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Using the Diffusion of Innovation Concept to Explain the Factors That Contribute to the Adoption Rate of E-journal Publishing

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ABSTRACT

This paper reports on the factors that contribute to the adoption rate of e-journal publishing based upon responses from 82 Malaysian journal publishers. Drawing upon the theory of innovation diffusion, the study examines the role of awareness, three organization variables (publication size, age of the journal, and experience of editors), and attributes of e-journals (relative advantage, compatibility, complexity, trialability and observability) as influences to the rate of e-journal publishing adoption. Findings show that only two attributes—complexity and trialability—emerge as significant contributors to e-journal adoption rates, and all three organization variables—journal's age, publication size, and editorial experience—are significant. Collectively, these five significant variables explained 57.8% of the variance in adoption rate. We discuss the results and implication of the findings with respect to the wider context of e-journal publishing.

1. Introduction

It is often assumed that people would readily adopt systems using new technologies to replace traditional ones. After all, we are already moving from the social structure of the X generations who are exposed to the Internet in their youth to the Net or Y generations who do not know life without the Internet (Oblinger & Oblinger, 2005). Therefore, it is likely that these X and Y generations would take to technologies like ducks to water. New technologies are adopted rapidly if they fulfill the need of users and if perceived as superior to other alternatives (Frambach & Schillewaert, 2002; Rogers, 2003). However, lack of enthusiasm towards some potentially beneficial innovations also exists even in social systems that are thought to be characteristically fertile for diffusion (Dilek-Kayaoglu, 2008). There is variation in the rate or speed of adoption among potential adopters of a given product within a particular social system or geographical setting (Toole, Cha, & González, 2012). This situation similarly applies to the adoption of electronic journal publishing by Malaysian journal publishers.

As early as the late 1990s, there were active discussions about the future of electronic journals, whether they would replace their print versions (Odlyzko, 1997, 2002), and whether academics would readily use and contribute to them (Borrego, Anglada, Barrios, & Comellas, 2007; Deligiannaki & Ali, 2011). Users of electronic journals gained limitless advantages without having to physically store anything (Massad, Brown, & Tucker, 2011). Publishers enjoyed reduction in cost but bear other costs such as virtual workflow management and delivery enhancement (Fidczuk, Beebe, & Wallas, 2007). Moving online has transformed the face of journal publishing and present opportunities for journal publishers, but not without some challenges due to the emergence of new roles, routines, values, attitudes and patterns of user and author behavior (Campbell & Meadows, 2011; Johnson & Luther, 2008). These challenges have influenced the decision making and time taken for the adoption of electronic journal publishing in many developing countries (Kanyengo, 2007; Salager-Meyer, 2008), including Malaysia (Zainab, Ang, & Abrizah, 2005). This study is motivated by the observation that even though the conditions are conducive and the infrastructure is in place in Malaysia, the adoption of electronic publishing for scholarly journals has been slow on the uptake, and there is a need to investigate why this is so.

Journal publishing in Malaysia dates back to the 1840s during the British colonial period, and the research endeavor at the time was devoted to the study and classification of natural resources, agriculture, medicine, and the geological surveys of the national territories. The number of scholarly periodicals grew over the years, especially after Malaysia's independence in 1957 (then called Malaya), which was a result of the emergence of local universities, research institutions, and learned societies. Most of these later journals, which mainly served local institutions and organizations, focused their publications on subjects in history, archaeology, natural history, literature, culture, and anthropology relating to Malaya (as it was known then) and the Malay Archipelago (Tiew, 1999). In the last two decades or so, the

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education policy has changed and is now centered on the globalization of higher education and the development of a knowledge-based economy that has increased collaboration on research and scientific publications (Arokiasamy & Nagappan, 2012).

The aim is to make Malaysian higher institutions more competitive in global research, and this has resulted in the tendency of Malaysian academics and students to bypass local or national journals and submit their manuscripts to journals published abroad (mainly Thompson ISI or Scopus indexed journals) (Roosfa & Yahya, 2011), which are available online, accessible to the global research community, and easily citable. This is because many Malaysian journals suffer from lack of visibility to the global research community, and a large number of these journals are still produced (only) in the traditional print format. An audit from 2011 of journals published in Malaysia revealed 464 titles with the public universities serving as the largest publishers (257 titles, 55.5%), followed by the professional associations (104 titles, 22.4%) and the government research agencies (96 titles, 20.6%). Commercial publishers produced only 1.5% of the total journals (7 titles) (Zainab, Sanni, Edzan & Koh, 2012). The study also found that 62.9% of Malaysian journals are still produced only in print format, and while 31.3% are produced in hybrid format (both print and electronic online), only 5.8% are born digital (exclusively on the Internet).

With studies showing that the rate of adoption of technologies channeled through the Internet are moving faster than other media and the view that Internet usage in Malaysia is estimated to be over 17 million in 2012, with a 60.7% population penetration rate (Internet World Statistics, 2012), the slow transition from print to electronic publishing indicates a disconnect between technology availability and utilization with respect to e-journal publishing adoption. Besides, Malaysia research universities and government research institutes have over the years reportedly channeled large amounts of funds to support research and development, thus, this slowness in adopting electronic journal publishing is a cause for concern since the diffusion of innovation is an integral part of economic and social development of any nation. This paper aims to identify and examine the most relevant factors or attributes that may potentially influence the adoption rate of e-journals among journal publishers in Malaysia.

2. Related Literature

One issue that was been discussed in the late 1990s was the innovativeness of electronic publishing. Can electronic publishing be considered as an innovation? Rogers (2003) has defined innovation as something new to a population or social system—a new process that provides a better way of doing, making, and delivering things. The social systems in this context are the journal publishers, the authors, scholars, libraries, and so on. Innovation is indicated by a change of process from manual to automation that enhances the quality of the product and its delivery. According to Rogers, four factors are important in innovation diffusion: (1) the innovation itself; 2) the communication channels used to spread information about the innovation; 3) time; and 4) the nature of the social system. Therefore, the change that innovation brings to a social system becomes rich ground for investigations. It is necessary to find out the attributes that can best explain the adoption of a particular innovation within a given social system.

Hahn and Schoch (1997) suggested that electronic publishing cannot be represented as a single innovation but as an "innovation cluster," a process involving multipart of independent innovations, which may be adopted at different rates. The cluster comprises publisher adoption, user adoption, and format adoption—adoption of different delivery and distribution methods. In the context of this study we will focus on the publisher's rate of adoption of electronic publishing for their journals. Previous studies of electronic journal publishing were more focused on finding out the rate of adoption by faculties, the main contributor and consumer of scientific journals. Brennan, Hurd, Blecic, and Weller (2002) interviewed 30 faculties about the features of electronic journals that influenced their adoption. They found that faculty members enjoyed easy navigation, searching capabilities, resource linking, timeliness of publication, the ease to make copies, access to mass issues, and the volumes of titles in a subject area. The adoption has also changed faculty habits of using journals as they make fewer visits to the library. Faculty members also read more papers than before, expanding broader in fields, and kept themselves informed through automated alerting systems (Tenopir, King, Edwards, & Wu, 2009). However, they are likely to spend less reading time per article (Niu et al., 2010). In Regazzi and Aytac's (2008) study of authors' perceptions of journal quality, the availability of journals in an online format as well as open access were highly ranked. Rowlands (2007) also found that scientists were reading more electronic articles and had widened their scope in scholarship. Borrego et al. (2007) reported an increase in adoption of electronic journals amongst Spanish academics. Meanwhile, adoption may be slower in developing countries due to many factors that are peculiar to each ecosystem. Trivedi and Joshi (2009) found that the majority (54.6%) of health care professionals in an Indian medical center preferred print to electronic journals. Kanyengo (2007) observed that many African countries face challenges in gaining access to the latest up-to-date serial issues (both print and electronic subscriptions) in all fields of knowledge due to lack of finance and adequate infrastructure, and they still depend largely on print subscriptions. De Groote (2008) suggested that print journals would continue to be widely used together with the electronic ones.

There were few studies that examined adoption by publishers of journals. Hahn and Schoch (1997) observed that the decision to adopt electronic publishing is formed based on existing knowledge, awareness amongst publishers, and their persuasive agents (peers, social system). If the social system is supportive, adoption will more likely occur. Once an innovation is adopted the publishers begin to implement the process and the extent of implementation will reflect the depth of adoption. Full implementation will likely reveal an electronic publishing culture, where assimilation of newer technologies becomes the norm and readily accepted. Varian (1997) predicted that there would be wider use of electronic production as print journal publishing increased in cost. Hynes and Stretcher (2005) estimated the growth of electronic journals to be between 12 and 15% per year, and this would continue to increase. Adoption can also be influenced by the perceived attributes of e-journals, for example, its benefit over print, as publishers experience fewer backlogs, faster process time for editing and reviewing, speedier production cycles, etc.

Diffusion studies have reported that the rates of adoption of technologies channeled through the Internet are moving faster than other media. However there is a significant difference in diffusion pattern and process across innovation types (Frambach & Schillewaert, 2002; Rogers, 2003). Unlike other Internet platforms like Facebook, blogs, and Twitter services that come free of charge with minimal risk, e-publishing platforms come with a great deal of responsibility for publishers and users. It was observed that the growth of refereed journals has increased consistently at about 3% to 4% per year, and the total number of active scholarly journals was about 24,000 in 2010 (Mabe, 2003). Even though Campbell and Meadows (2011) highlighted significant contributions from emerging economies such as Brazil, China, India and South Korea, the numbers of indexed scientific journals produced by developing countries remain relatively small compared to the developed countries, and the disparity continues to widen yearly (Salager-Meyer, 2008). In an audit of Malaysian journals by Zainab et al. (2012), it was found that among the 464 Malaysian journals identified, less than 100 titles had adopted a hybrid (print and electronic) mode of publication. The number of publishers who opted to publish e-only stands at 27 titles, many of which were previously hybrid. In a population with high Internet usage, good infrastructure, and financial support from universities and government research institutions, the sluggish approach in adopting electronic journal publishing by Malaysian journal publishers

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deserves a proper assessment. Therefore, this research examines the most relevant attributes and influences to the adoption rate of e-journal publishing.

A potential adopter will pass through five stages in the innovation decision process: (a) knowledge (state of knowing or awareness), (b) persuasion (state of being persuaded by the attributes of the innovation), (c) decision (decision to adopt or reject), (d) implementation of the adoption, and (e) confirmation (Rogers, 2003). Many factors can play a role at different stages in the innovation decision processes, and this needs to be considered when promoting an innovation.

At the knowledge stage, individuals would possess general propensity to adopt an innovation, which are congruent to his or her social system. Potential adopters would form a set of attitudes based on the information sources and the messages being delivered about the innovation. To be persuaded, the adopter would have formulated perceptions about the characteristics of the innovation itself. Besides the awareness factor and organization characteristics (organization age, size, and experience), the decision to adopt or not to adopt an innovation would be based on the following attributes: relative advantage, compatibility, complexity, observability, and trialability.

2.1. Relative Advantage

Relative advantage refers to the extent in which publishers perceive the e-publishing mode to be better than the print-publishing mode as well as the degree to which e-publishing provides improvements in the quality and delivery of their publication. Frambach and Schillewaert (2002) found significant correlations between relative advantage and adoption. Also, Arts, Frambach, and Bijmolt (2011) found strong significant correlation between relative advantage and compatibility.

2.2. Compatibility

An innovation that is perceived to be in tandem with publishers' work behavior, values, experience, and practice (or compatibility) will experience a high rate of adoption. Kim and Galliers (2004) found that compatibility was positively related to an innovation's rate of adoption. However, Hafizah and Kamil (2009) found no significant correlation between compatibility and adoption of e-learning as a teaching tool by lecturers.

2.3. Complexity

Complexity relates to the extent in which publishers perceive e-journal publishing to be difficult to understand and use. Al-Ghaith, Sanzogni & Sandhu (2010) noted that perceived complexity was the most significantly related factor affecting e-service adoption. Pankratz, Hallfors, and Cho (2002) also identified complexity to be an important factor in the adoption of a federal drug prevention policy. In the study of adoption of instant messaging in the workplace, Glass and Li (2010) found that adopters perceived instant messaging to be free of physical and mental effort (perceived ease of use or simplicity) for use in their work. However, in a separate study on e-learning by Lee, Hsieh, & Hsu (2011), positive correlation was observed between complexity and perceived usefulness of e-learning, and the authors argued that when the innovation was perceived to be highly complex, users tended to perceive them to be highly useful even though they experienced a certain degree of difficulty in using it.

2.4. Observability

Observability refers to the degree at which publishers perceive they can explain, describe, or communicate the outcome of e-journal publishing. In a study of adoption of personal workstations by employees, Moore and Benbasat (1991) found that one of the best attributes that explains adoption is "result demonstrability" or the extent that results are benefits of the innovation are apparent. Pankratz et al. (2002) explained that when respondents perceived that members of the social system would notice changes upon implementing the innovation, they were more likely to fully adopt it.

2.5. Trialability

Trialability refers to the extent that publishers perceive their ability to try, test or experiment with e-journal platforms or Web sites on a limited scale before making a decision on whether to adopt it or not. Studies indicated that prior experience with technological innovations might increase the likelihood of future adoption (Hausman & Stock, 2003). Findings from Gardner and Amoroso (2004) showed the importance of experience (trialability) of using the Internet as a variable affecting the perceived usefulness of the Internet.

The third phase of the diffusion process is the decision to adopt, reject, or delay. Decision making affects the rate of adoption and the rate of adoption could be observed in terms of the speed with which an innovation is adopted by members of the social system (fourth phase). This was measured by the length of time it required publishers to adopt e-journals. Therefore, this study aims to examine whether publishers' awareness, organization characteristics, and perceived attributes of electronic journals are related to the rate of e-journal adoption.

3. Methodology

This study employed the quantitative research method, which included an elicitation study, design of a new instrument for data collection (questionnaire), and data analysis. The questionnaire was grouped into three sections: (a) respondent's awareness of the e-journal publishing process, (b) perceptions about the five attributes of e-journals, and (c) the characteristics of respondents and their organization. The rate of adoption was measured by the length of time it required publishers to adopt e-journal publishing. This is obtained from responses to the question: "If you have adopted e-journal publishing, in what year did you adopt?" Perceptions about the five attributes were measured using relevant scale item statements (Fig. 1). For characteristics of respondents and their organizations, the journal's age was obtained from responses to the question: "In what year was the first issue of your journal published?" Information about publishers' years of experience was obtained from responses to the question: "How many years have you been involved in journal publishing personally?" Publication size was obtained from responses to the question: "How many issues do you publish in a year?" (see Appendix A).

3.1. Research Questions

The study will answer the following research questions:

RQ1. *Is there a relationship between awareness of the electronic journals process and rate of adoption of e-journal publishing?*

It is assumed that publishers would more likely adopt electronic publishing if they are aware of the potential and existence of the innovation. Respondents were asked to respond to seven statements on a scale of 1 (strongly disagree) to 5 (strongly agree) for the construct measuring "Awareness of e-journal publishing."

RQ2. *Is there a relationship between perception about the five attributes of e-journals and rate of adoption of e-journals?*

The perception of an individual about the characteristics of an innovation can explain the rate of adoption of the innovation. This study seeks to find out if there is a relationship between the five attributes of e-journals: relative advantage (10 items), compatibility

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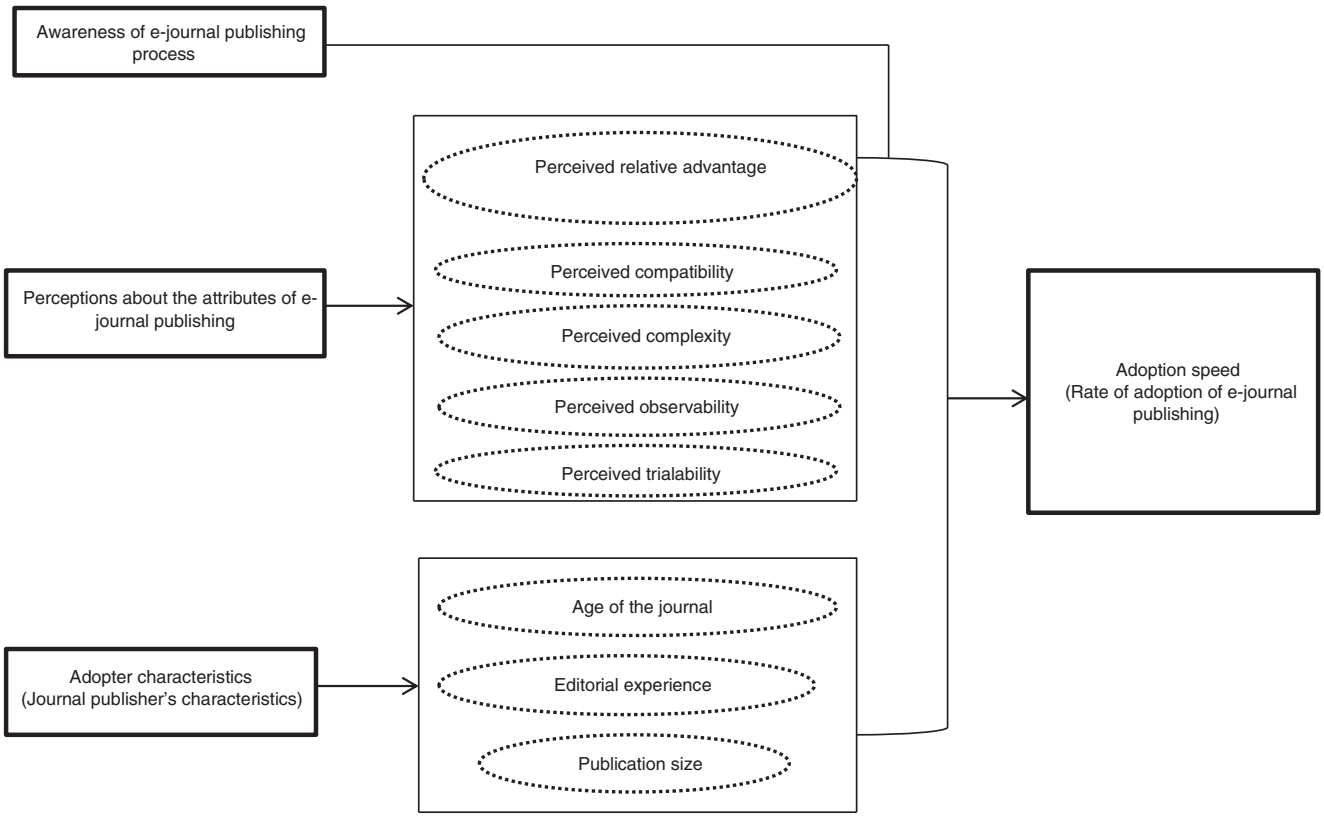

Fig. 1. Conceptual research model of the variables affecting the adoption rate of e-journal publishing.

(6 items), complexity (5 items), observability (5 items), trialability (3 items) and rate of adoption of e-journals.

RQ3. *Is there a relationship between journal's age, editorial experience, publication size, and rate of adoption of e-journals?*

It has been observed that organizational characteristics or publishers' characteristics such as organization age, years of experience, and organization size can explain the adoption of an innovation (Rogers, 2003; Trivedi & Joshi, 2009). Organization age can have an effect on rate of adoption of any innovation. Also, among potential adopters, those with wealth of experience might have the propensity to adopt e-journal publishing over those with less experience. It was conceived that journal publishers with larger publication runs would more likely adopt e-publishing earlier than others in the social system. In this study, we wish to examine if there is a relationship between "journal's age," "publisher's years of experience," "publication size," and rate of adoption of e-journals.

3.2. Data Collection and Analysis

This is a quantitative study, and we elicit responses from 150 journal editors, who attended the launching of a national journal citation system organized by the Ministry of Higher Education Malaysia in June 2012. A total of 90 questionnaires were completed, and 82 were usable. Over 53.7% (44) of respondents were between 30 and 49 years old, 18% (15) were above 50 years, and 17% (14) were under 30 years. About 61% (50) were editors of journals affiliated with academic institutions, 21% (17) with government agencies, 12% (10) with professional societies, 4% (3) with research institutes, and others (2%, 2). The majority (37, 45%) of the journals were in the field of natural sciences and medicine, 10 (12%) were in engineering and technology, 28 (34%) were in the arts, humanities and social sciences, and 7 (9%) were in multi-disciplinary fields.

The scale items in the questionnaire were subjected to a factor analysis test (see Appendix, Table A6). The study sought to know how much of the scale items can explain respondent's levels of awareness and perceptions of the attributes of e-journals, therefore, the larger the recorded variance, the better the validity of the study. A value of 0.5 and above of multicolinearity is required and considered strong, and a value of 0.40 and below is considered weak. For the factor analysis to be considered appropriate, Bartlett's test of sphericity should be significant at $p < .05$, and values of the KMO measure of sampling adequacy should be between 0.5 and 1.0. For this study, scale items that recorded factor loading of less than 0.40 were not accepted and were dropped. The internal consistency of each scale was measured using Cronbach's alpha. Measures of reliability range from 0 to 1, and each scale should exhibit adequate reliability with Cronbach's alpha close to or above the recommended 0.70 level. To answer the research questions, we conducted statistical inferential tests such as the Pearson product–moment correlation coefficient and the multiple linear regression analysis. Table 1 shows the means and standard deviation values determined for the six constructs analyzed in this paper.

Table 1
Descriptive statistics of the six constructs.

Constructs	Mean	Standard deviation
Relative advantage (10 items)	4.09	0.90
Compatibility (6 items)	3.92	1.36
Complexity (5 items)	3.07	1.02
Observability (5 items)	3.58	085
Trialability (3 items)	3.50	0.99
Awareness (7 items)	3.46	090

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4. Findings

4.1. Awareness of Electronic Journals and Rate of Adoption (RQ1)

Results show that awareness ($r = .294$, $p > .05$) is not significantly related to rate of adoption of e-journals among Malaysian journal publishers (Table 2). However, the awareness construct is significantly correlated with innovation characteristics of compatibility ($r = .225$, $p < .05$), especially with observability ($r = .308$, $p < .01$) and trialability ($r = .489$, $p < .01$). One possible explanation for this is the nature of the innovation being studied and the population sampled. As most Malaysian journal editors are authors and researchers themselves, it is expected that those who are aware of e-journal publishing might have observed and tried the procedures involved in submitting papers and publishing in e-journals. However, many editors had not yet decided whether to adopt an electronic format for their own journal, or they were in the process of making this decision at the time these data were collected. Rogers (2003) similarly found awareness of innovation does not always influence adoption. This implies that awareness of e-journals is not related to the adoption of e-journals. Many Malaysian publishers are aware of e-journal publishing but are still not adopting e-journal publishing for their own journal publication.

4.2. Perception about Innovation Attributes and Rate of Adoption (RQ2)

Results show that among the five attributes, relative advantage ($r = -.219$, $p > .05$), compatibility ($r = .241$, $p > .05$) and observability ($r = 0.105$, $p > .05$) are not significant in explaining rate of adoption of e-journals among Malaysian journal publishers (Table 2). However, complexity ($r = -426$, $p < .05$) and trialability ($r = .373$, $p < .05$) are very significant. This indicates that Malaysian journal publishers recognize the advantage of publishing e-journals, but this is not a dominant influence in adoption rate. Also, perceptions of compatibility are not significantly related to the adoption rate. This result is in contrast to previous studies on innovation diffusion that found significant correlations between relative advantage and compatibility with rate of adoption. However, respondents' perception of complexity is significant in explaining rate of adoption. This implies that the more complex publishers perceive e-journal publishing, the less likely they would adopt. Moreover, the significance of trialability as a factor that contributes to the rate of adoption shows that Malaysian publishers who have had experience submitting papers to e-journals are more likely to adopt e-journals earlier than publishers who have yet to or have less experience working with e-journal platforms. This indicates that many of the publishers (both adopters and non-adopters) perceive e-journal publishing to have more advantage than printed journals. Also most of the respondents perceive e-journal publishing to be consistent with the values of journal publishing. However, the positive perception on the relative advantage and compatibility of e-journals does not lead to a decision to publish electronically, as many Malaysian journal publishers are still yet to adopt e-journal publishing.

Table 3
Correlation analysis between publisher's characteristics and rate of adoption.

Correlates	Rate of adoption
Journals age	.540**
Publication size/run	.386*
Editorial experience	.507**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

4.3. Organization Characteristics and Rate of Adoption (RQ3)

Result shows that all three organization variables, journal's age ($r = .540$, $p < .01$), editorial experience ($r = .507$, $p < .01$), and publication size ($r = .386$, $p < .05$), are relevant factors that contribute to the adoption rate of e-journals among Malaysian journal publishers (Table 3). This implies that journal publishers who have been in the business for a long time are more likely to adopt e-journals earlier than those who were relatively new. This finding is similar to results from previous studies, such as Zakaria and Rowland (2006) as well as Scott, Plotnikoff, Karunamuni, Bize, and Rodgers (2008). Also, journal titles with large publication runs were more inclined to adopt new technologies than those with fewer production runs; this finding is similar with other studies, such as Hu, Chau, and Sheng (2002) and Nordin, Othman, and Che Mat (2008). The findings imply that publishers of more established journals would more likely adopt new, innovative technologies earlier than new journals.

Overall, the five factors that contributed to e-journal adoption rates were complexity, trialability, journal age, publication size, and editorial experience. The result of the regression analysis (Table 4) indicated that these five variables collectively explained 57.8% of the variance ($R^2 = .646$, $F(5,26) = 9.481$, $p < .01$). It was found that complexity (Beta $= -.274$, $p < .01$), trialability (Beta $= .274$, $p < .01$), journal age (Beta $= .303$, $p < .01$), publication size (Beta $= .314$, $p < .01$), and editorial experience (Beta $= .277$, $p < .01$) significantly predicted the adoption rate of e-journals among Malaysian journal publishers.

5. Discussion

Our findings show that not all the innovation characteristics identified in previous literature emerge as an influence to the rate of adoption of e-journal publishing among Malaysian journal publishers. We found that awareness and perceptions of relative advantage were not relevant in explaining adoption rate. Among the five attributes of innovation, complexity and trialability were the most relevant influences on the rate of innovation adoption. This indicates that Malaysian editors are more likely to adopt an innovation earlier and

Table 2
Correlation analysis between e-publishing adoption variables and rate of adoption.

Correlates	Rate of adoption	Awareness	Relative advantage	Compatibility	Complexity	Observability	Trialability
Rate of adoption	1	0.294	−0.219	0.241	−.426*	0.105	.373*
Awareness	0.294	1	0.147	.225*	0.14	.308**	.489**
Relative advantage	−0.219	0.147	1	.439**	−0.021	.466**	.292**
Compatibility	0.241	.225*	.439**	1	−0.007	.415**	.538**
Complexity	−.426*	0.14	−0.021	−0.007	1	−0.091	−0.035
Observability	0.105	.308**	.466**	.415**	−0.091	1	.636**
Trialability	.373*	.489**	.292**	.538**	−0.035	.636**	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

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Table 4
Regression analyses of the five significant variables.

Variables	Beta
Complexity	−0.274
Trialability	0.274
Journal age	0.303
Publication size	0.314
Editorial experience	0.277

Adjusted $R^2 = .578$, $p < .01$.

rapidly when they perceive it to be less complex to use and manage. They will also be receptive to a new technology if they are able to try it on a limited scale and see how it functions.

Complexity is an important attribute in e-journal adoption because the whole cycle of electronic publishing is built on the platform provided by the Internet. Most of the tasks that were previously carried out by typesetters and publishers are now done by the authors, editors, or reviewers themselves. This entails training and learning new skills, which are perceived by respondents to be challenging and complex. Although, there are journal management systems like ScholarOne, BenchPress, EditKit, EJPress, etc., which could be purchased by publishers, very few Malaysian publishers can afford them. For these reasons, most Malaysian publishers have developed their own journal publishing systems, as each journal issue runs are not large enough to warrant the viability of using a commercial system. Most of the in-house journal management systems are limited in functions, mainly offering author submissions and reviewer assignment support. This experience may have slowed down the rate of adoption for e-journal publishing, as using prototypes would entail a higher risk of data loss and system failure. Additionally, working editorial teams are in most cases comprised of a few, fully committed editors, who lend their own time to manage the journals in addition to other academic duties. This perceived complexity could be minimized if online journal management systems become increasingly affordable as well as easier to use and understand.

Publishers who have had prior experience accessing and browsing other e-journal Web sites are more likely to adopt e-publishing earlier than those who do not have this experience. Experience with e-journals can erase doubts publishers might have and provide a guarantee that these technologies can meet certain expectations. This study found that organization characteristics appear to have a large influence on innovation adoption rate. More experienced publishers of older journals with large publication runs are more receptive to e-journal publishing than newer publishers. Although respondents perceive a great deal of relative advantage and compatibility in e-journal publishing, these are not the most important factors to influence them in adopting e-journal publishing. Likewise, observability of e-journals is also not influential in the decision to adopt e-journal publishing. Complexity, trialability, and organization characteristics are the main factors that affect the rate of adoption of e-journal publishing among Malaysian journal publishers.

6. Conclusion

We have presented the results of an investigation on adoption rates of e-journal publishing among Malaysian journal publishers. While the diffusion of innovation in developed countries may follow the popular acceptance models reported in classical literature, the situation might be different in developing countries including Malaysia. In the classical adoption or acceptance models, perceived benefit, usefulness, relative advantage, or compatibility most often emerges as a key influence to adoption rate. This is because new innovations are supposed to bring productivity, enhancement, benefit, and profit to the individual or unit of adoption. So when an individual or unit of adoption perceives an innovation to have great advantage, benefit, and compatible with certain values, the rate of adoption is expected to be high.

However, the situation in Malaysia is somewhat different from other developing countries especially in terms of institutional financial support for publishing and the availability of a good Information and Communication Technology (ICT) infrastructure to support electronic publishing. Malaysian journals are mainly published by academic institutions, professional societies, and governmental research agencies with little concern for profit or financial returns in journal publishing (Zainab, Sanni, Edzan, & Koh, 2012; Zakaria & Rowland, 2006). The costs of journal publishing are absorbed by the governing bodies. The universities, government agencies, and professional associations are the ones who bear the publication costs, such that most editors of journals depend on their governing bodies for operational costs of journal publishing, not on subscribers or contributing authors. Consequently, profit is not a motivating factor for publishers to adopt e-publishing.

Commercial publishers produced only 1.5% of the total journals (7 titles). Also, in most instances, even when electronic publishing is adopted, the publishers are likely to opt for the green open access route. The *Directory of Open Access Journal* (2013) listed 79 journals from Malaysia that are open access, and most are from newly established universities. In most instances many also maintain their print versions. This is observed by Jubb (2011) who indicated that publishing costs for journals adopting the "green" route were absorbed by the institutional host and treated as part of the operational budget. In most of the journals that are published electronically, the costs incurred are being borne by the respective universities, professional associations, and government agencies. As financial support for publishing in print are still available and adopting dual modes or an e-only mode of publishing is perceived by some publishers to be complex and difficult to maintain, there seems to be less urgency to change a familiar practice, and this may result in delayed adoption. Obviously, there is no evidence to indicate or suggest that Malaysian journal publishers would do away with print journals in the near future, and it seems many of them are comfortable doing things the old traditional, print way.

What is obvious from this study is that stable financial support and the availability of good ICT infrastructure does not guarantee the adoption of an innovation such as electronic publishing, which has become important to increase a journal's visibility and accessibility. The same cannot be said of other developing countries that are beset with social problems like lack of basic infrastructure, unstable political power, and poor Internet access that continues to widen the digital divide. In the case of Malaysia, printed journals are perpetuated by this institutional support, and adoption can perhaps be hastened by making electronic publishing mandatory for the eligibility of assistance. Hence, the model that predicts innovation or technology adoption needs to be modified to include mandatory requirements as a variable in the Malaysian case.

The findings from this study are limited to publishers that attended the national conference held by the Ministry of Higher Education Malaysia and, as such, cannot be generalized. However, the study does highlight and discuss the factors relevant to the adoption of e-journal publishing in Malaysia, and the findings are useful in understanding what needs to be considered by universities and government agencies to further enhance the visibility and accessibility of their journals by perhaps mandating electronic publishing in order for publishers to obtain continued financial support.

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Appendix A

Table A1
Relative advantage.

Scale items	Factor loading
1. E-journals are easier to produce than print journals	0.56
2. E-journals increase the quality of journals than print journals	0.59
3. E-journals make journals more visible than the print journals	0.74
4. E-journals attracts more authors to submit than print journals	0.64
5. E-journals give authors more recognition than print journals	0.68
6. E-journals attracts wider readership than print journals	0.82
7. E-journals are faster to publish than the print journals	0.74
8. E-journals are easier to disseminate than print journals	0.71
9. E-journals makes articles more accessible than print journals	[a]
10. E-journals enhances our productivity than print journals	0.64

Variance explained = 42.5% Cronbach's alpha = .845 N of items = 9.
[a] Indicate item that didn't load and is omitted from the final questionnaire.

Table A2
Compatibility.

Scale items	Factor loading
1. Complies with current situation in our organization	0.91
2. Complies with all aspects of our publishing work	0.91
3. Suits the way we like to publish our works	0.87
4. Complies with our publishing values and norms	0.92
5. Complies with the needs of our members/users	[a]
6. Is consistent with the practice of journal publishing	0.9

Variance explained = 68.55% Cronbach's alpha = .943 N of items = 5.
[a] Indicate item that didn't load and is omitted from the final questionnaire.

Table A3
Complexity.

Scale items	Factor loading
1. Adoption of e-journal publishing is very challenging	0.79
2. Implementation of e-journal publishing is difficult	0.8
3. E-journal publishing is too demanding	0.82
4. E-journal publishing requires new technical skills/technologies which are difficult to understand	0.8
5. E-journal publishing requires many difficult tasks	0.8

Variance explained = 64.43% Cronbach's alpha = .862 N of items = 5.

Table A4
Observability.

Scale items	Factor loading
1. I have no difficulty communicating to others about how to implement e-journal publishing	0.51
2. I have seen how other publishers handle e-journal publishing	0.73
3. I can communicate to others the consequence of publishing e-journals	0.76
4. The outcome of publishing e-journal is clear to me	0.84
5. I have observed many e-journal website and see how they work	0.84

Variance explained = 55.828% Cronbach's alpha = .787 N of items = 5.

Table A5
Trialability.

Scale items	Factor loading
1. I have a great deal of opportunity to try various e- journal applications	0.81
2. I have experimented with e-journal publishing on a number of publishing platforms such as open journal systems	0.87
3. I have opportunities to submit/ review papers in e-journals through the online electronic submission system	0.84

Variance explained = 70.42% Cronbach's alpha = .788 N of items = 3.

Table A6
Factor loadings for awareness of e-publishing.

Scale items	Factor loading
1. I discuss issues about e-journals with colleagues	0.62
2. I read about issues concerning e-journals	0.67
3. I am aware of the format type of e-journals	0.82
4. I am aware of the management process of e-journals	0.88
5. I am aware of rules and policies concerning e-journals	0.86
6. I am aware of e-journal reviewing process	0.8
7. I am aware of the access and pricing policy of e-journals	0.73

Variance explained = 59.65% Cronbach's alpha = .882 N of items = 7.

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