The importance of actual use in defining and measuring innovative behaviour: Comparison of e-book reader users and non-users

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Abstract
This study introduces the concept of personal innovative behaviour and demonstrates its validity in the context of e-book reader adoption and use. Personal innovative behaviour, unlike measures of consumer innovativeness, amalgamates decisions about product adoption with reports of the product's actual use. Quantitative methodology was used, and probability proportional stratified sampling technique was used to obtain the proportionate sample. Items to measure personal innovative behaviour for e-book readers were included in a questionnaire distributed to students at a Malaysian university. Of the 386 participants, 79% used the e-book reader, half of them for academic purposes. Confirmatory factor analysis using Amos tested the concept of personal innovative behaviour for both users and non-users. The results indicated that the underlying dimensions, (intended Adoption Behaviour and actual Use Behaviour), could be measured and combined in a structural model only for users, i.e. innovators. Good model fit confirmed the validity and reliability of the framework. The redefined construct and scale validation will be helpful to researchers to measure the individual personal behaviour in terms of their final decision to adopt and actual usage of the novel product. The personal innovative behaviour scale presented here can be used by researchers and practitioners to measure adoption and use of personal information products and devices. The two dimensional conceptualization of personal innovative behaviour (intended Adoption Behaviour and actual Use Behaviour) reconciles similarities and differences between the decision and action variables in innovation diffusion theory and the technology acceptance model.

Keywords
Actual use, e-book reader, IDT, personal innovative behaviour, TAM

Introduction
Technological innovation has been accompanied by many changes in students’ behaviour. Continued innovation in software and mobile devices for personal access to information and education has resulted in an increase in availability of innovative information products, like e-book readers. An e-book reader, also referred to as a dedicated e-book reader (Chou et al., 2010) or a physical device that stores the software needed to manage, stores and displays the digital content of the e-book itself. E-books are ‘digital reading material, text in digital form,
a physical book converted to digital file format’ (Jung et al., 2012: 205). A well-known example is Amazon’s Kindle launched in 2007 (Aharony, 2014; Foasberg, 2011; Jung et al., 2012). Fuelled by the infusion of e-book reader technological innovation, individuals’ book reading and storing behaviour is changing (Ratten, 2011; Spacey et al., 2014) and universities are experimenting with different approaches to providing students with access to e-books. In this context, provision of dedicated e-book readers is still relatively uncommon and an innovative move for many universities.

Problem statement

Educational institutions and their information services units in developed and developing countries are taking the opportunity to expand their services through provision of such innovative products – but institutional provision is only of value if users adopt and use the innovative products. Measures of adoption intention and ongoing use are important aids to evaluation as Mulholland and Bates (2014) discussed in regard to academic staff perception about e-book use. Similarly, the literature (Aharony, 2014) extensively discusses intention to adopt an innovation but, surprisingly, no measure of personal innovativeness that includes actual use of the new product, exists. Inferring from this literature gap the purpose of this study is to discuss this gap and reports on development and validation of a measure of personal innovative behaviour (PIB) in the context of e-book reader use by Malaysian students.

Literature review

Need for re-definition of the consumer innovativeness construct

Innovativeness is a concept adopted from marketing, where it was first discussed by Midgley and Dowling (1978) as an intrinsic characteristic of all individuals, only some of whom have high innate innovativeness. While the terms innovativeness (Goldsmith and Hofacker, 1991; Raju, 1980; Roehrich, 1994) and consumer innovativeness (Baumgartner and Steenkamp, 1996; Le Louarn, 1997; Midgley and Dowling, 1978) are often used interchangeably in marketing, a distinction can be made between life innovativeness and adoptive innovativeness (Roehrich, 2004: 672, 673). Life innovativeness is considered to be a generic trait, not necessarily associated with new product or service adoption. It is defined as ‘a central predisposition to take innovative decisions, which expresses itself at every level of human activity’ (Le Louarn, 1997; Roehrich, 2004: 674), believed to underlie ‘the intelligent, creative, selective use of communication for solving problems’ (Leavitt and Walton, 1975; Roehrich, 2004: 673). Innovators are people who seek out and solve new problems (Kirton, 1976) and who are open and willing to change (Hurt et al., 1977).

Adoptive innovativeness, on the other hand, specifically concerns an individual’s approach to new or innovative products and services. Goldsmith and Hofacker (1991: 211) introduced the concept as the ‘tendency to learn about and adopt innovations (new products) within a specific domain of interest’. Adoptive innovativeness is believed to be driven by two basic needs: a need for stimulation – hedonistic innovativeness – and a need for uniqueness – social innovativeness (Roehrich, 1994), and it can be observed through innovative behaviours. One approach to measuring adoptive innovativeness is that of Baumgartner and Steenkamp (1996: 134) who introduced the notion of exploratory buying behaviour to identify consumers who ‘enjoy taking chances in buying unfamiliar products, are willing to try out new and innovative products …[and seek] stimulating consumption experiences’ (Roehrich, 2004: 674).

To date, studies of adoptive innovativeness for information technology (IT), while being specific to the IT domain, have been generic in their treatment of IT. Agarwal and Prasad (1998: 206) introduced the concept of personal innovativeness in information technology (PIIT) as ‘the willingness of an individual to try out any new information technology’ and developed a four-item scale to measure it. Hartman et al. (2004) used an even more generic scale in their study of the innovativeness of adolescents as adopters of IT.

Definitions and scales developed to measure adoptive innovativeness are summarized in Table 1. As the definitions illustrate, adoptive innovativeness encompasses attraction to novel products, a predisposition to try new products and purchase of new products. However, while scales developed in marketing and consumer psychology seek to uncover a predisposition to innovativeness and the drivers of innovativeness in a specific domain, as well as innovative behaviours whereby innovativeness can be observed, innovativeness in IT is measured only in terms of innovative behaviours. Furthermore, the innovative behaviours measured are limited to purchase and initial or exploratory use of a product, and specifically exclude ongoing use of the product, even when the product remains innovative or novel in the market or to the majority of potential adopters and users. Indeed, an analysis of the items used in all prior scales reveals that consumer innovativeness is measured in terms of initial intent or decision toward product adoption; actual use of the product is neglected. For example, ‘I will buy a new rock album, even if I haven’t heard it yet’ (Goldsmith and Hofacker, 1991) ‘I am more interested in buying new than known products’ (Roehrich, 1994), ‘I like to experiment with new information technologies’ (Agarwal and Prasad, 1998). Thus, the conceptualization and measurement of the actual use (actual adoption) that is important for understanding adoption of innovative IT is missing in the
<table>
<thead>
<tr>
<th>Authors</th>
<th>Scope and name</th>
<th>Definition</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Le Louarn (1997)</td>
<td>Innate Innovativeness:</td>
<td>A central predisposition to take innovative decisions, which</td>
<td>I am the kind of person who tries every new product at least once. When I hear about a new product, I try to know more about it at the first occasion. Before trying a new product, I try to learn what friends who possess this product think about it. I seek out the opinion of those who have tried new products or brands before I try them. I’d rather choose a brand that I usually buy rather than try something I am not confident in. I never buy something I don’t know anything about with the risk of making a mistake.</td>
</tr>
<tr>
<td></td>
<td>Innovativeness</td>
<td>expresses itself at every level of human activity.</td>
<td></td>
</tr>
<tr>
<td>Goldsmith and</td>
<td>Adoptive Innovativeness:</td>
<td>Tendency to learn about and adopt innovations (new products)</td>
<td>Compared to my friends, I own few rock albums. In general, I am the last in my circle of friends to know the titles of the latest rock albums. In general, I am among the first in my circle of friends to buy a new rock album when it appears. If I heard that a new rock album was available in the store, I would be interested enough to buy it. I will buy a new rock album, even if I haven’t heard it yet. I know the names of new rock acts before other people do.</td>
</tr>
<tr>
<td>Hofacker (1991)</td>
<td>Consumer Innovativeness</td>
<td>within a specific domain of interest.</td>
<td></td>
</tr>
<tr>
<td>Roehrich (1994)</td>
<td>Adoptive Innovativeness:</td>
<td>Innovativeness is an expression of two central needs: hedonist innovativeness (tied to need for stimulation) and social innovativeness (tied to need for uniqueness).</td>
<td>I am more interested in buying new than known products. I like to buy new and different products. New products excite me. I am usually among the first to try new products. I know more than others on latest new products. I try new products before my friends and neighbours. I would rather stick to a brand I usually buy than try something I am not very sure of. When I go to restaurant, I feel it is safer to order dishes I am familiar with. If I like a brand, I rarely switch from it just to try something different. I enjoy taking chances in buying unfamiliar brands just to get some variety in my purchase. When I see a new brand on the shelf, I’m not afraid of giving it a try.</td>
</tr>
<tr>
<td></td>
<td>Innovativeness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baumgartner and</td>
<td>Adoptive Innovativeness:</td>
<td>Consumers who are high on exploratory acquisition of products enjoy taking chances</td>
<td>I would rather stick to a brand I usually buy than try something I am not very sure of. When I go to restaurant, I feel it is safer to order dishes I am familiar with. If I like a brand, I rarely switch from it just to try something different. I enjoy taking chances in buying unfamiliar brands just to get some variety in my purchase. When I see a new brand on the shelf, I’m not afraid of giving it a try.</td>
</tr>
<tr>
<td>Steenkamp (1996)</td>
<td>Exploratory consumer</td>
<td>in buying unfamiliar products, are willing to try out new and innovative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>buying behaviour</td>
<td>products, value variety in making product choices, and change their</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>purchase behaviour in an effort to attain stimulating consumption</td>
<td></td>
</tr>
<tr>
<td>Agarwal and</td>
<td>Adoptive Innovativeness:</td>
<td>The willingness of an individual to try out any new information technology.</td>
<td>If I heard about a new information technology, I would look for ways to experiment with it. Among my peers, I usually the first to try out new information technologies. In general. I am hesitant to try out new information technologies. I like to experiment with new information technologies. I am usually one of the first of my friends to buy ‘new look’ clothes when they come out. I help my family with shopping for new technology types of products.</td>
</tr>
<tr>
<td>Prasad (1998)</td>
<td>Personal Innovativeness</td>
<td>in Information Technology (PIIT)</td>
<td></td>
</tr>
<tr>
<td>Hartman et al.</td>
<td>Adoptive Innovativeness:</td>
<td>No specific definition, but draws on (Hirschman, 1980) three dimensional</td>
<td>I am usually one of the first of my friends to buy products that involve new technology when they come out. I usually buy high-tech products before my friends do. I am usually one of the first of my friends to buy ‘new look’ clothes when they come out. I help my family with shopping for new technology types of products.</td>
</tr>
<tr>
<td>(2004)</td>
<td>Innovativeness</td>
<td>model of adoptive innovativeness, vicarious innovativeness and use</td>
<td></td>
</tr>
</tbody>
</table>
consumer innovativeness literature, despite its semantic attractiveness.

**Theoretical justification**

Our redefinition of the consumer innovativeness construct is based on the view that that consumer innovativeness involves not just the individual’s personal intention to adopt a product, but also their actual post-adoption use of the product. In doing so, we acknowledge Roehrich’s (2004) work on innovativeness scale comparison and address his recommendation for development of a theoretically sound integrated innovative behaviour model. We base our theoretical model development on insights from the organizational literature of innovation, which considers both the decision to adopt an innovation and its actual use as necessary components of innovation. Because we are seeking to understand individuals’ innovative behaviour in relation to new digital information products, we integrate two theories often used to explain IT innovation adoption and usage, Davis’ (1989) technology acceptance model (TAM) and Rogers’ (2003) innovation diffusion theory (IDT).

**Innovative behaviour.** In a organizational context, innovativeness is concerned with the adoption decision (the final choice or intention to adopt or reject the innovation) and adoption/implementation of the innovation for actual use (Rogers, 2003). The coupling of these two elements represents the essence of innovative behaviour.

De Jong and Den Hartog (2007: 43) defined innovative behaviour as ‘behaviour directed towards the initiation and application (within a work role [our italics], group or organization) of new and useful ideas, processes, products or procedures’. Rogers (2003) explained innovation in organizations as two-stages of a process. ‘Initiation is the conceptualizing, information gathering for the adoption of an innovation and the decision to adopt. Implementation consists of all the events, actions, and decisions involved in putting the innovation into use’ (Rogers, 2003: 420, 421). As De Jong and Den Hartog noted, individuals as well as groups can act to both initiate and implement innovations. Put another way, the idea is first adopted, i.e. an individual reaches the decision to adopt or implement the innovation, and then actual implementation of the idea needs to occur for innovation to take place (King and Anderson, 2002).

Thus, innovative behaviour is a multi-dimensional concept that covers all the behaviours of individuals through which they can contribute to the innovation process (De Jong and Den Hartog, 2007; West and Farr, 1990). During the process of adopting and implementing any new innovation different ideas might be generated in a person’s mind, and based on their thinking about the innovation (perhaps including their need for it) they make the decision to adopt or reject the innovation. PIB develops during the innovation process, in which production and practice are equally involved (Li and Wu, 2011). For example, an individual’s creation of novel or beneficial ideas (including ideas for use of new products) which are then put into practice by the individual indicate the individual’s innovative behaviour. All the activities of individuals directed at the production and application of such beneficial novelty are indicators of the individual’s PIB (Foasberg, 2011; Kleyesen and Street, 2001; Scott and Bruce, 1994; West and Farr, 1990).

**Innovation diffusion theory.** Rogers’ (2003) innovation diffusion theory discusses the process of an individual’s decision to adopt and actual adoption of innovation. Like his propositions for adoption and diffusion of innovations in organizations, the process involves several stages. We are primarily interested in particular in the two stages that involve the adoption decision and use: decision and implementation. As shown in Figure 1, the result of the innovation decision is adoption (1) or rejection (2). As implementation of the innovation continues, an individual who has decided to adopt the innovation
can continue to use it, in which case there is confirmation of continued adoption, or they can discontinue its use. An individual who has initially made the decision to reject the innovation might confirm their rejection of it after it has been more widely implemented or be a later adopter.

**The technology acceptance model (TAM).** The technology assessment model (TAM), Davis (1989) was developed to explain individuals' acceptance (use) of new technology. The model draws on the intention-behaviour relationship as the basis of the reasoned action perspective on human behaviour (Fishbein and Ajzen, 1975). Fishbein and Ajzen's theory of reasoned action (TRA) proposes, among other things, that the best predictor of behaviour is intention to perform that behaviour. The link between intention and behaviour has been demonstrated in a variety of domains by researchers adopting both the TRA and the TPB, a related model based on the same intention-behaviour link (Albarracin et al., 2001; Armitage and Conner, 2001; Fishbein and Ajzen, 2011). The TAM, which is most often presented in the form shown in Figure 2, proposes that actual system use can be predicted by behavioural intention to use the system (BI), and that BI is formed from the perceived usefulness (PU) and perceived ease of use (PEOU) of the system.

**Model development**

**Relationship between IDT and TAM.** Similarities between IDT and TAM were exploited by Chen et al. (2002), combining the two models to study the use of virtual stores. Similarly, Oh and Yoon (2014) integrated the IDT and TAM to examine the factors affecting the adoption of products based on haptic enabling technology. Researchers outside the field of information science and information systems have noted TAM’s basis in the reasoned action perspective, and combined IDT with TPB, in particular the intention-use link (Herrero Crespo and Rodriguez del Bosque, 2008).

The characteristics of the model are very similar. Both IDT and TAM propose that adoption/intention is affected by an assessment of the need for or value of the new technology. The decision stage in IDT is when individuals express their intention to adopt or reject an innovation, which is similar to intention to use in TAM (Jung et al., 2012). The use variable in the TAM conforms to adoption during implementation of the innovation in IDT (Chen et al., 2002; Davis, 1989; Wu and Wu, 2005).

Vertical comparison of the decision/intention and implementation/use concepts (as shown in Figure 3) shows that, just as the IDT ‘decision’ talks about decision/intention to adopt or reject the innovation (Jung et al., 2012),
the ‘behavioural intention to use’ in TAM is intention to adopt or reject IT (Davis, 1989). De Jong and Den Hartog’s (2007) definition of innovative behaviour, which involves generation and application of new ideas and products, holds the capacity to absorb the meaning of decision and intention to use. Both IDT decision and TAM behavioural intention can be considered as the idea generation component of innovative behaviour.

Similarly, IDT implementation explains the adoption decision in terms of the actual use of innovation (Rogers, 2003). Actual use of the system or technology in TAM is a similar concept: having formed an intention to adopt the new IT, individuals are more likely to actually use or implement it. This comparison mirrors with application or implementation of an idea or product in innovative behaviour as defined by De Jong and Den Hartog (2007).

The horizontal comparison of intention-to-actual use behaviour emphasizes the importance of actual use of the innovative product. In practice, it is important for innovative product providers to know not only the intention to use the new product, but also its actual use. It also emphasizes the similarity between the intention and application elements of innovative behaviour and the TPB, in which intentions are conceptualized as ‘readiness’ to act (Fishbein and Ajzen, 2011: 21), and thus, intentions and actions are linked in time.

### Personal innovative behaviour based on IDT and TAM

Horizontal and vertical comparison of IDT and TAM is presented, with definitions, in Table 2. Drawing on the comparison above, PIB is proposed as an integration of the intended adoption and actual adoption and use elements of the two theories. PIB is defined as ‘intended adoption behaviour (iAB) directed towards the actual use or actual usage behaviour (aUB) of innovative products, ideas or processes’. PIB can be considered as a multidimensional construct that encompasses all behaviours through which individuals can contribute to the process of innovation. Considering the multidimensional nature of PIB, this study postulates its measurement using two dimensions: decision/intention of new product adoption (initiation or purchasing or obtaining access to the innovation), i.e. iAB, and actual use (implementation or continued adoption as distinct from rejection of the innovation) of the product, i.e. aUB. Table 2 shows that decision/intention to adopt (iAB) and implementation/actual use (aUB) can possibly be used as two dimensions of PIB.

PIB is presented graphically in Figure 4, which shows how iAB and aUB are linked together to define and identify personal innovative behaviour. This model, based on two existing technology adoption research streams, IDT and TAM, provides a strong theoretical foundation for study of e-book reader adoption.

### Methodology

**Data collection and sample**

A field survey was used to gather data from students at a prestigious public university in Kuala Lumpur, the capital city of Malaysia, as part of a larger survey on technology innovation. The students are a young technical elite and the target market of various technology companies. On average they spend more time and money on technological products than others (Horrigan, 2003), for example on games, note-taking, dictionary usage and maps. A stratified probability sampling technique was used to obtain a proportionate sampling frame from each faculty. A cover letter with the study objective and assurance of confidentiality was attached to the survey which was distributed in five faculties. Data was collected by distributing a total of 500 closed-ended paper-based questionnaires. A total of 445 questionnaires were returned, indicating 88.6% return
rate, of which 386 students’ responses were errorless and usable.

The respondents included 156 females and 149 males (one did not provide gender), with an age range from minimum 18 to 45 years. Almost 47% were from computer science (see Figure 5).

There were 305 e-book reader users and 81 non-users. Six different e-book readers were used, and while most of the respondents used the Amazon Kindle reader (27%) or the Barnes & Noble Nook (25%), all the major and minor e-book readers in the market at the time were quite well represented, as shown in Table 3.

As shown in Table 4, 65% of the respondents use the e-book reader 1–3 times a day and while they use it mostly (47%) for recreational reading, which is considered important for academic attainment (Gladwin and Goulding, 2012), a quarter of the users use it for class reading and a similar number use it for reading research papers and materials.

**Measures**

Items to measure PIB were taken from validated scales from previous literature, as presented in Table 5. The items were measured on five-point Likert-type scales ranging from strongly agree (1) to strongly disagree (5). Actual use was measured with a frequency scale of very frequently (1) to never (5).

As Table 6 shows, there are differences in the responses of e-book reader users and non-users on most items. Nonetheless, it would be difficult to differentiate a user from a non-user on the basis of two adoption intention items which, intuitively, seem good discriminators: Ado2 (I intend to use an e-book reader) and Ado4 (I prefer to use an e-book reader rather than paper-based books).

**Analytical techniques**

Analysis of data involved confirmatory factor analysis (CFA) using AMOS 20.0 with bootstrapping to account for the small sample of non-users. It was not technically possible to create a multi-group model, so separate measurement models were built for e-book reader users and non-users. The logic behind the development of separate models is that, if PIB is a concept that distinguishes innovators (those who actually use e-book readers in this case) from non-innovators (those who do not use e-book readers), it will be possible to develop a satisfactory measurement model of PIB for users, but not for non-users.

First, separate latent variable measurement models were developed for iAB and uAB (for both users and non-users) based on the items in Table 3. These models were examined for recommended values for item loadings on the latent variable (all statistically significant and above .7, (Byrne, 2013)) and reliability (composite reliabilities greater than .7 (Werts et al., 1974)), average variance extracted (AVE) > 0.50 (Fornell and Larcker, 1981) and Cronbach’s alpha greater than .7 (Churchill and Gilbert, 1979).

In the second stage, the separate latent variables were combined in a joint measurement model to represent measurement of PIB (separately for users and non-users). At this stage, it was possible to test that iAB and uAB were two distinct variables. The test of discriminant validity checked that the square root of AVE was greater than the correlation between the two latent variables (Jöreskog, 1993). The following Byrne (2013) benchmark values for fit were applied: $\chi^2/df < 3$, adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), and normed fit index.
Table 4. E-book reader usage.

<table>
<thead>
<tr>
<th>Times/day</th>
<th>No. users</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–3</td>
<td>198</td>
<td>65</td>
</tr>
<tr>
<td>4–6</td>
<td>66</td>
<td>22</td>
</tr>
<tr>
<td>7–9</td>
<td>29</td>
<td>9</td>
</tr>
<tr>
<td>10–12</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>13 or more</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Purpose</th>
<th>E-book reader usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational reading</td>
<td>143</td>
</tr>
<tr>
<td>Class reading</td>
<td>77</td>
</tr>
<tr>
<td>Research reading</td>
<td>73</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 5. Scale items and sources.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Items</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intended Adoption</td>
<td>interested to use the e-book reader (Ado1)</td>
<td>Jung et al. (2012); Read et al. (2011)</td>
</tr>
<tr>
<td>Behaviour (iAB)</td>
<td>intend to use e-book reader (Ado2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>want to experience e-book reader (Ado3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>prefer to use e-book reader than paper-based books (Ado4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>intend to use an e-book reader regularly in future (Ado5)</td>
<td></td>
</tr>
<tr>
<td>Actual Use Behaviour</td>
<td>use the e-book reader (AcU1)</td>
<td>Liao and Lu (2008)</td>
</tr>
<tr>
<td>(aUB)</td>
<td>used the e-book reader in the last 6 months (AcU2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>using the e-book reader first in circle of friends (AcU3)</td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Intended adoption and actual e-reader use scores, e-book readers and non-users.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Items</th>
<th>E-book reader users</th>
<th>Non-users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>iAB</td>
<td>Ado1</td>
<td>2.32</td>
<td>1.09</td>
</tr>
<tr>
<td></td>
<td>Ado2</td>
<td>2.29</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>Ado3</td>
<td>2.45</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td>Ado4</td>
<td>2.35</td>
<td>1.05</td>
</tr>
<tr>
<td></td>
<td>Ado5</td>
<td>2.50</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>Scale</td>
<td>11.91</td>
<td>4.52</td>
</tr>
<tr>
<td>aUB</td>
<td>AcU1</td>
<td>2.38</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td>AcU2</td>
<td>2.39</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>AcU3</td>
<td>2.61</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>Scale</td>
<td>7.39</td>
<td>2.85</td>
</tr>
</tbody>
</table>

Note. Item scores range from 1 – highest to 5 – lowest. Scale score is simple addition of item scores for each participant.

Results

Single measurement models for adoption intention (iAB) and actual use (aUB)

All items loaded significantly on the latent variable they were established to measure, and all item loadings are above the recommended minimum of .5. All measures of reliability are also satisfactory (Table 7), but the lower values for non-users than users indicating weaker measurement for non-users.

Measurement and validation of PIB

The joint PIB measurement models for e-book reader users and non-users are shown in Figure 6 and Figure 7 respectively. Comparison of the correlation between iAB and aUB with the square root of the variance in each variable (AVE) (Table 8) confirms that there is discriminant validity: the items measure two distinct variables.

Although the underlying constructs are sound and can discriminate between users and non-users, they can only be combined in a satisfactory joint PIB measurement model for e-book reader users as shown in Table 9, which compares the fit of the proposed PIB measurement model for users and non-users. Only the responses from actual users fit the proposed PIB measurement model. Thus, as expected, for users, intended adoption and actual use fit together to represent innovative behaviour whilst, on the other hand, non-users’ intended adoption and actual use (although both lower than intention and use for users) do not together define PIB.

Discussion

The aim of this paper is to develop the concept of personal innovative behaviour (PIB) and empirically test it in the e-book reader domain. PIB has the conceptual advantage that, unlike earlier concepts of innovativeness which do not incorporate actual use, it incorporates both intention to adopt an innovation and actual use of the innovation. As the integration of the innovation adoption intention and actual innovation use elements of two existing theories, IDT and TAM, PIB has a sound theoretical basis. From a theoretical point of view, TAM makes no distinction between users and non-users of IT, assuming that the same model is equally valid for both. Fishbein and Ajzen (2011), on the other hand, pointed out that prediction of failure to act in a certain way (e.g. non-use of an e-book reader at a certain moment in time) is not necessarily the opposite of predicting the action (e.g. actual use of the e-book reader at that moment in time). It appears that this might be the case for IT. Looking back at Table 6, items which at face value seem to be good predictors of use or non-use of e-book readers (Ado2 and Ado4) do not appear to discriminate well between users and non-users. Further, these(NFI) should be greater than .9; and root mean square error of approximation (RMSEA) shows good fit below .05, mediocre fit from .08 to .1 and poor fit if greater than .1.
items have lower loadings than the others on adoption intention for non-users (Figure 6) and thus contribute to the poor performance of PIB for non-users. Empirically, PIB is validated for e-book reader users and shown not to be a valid construct for non-users.

Clearly, because the concept has been tested here in a single institution, it needs to be tested in a wider sample, in different contexts and cultures to confirm its generalized validity. Nonetheless, the results suggest interesting theoretical and practical implications.

**Implications for theory and research**

There are two important implications for researchers. Researchers can use this integrated PIB construct, instead of using a single stage innovativeness or intention construct, to confirm the actual innovative behaviour of an individual. It should be possible, adopting De Jong and Den Hartog’s (2007) definition of innovative behaviour to apply the concept of PIB in different contexts within a group, organization or work role to measure innovative behaviour towards any new idea, processes or procedures. Researchers might consider other behavioural, demographic and organizational factors that can be used with the construct, particularly those which contribute to the formation of adoption intention.

The second implication is that propositions, use models and measures developed for and validated with innovators and early adopters, are not necessarily appropriate for explanation or prediction of adoption by non-innovators.
As Rogers’ (2003) IDT shows (Figure 2), initial ‘rejection’ of an innovation does not mean permanent rejection; as the innovation is diffused, individuals who were initially non-users could become users. This study indicates that these initial non-users are different, and that their adoption intention and actual use cannot be measured in the same way as that of innovators. Users and non-users need to be modelled separately, and different measures, if not different models, need to be developed for non-innovators.

**Implications for practice**

From the practical point of view, this study is a reminder that research that predicts rates of adoption of new personal IT often relies on measures of innovativeness that do not take actual use into account. Yet, such accounts are unreliable because both innovators and non-innovators can express similar intentions but have different actual take up of the new technology. Individuals might have the intention to use e-book reader but lack the innovative behaviour to use it in practice. This distinction between adoption intention and innovative behaviour is likely to be seen in other forms of new technology.

**Conclusion**

Research on innovation has focused mainly on measures of individuals’ innovative behaviour through constructs such as innovativeness, consumer innovativeness, personal innovativeness, innate innovativeness, use innovativeness. However, scant attention has been paid to the real meaning of innovative behaviour, i.e. both initiation and implementation of an innovation. Researchers studying personal innovativeness have placed emphasis on the individual’s final decision/intention to adopt or reject the new innovation/product/idea, but this is only the first stage of innovative behaviour. They have neglected the second stage, the actual use, and have not studied the nature, frequency, location or other aspects, outcomes or implications of actual use. This paper takes a first step in addressing this research gap through conceptual development, measurement and validation of PIB in the e-book reader context. PIB can be measured in other domains through adaptation of the simple measures of intended Adoption Behaviour (iAB) and actual Use Behaviour (aUB) used to study e-book readers. Whilst, conceptually, each sub-construct (iAB, aUB) could also stand on its own, the value of PIB comes from an understanding of the behavioural difference between innovators and late adopters: while both might report very similar intentions to adopt, only the innovators act early in the life of an innovation. Thus, the PIB scale can be used by researchers and practitioners to better understand not only innovative intentions, but also actual innovation of personal information products and devices. Furthermore, the existence of this measure of actual PIB provides a starting point for research on the antecedents of PIB, the factors that distinguish between implementation and failure to implement intentions to adopt innovations early in the implementation stage, later stages of diffusion, and the outcomes of PIB.

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Note

1. This study focuses on dedicated e-book readers, which we refer to by the simplified term, e-book reader.

References


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