Technology Acceptance Research" to make a critical appraisement of TAM research and its direction. One paper commented by Fred Davis and his colleagues, is entitled: "Dead or alive? The development, trajectory and future of technology adoption research," (Venkatesh, Davis & Morris, 2007). Their analysis suggests that despite of excessive replication and minor extension of TAM research, there is tremendous and valuable progress for future theory advances.

After Venkatesh et al. (2007) brought the issue concerning the challenge and opportunity of TAM, there are 3,407 journal papers conducting TAM research in Web of Science from 2008 to 2014. This number far exceeds the number of 1,167 TAM research before the publication year of 2008 (summarized from Table 5). Accordingly, many quantitative review papers are conducted after 2007 to analyze the systematic and intellectual findings of TAM, such as meta-analysis and co-citation analysis. While the meta-analysis is useful in distinguishing the interrelationships among TAM factors across difference settings, the citation-based analyses contribute in the overview of literature development and progression. A co-citation analysis together with other statistical analyses (e.g., factor analysis, multidimensional scaling, and cluster analysis) are able to capture the main trends within a certain research field. According to Garfield et al. (1964), the use of citation is a powerful method to show how knowledge disseminates within scientific disciplines. For instance, the count of citations is currently treated as one of common means to demonstrate the general acceptance of an academic research article. To answer Venkatesh et al.'s (2007) question, which is also the concerns of many TAM researchers, this paper attempt to analyze the large bibliographic citations of TAM research paper published in well-recognized journal publications. In addition, a main path analysis is adopted to trace

the trajectory of TAM literature development and visualize the most critical citation routes into a citation network.

This paper offers valuable contributions, not only because it is few of the studies apply bibliometric techniques to the technology acceptance research literature, but also because it complements and improves the findings of other studies that have approached the subject from both of the qualitative and quantitative perspectives. The following presentation of this present study is composed of three main sections after the brief introduction. First, the section of data and method is to make a description of the process of data selection, including the query and keywords used for search, and the method of main path analysis. Next, the section of results presents the descriptive statistics regarding the distribution of research papers, authors, and journals of the search. Finally, a concluding remark and limitation of this paper is provided in the last section.

Data and methods

1. The process of data inclusion

To construct a holistic research review of TAM literature, this study adopted multi-keyword queries on the Web of Science (WoS). The WoS is one of reputed sources for the search of academic literature. Two databases of the WoS, the Sciences Citation Index (SCI) and the Social Sciences Citation Index (SSCI), are the major sources indexed the most highly quality journal research papers in technology management filed, including TAM research. Therefore, these two databases, SCI and SSCI, were selected for the following search in the WoS system. In addition, the time span of data search was set from 1989 for data retrieval to line up with the year of Davis's original works (Davis, 1989) and ended up in the third quarter of 2014. The whole procedure of data inclusion using multi-keyword queries is shown in Table 1.

Table 1: Data inclusion by query.

Step	History of query	Purpose of query	Results of query
#1	TS= ("perceived usefulness*")	Initial search to include the papers related to the three main keywords of TAM research as much as possible	1,814
#2	TS= ("perceived ease of use*")		724
#3	TS= ("technology acceptance model*")		1,770
#4	step #1 AND step #2	Refine the papers by using Boolean function to collect the papers with either two search keywords used in steps #1 to #3.	579
#5	step #1 AND step #3		833
#6	step #2 AND step #3		490
#7	step #4 OR step #5 OR step #6	Collect all the refinery results of the searches	1,038

The first three queries (steps #1 to #3) contained two main constructs of TAM (PU and PEOU) and one well-recognized full name of the "technology acceptance model". These three keywords were then used as keywords for the initial search. In addition, the search accompanied the wildcard sign (*) to collect relative papers as much as possible. Accordingly, three searches using keywords of "perceived usefulness*",

"perceived ease of use*", and "technology acceptance model*" in the topic column of WoS resulted in the amounts of 1,814, 724, and 1,770 research papers, respectively. Next, the steps #4 to #6 used the Boolean logic "AND" to pair each two results of search from steps #1 to #3. Finally, the other Boolean function "OR" was used in step #7 to collect all the refinery results of query. Accordingly, a total of 1,038 papers were obtained.

2. The method of main path analysis

The main path analysis (MPA) was first introduced in the research of Hummon and Doreian (1989). The method is network-based and uses citation information to help researchers trace the knowledge flow of main idea in a scientific discipline. The main idea of MPA assumes that knowledge flow from a previous work to the citing publication when this previous publication was cited by the latter one. To measure the significance of each knowledge flow from nodes to nodes in the citation network, the algorithm "search path link count" (SPLC) suggested by Hummon and Doreian (1989) is adopted in this study

The analysis of key-route main path is an extension of MPA (Liu and Lu, 2012), which guarantees that the top significant links found by SPLC algorithm will be included in the resulting main paths. Practically, the key-route main path analysis begins by identifying the link with the highest SPLC (key-route) in the network. Further, it continues to connect nodes both forward from the head node of a given link and backward from the tail node of the same link, and then repeats the same procedure for all other specified key-routes. In this study, we adopt the global key-route main path, instead of a local one.

Results

1. Descriptive statistics

As shown in Table 2, the literature development of TAM research was presented with three stages. The pioneering stage continued for a decade (1989-2000), in which the amount of research papers and authorships were less than a hundred. The boom of TAM research started from the year of 2001. During the second decade (2001-2010), the size of published research and contributed authors has increased 10 times comparing with the first decade, and the growing trend of TAM research continued within more recent year (2011-2014). Currently, the size of TAM publication has accumulated to 1,038 journal articles. This indicates that the TAM research has become one of the major issues within management and education discipline.

Table 2: Distribution of research papers and authorships.

Year	Papers	Accumulated papers	Authors*	Accumulated authors
1989	1	1	1	1
1992	2	3	5	6
1993	1	4	3	9
1994	3	7	5	14
1995	6	13	11	25
1996	7	20	8	33
1997	5	25	12	45
1998	9	34	12	57
1999	7	41	13	70
2000	8	49	6	76
2001	13	62	28	104
2002	15	77	32	136
2003	25	102	43	179
2004	22	124	41	220
2005	38	162	87	307
2006	31	193	60	367
2007	62	255	120	487
2008	86	341	177	664
2009	104	445	197	861
2010	81	526	150	1,011
2011	131	657	249	1,260
2012	132	789	302	1,562
2013	129	918	250	1,812
2014*	120	1,038	173	1,985

* The full-author of each paper was counted. The data was collected until the third quarter of 2014.

These 1,038 TAM related research papers were then identified and retrieved along with their citation data from the Web of Science (WoS). Note that the citation was counted only referenced by journal articles in order to keep the quality of research papers in this analysis. The whole process of data retrieval was complete in November 5, 2014. Overall, the pool of TAM candidate papers has jointly received a great among of 33,634 citations from 9,908 journal articles, indicating a significant research impact of the whole TAM research community.

Looking inside, all the 1,038 papers have been published in 269 various journals, where the most influential journals in terms of total published papers are *Computers in Human Behavior* (CHB), *Behaviour & Information Technology* (BIT), *Computers & Education* (C&E), and *Information & Management* (I&M). While the CHB and C&E have been ranked as the top tier journals in education and education research, the BIT and I&M are long-standing high quality journals in the field of information systems (IS) research. These top four publications have issued over 200 TAM-related research papers since 1995 and shared a relatively high impact in terms of g-index and h-index. Note that one most long-standing periodical in TAM literature is attributed to MIS Quarterly, which had published the best-cited original TAM work which authored by Fred D. Davis in 1989. The sample articles of *MIS Quarterly* included in this dataset has been jointly cited with the highest 13,114 times over the other journals. Most of the rest journals have published TAM studies after 2000. The detailed

statistics of journal distribution about 1,038 selected TAM research are listed in Table 3.

Table 3: Journal Statistics (top ten).

Journal title	Total papers	g-index	h-index	Active years	Total citations
Computers in Human Behavior	63	35	22	1999-2014	1,374
Behaviour & Information Technology	49	20	12	1999-2014	455
Computers & Education	48	35	20	2003-2013	1,291
Information & Management	43	43	28	1995-2014	4,348
Journal of Computer Information Systems	28	14	10	1996-2014	226
MIS Quarterly	19	19	17	1989-2012	13,114
International Journal of Mobile Communications	19	12	9	2009-2013	168
Online Information Review	17	13	7	2006-2012	182
Industrial Management & Data Systems	15	15	9	1998-2013	360
International Journal of Medical Informatics	15	15	6	2007-2014	305

2. The overall TAM development: Top 20 key-route main paths

The citation network using key-route main paths analysis is visualized as show in Figure 1, presenting an overview of TAM development from 1989 to 2014. The number of top key-routes is set to 20 to make sure that the overall main paths include the most critical 20 routes of the TAM development. In this figure, the arrow shows the direction of knowledge flow, and the line thickness reflects the size of traversal count. The thicker the line is, the more counts and significant the route is. The key-route 20 main paths consist of 29 research papers represented as 29 nodes in the map. Each node in the figure is denoted as a notation with the information of authors, published year, times cited, and published journal. For example, "DavisBW1992(769)Journal of Applied Social Psychology" represents Davis as the last name of the 1st author, followed by BW as the initials of the co-author's last name (i.e., Bagozzi and Warshaw). The figure 1992 represents the published year, 769 inside the parentheses denotes the citation times of the paper, and the node ended with its name of publication, the *Journal of Applied Social Psychology*.

The shape of the key-route paths resemble a double helix which begins from the sourcing node of "Davis1989(4720)MIS Quarterly" and converges at four critical nodes: "Venkatesh1999(329)MIS Quarterly", "Venkatesh2000(836) Information Systems Research", and "ZhouLW2010(47) Computers in Human Behavior". There is no surprise that the path begins with Davis (1989), who introduced two renowned ideas, PU and PEOU, and proposed an initial research framework of technology acceptance, which is known as the Technology Acceptance Model (TAM). Then, a series of theoretical development, validation, extension, and application were presented. Accordingly, two research trends can be characterized as theoretical development and construction as well as theory application.

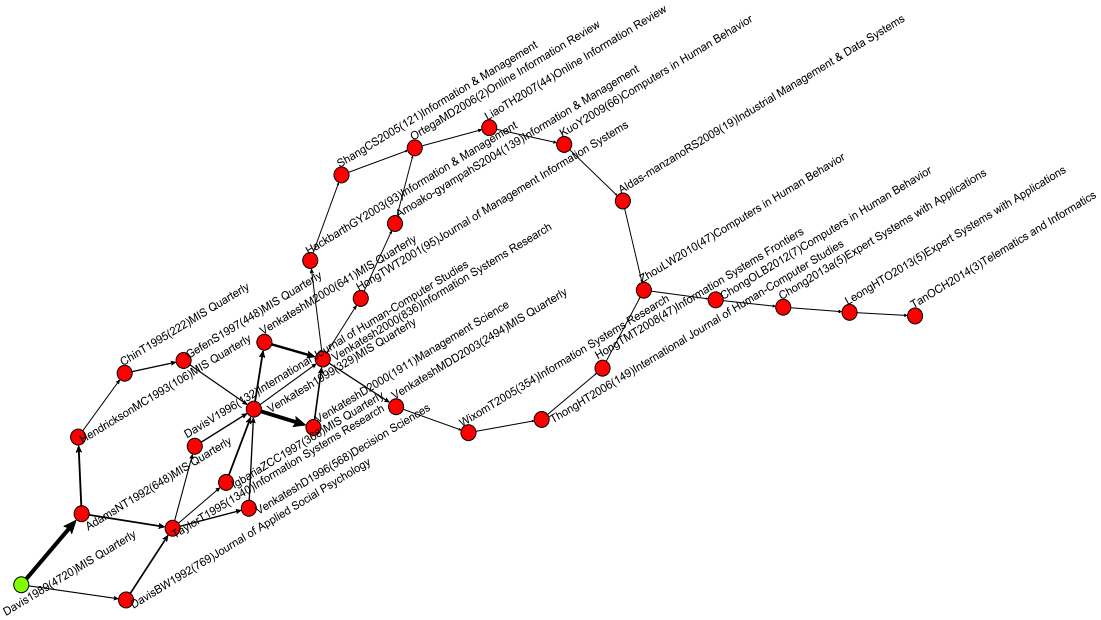

Figure 1: Top 20 key key-route main paths of technology acceptance model (TAM).

The first trends of theoretical development, validation, and extension begin with Davis (1989), then diverts into two paths. One path demonstrating the validation of TAM begins with Adams et al. (1992) by testing and replicating TAM. They confirmed the convergent and discriminant validity of the two constructs: PU and PEOU. Hendrickson et al. (1993) conducted a further investigation to examine the reliability of PU and PEOU, and confirmed the test-retest reliability of these two variables. Chin and Todd (1995) differentiated the measurements between PU and effectiveness, and concluded a one-dimensional measurement of PU. Followed the original TAM model, Gefen and Straub (1997) tested the gender effect and suggested the matter that the issues of gender difference should be added along on the models along with other cultural effects.

Another path discusses the development and extension of TAM, mostly exploring the antecedents of PU and/or PEOU. This trend is started with the work of Davis et al. (1992), which proposed the importance of intrinsic motivation. To predict user's behavioral intention in workplace, Davis and his colleagues presented the view with extrinsic motivation of PU. The following node, Taylor and Todd (1995), decomposed the belief structures based on the Theory of Planned Behavior (named as DTPB) and identified two main elements of TAM (i.e., PEOU and PU) as the antecedents of attitude. This streams continued by two following studies. While the study of Igbaria et al. (1997) explored and confirmed that the exogenous organizational variables influence both PEOU and PU, the research of Venkatesh and Davis (1996) developed a model to investigate the antecedents of PEOU. These pioneering works converged at the research of Venkatesh (1999), which re-examined and verified the role of intrinsic motivation in comparison with a traditional training method.

Following the first convergent node of Venkatesh (1999), two nodes of VenkateshM2000(641) and VenkateshD2000 (1911) diverged and met quickly at the second convergent node of Venkatesh (2000). WhileVenkatesh and Morris (2000) integrated subjective norm into the TAM and investigated gender differences in the

adoption of information system, Venkatesh and Davis (2000) proposed TAM2 by investigating the antecedents of PU in terms of subjective norm, image, cognitive instrumental factors, and moderating factors. These two studies merged to the study of Venkatesh (2000), which proposed computer self-efficacy, facilitating conditions, computer playfulness, and computer anxiety as the early perceived determinants of PEOU. Overall, the key-route main paths of TAM from 1989 to 2000 presented a theoretical research stream of TAM development and extension.

The second development of the TAM literature evolved between 2001 and 2006. Appeared in the lower circle of key-routes, two critical studies continued the trend of theoretical development which began with the node of VenkateshMDD2003(2494), then followed by WixcomT2005(354). Unlike previous research proposed by Venkatesh which were endeavored on the extension of TAM by investigating the antecedents of PEOU and PU, Venkatesh et al. (2003) proposed a renowned competing model, named the Unified Theory of Acceptance and Use of Technology (UTAUT). Instead of using the terms of PEOU and PU, four core determinants of intention and usage, and four moderators are adopted in the UTAUT. Nevertheless, effort expectancy and performance expectancy, two key factors of UTAUT, are considered to resemble PEOU and PU, respectively (Chiu and Wang, 2008). Then the knowledge flow goes to Wixcom and Todd (2005), which integrated satisfaction literature into technology acceptance literature, and Thong et al. (2006), which developed an expanded expectation-confirmation model by incorporating the post-adoption beliefs of PEOU, PU, and perceived enjoyment.

The other upper key-routes of TAM represent the trend of theoretical application. While one route begins with the studies of Hackarth et al. (2003) and Shang et al. (2005); the other one is from Hong et al. (2001) to Amoako-Gyampah and Salam (2004). The first stream leaded by Hackarth et al. (2003) traced the link between system experience and PEOU via both positive (computer playfulness) and negative (computer anxiety) responses, and other important intrinsic motivations (e.g., entertainment). The other clan goes with Hong et al. (2001) who investigated the effects of a set of individual differences (computer self-efficacy and knowledge of search domain) and system characteristics (relevance, terminology, and screen design) on the intention to use digital library and the system of enterprise resource planning (ERP). The upper key-routes merges at the node of OrtegaMD2006(2). Note that Ortega et al. (2006) investigates managers' acceptance of online business management applications, but received only two citations (one is cited by Liao et al. (2007)). In sum, following the early TAM foci, the main emphases of TAM literature within the mid-2000s are to investigate the utilitarian purpose of technology adoption, and most of research was surveyed in the organizational contexts.

Currently, the trend of TAM research is shift to mobile-based application, or m-acceptance, since 2006. For example, in the routes of lower circle, the research of Thong et al. (2006) opened an era of mobile commerce/service from the perspective of consumers. Similarly, the research of Hong et al. (2008) tested mobile data services based on the model of DTPB. On the other hand, Liao et al.'s (2007) study analyzed factors influencing the usage of 3G mobile services. Kuo and Yen (2009) worked on 3G mobile value-added services. Aldas-Manzano et al. (2009) explored factors influencing consumers' engagement in mobile shopping. This stream opened a start line of mobile-based TAM research, and then converged at the node of

ZhouLW2010(47), which proposed a mobile banking user adoption model by integrating the task technology fit (TTF) model and the UTAUT.

Following the mobile-based research line of TAM, two recent papers in the key-routes examined factors affecting consumers' intention to adopt 3G (Chong et al., 2012) by adopting neural network (a non-linear and non-compensatory model) and UTAUT (Chong (2013a). The other two nodes in the tail of network proposed a more specific and novel application of mobile commerce, i.e., NFC (Near Field Communication). For example, the study of Leong et al. (2013) explored factors influencing the adoption of NFC-enabled mobile credit card with gender, age, experience and usage as moderator variables. The research of Tan et al. (2014) examined the adoption of mobile credit card (i.e., NFC) with TAM and four additional constructs.

Taken together, the present key-route main path has delivered a graphically visualization overview of citation network, including the first emerging theoretical development stage from 1989 to 2000, the continuing validation and extension stage until mid-2000s, and the current foci on mobile acceptance since 2006. This provides a conceptual map toward understanding the literature development of TAM.

Conclusion and limitation

The main purpose of this study is to identify the most significant trajectories of research development within TAM discipline. The key-route main path analysis helps extract the key information from a complicated citation network and present the development trajectories of TAM research. Although the most critical 20 routes is included to cover as many core literature as possible, subjected to the limited availability of papers and associated citation information of the Web of Science, some TAM studies of certain importance may be ignored. For the future research, one can expand the pool of databases and increase the number of key-routes in the analysis. Bearing these limitation in mind; however, this current paper presents a holistic view of TAM literature development from 1989 to 2014.

References

Adams, DA., Nelson, RR., & Todd, PA. (1992). Perceived usefulness, ease of use, and usage of information technology: A replication. *MIS Quarterly, 16*(2), 227-247.

Aldas-Manzano, J., Ruiz-Mafe, C., & Sanz-Blas, S. (2009). Exploring individual personality factors as drivers of M-shopping acceptance. *Industrial Management & Data Systems, 109*(5-6), 739-757.

Amoako-Gyampah, K., & Salam, AF. (2004). An extension of the technology acceptance model in an ERP implementation environment. *Information & Management, 41*(6), 731-745.

Chin, WW., & Todd, PA. (1995). On the use, usefulness, and ease of use of structural equation modeling in mis research: A note of caution. *MIS Quarterly, 19*(2), 237-246.

Chiu, C. M., & Wang, E. T. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information & Management, 45*(3), 194-201.

Chong, AYL. (2013). Predicting m-commerce adoption determinants: A neural network approach. *Expert Systems with Applications, 40*(2), 523-530.

Chong, AYL., Ooi, KB., Lin, BS., & Bao, HJ. (2012). An empirical analysis of the determinants of 3G adoption in China. *Computers in Human Behavior, 28*(2), 360-369.

Davis, FD. (1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Davis, FD., Bagozzi, RP., & Warshaw, PR. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*(14), 1111-1132.

Davis, FD., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *International Journal of Human-Computer Studies, 45*(1), 19-45.

Gefen, D., & Straub, DW. (1997). Gender differences in the perception and use of E-mail: An extension to the technology acceptance model. *MIS Quarterly, 21*(4), 389-400.

Hackbarth, G., Grover, V., & Yi, MY. (2003). Computer playfulness and anxiety: positive and negative mediators of the system experience effect on perceived ease of use. *Information & Management, 40*(3), 221-232.

Hendrickson, AR., Massey, PD., & Cronan, TP. (1993). On the test-retest reliability of perceived usefulness and perceived ease of use scales. *MIS Quarterly, 17*(2), 227-230.

Hong, SJ., Thong, JYL., Moon, JY., & Tam, KY. (2008). Understanding the behavior of mobile data services consumers. *Information Systems Frontiers, 10*(4), 431-445.

Hong, W., Thong, JYL., Wong, WM., & Tam, KY. (2001). Determinants of user acceptance of digital libraries: An empirical examination of individual differences and system characteristics. *Journal of Management Information Systems, 18*(3), 97-124.

Hsiao, C. H., & Yang, C. (2011). The intellectual development of the technology acceptance model: a co-citation analysis. *International Journal of Information Management, 31*(2), 128-136.

Hummon, N. P., & Doreian, P. (1990). Computational methods for social network analysis. *Social Networks, 12*(4), 273-288.

Igbaria, M., Zinatelli, N., Cragg, P., & Cavaye, ALM. (1997). Personal computing acceptance factors in small firms: A structural equation model. *MIS Quarterly, 21*(3), 279-305.

Kuo, YF., & Yen, SN. (2009). Towards an understanding of the behavioral intention to use 3G mobile value-added services. *Computers in Human Behavior, 25*(1), 103-110.

Lee, Y., Kozar, K.A., & Larsen, K. (2003). The technology acceptance model: past, present, and future. *Communications of the Association for Information Systems, 12*(1), 752-780.

Leong, LY., Hew, TS., Tan, GWH., & Ooi, KB. (2013). Predicting the determinants of the NFC-enabled mobile credit card acceptance: A neural networks approach. *Expert Systems with Applications, 40*(14), 5604-5620.

Liao, CH., Tsou, CW., & Huang, MF. (2007). Factors influencing the usage of 3G mobile services in Taiwan. *Online Information Review, 31*(6), 759-774.

Liu, J. S., & Lu, L. Y. (2012). An integrated approach for main path analysis: Development of the Hirsch index as an example. *Journal of the American Society for Information Science and Technology, 63*(3), 528-542.

Ortega, BH., Martinez, JJ., & De Hoyos, MJM. (2006). Analysis of the moderating effect of industry on online behaviour. *Online Information Review, 30*(6), 681-698.

Plouffe, C.R., Hulland, J.S., & Vandenbosch, M. (2001). Research report: richness versus parsimony in modeling technology adoption decisions: understanding merchant adoption of a smart card-based payment system. *Information Systems Research, 12*(2), 208-222.

Shang, RA., Chen, YC., & Shen, L. (2005). Extrinsic versus intrinsic motivations for consumers to shop on-line. *Information & Management, 42*(3), 401-413.

Sumak, B., HericKo, M., & Pusnik, M. (2011). A meta-analysis of e-learning technology acceptance: The role of user types and e-learning technology types. *Computers in Human Behavior, 27*(6), 2067-2077.

Tan, GWH., Ooi, KB., Chong, SC., & Hew, TS. (2014). NFC mobile credit card: The next frontier of mobile payment? *Telematics and Informatics, 31*(2), 292-307.

Taylor, S., & Todd, PA. (1995). Understanding information technology usage - a test of competing models. *Information Systems Research, 6*(2), 144-176.

Thong, JYL., Hong, SJ., & Tam, KY. (2006). The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance. *International Journal of Human-Computer Studies, 64*(9), 799-810.

Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology, 52*(5), 463-479.

Venkatesh, V. (1999). Creation of favorable user perceptions: Exploring the role of intrinsic motivation. *MIS Quarterly*, *23*(2), 239-260.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11*(4), 342-365.

Venkatesh, V., Davis, F., & Morris, M. G. (2007). Dead or alive? the development, trajectory and future of technology adoption research. *Journal of the Association for Information Systems*, *8*(4), 267-286.

Venkatesh, V., & Davis, FD. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, *27*(3), 451-481.

Venkatesh, V., & Davis, FD. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204.

Venkatesh, V., & Morris, MG. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, *24*(1), 115-139.

Venkatesh, V., Morris, MG., Davis, GB., & Davis, FD. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-478.

Wixom, BH., & Todd, PA. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research*, *16*(1), 85-102.

Wu, J., & Lederer, A. (2009). A meta-analysis of the role of environment-based voluntariness in information technology acceptance. *MIS Quarterly*, *33*(2), 419-432.

Wu, J., & Lu, X. (2013). Effects of extrinsic and intrinsic motivators on using utilitarian, hedonic, and dual-purposed information systems: a meta-analysis. *Journal of the Association for Information Systems*, *14*(3), 153-191.

Zhou, T., Lu, YB., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, *26*(4), 760-767.

Contact email: maehsiao@gmail.com