

Abstract

Purpose – The purpose is to understand how attitudes, norms (injunctive and descriptive), and perceived behavioral control (PBC) (capacity and autonomy) influence intention to publish Open Access (OA), and how personal innovativeness in information technology (PIIT) affects attitude and PBC.

Design/methodology/approach – This study employs an integrated and extended theory of planned behavior (TPB) framework within a cross-sectional survey design. The sample consists of researchers at a Norwegian university, and data is collected digitally via email invitation and analyzed using structural equation modelling (SEM).

Findings – This study determines that attitude is the strongest predictor of intention to publish OA, followed by injunctive and descriptive social norms, and PBC capacity and autonomy. All factors positively influence intention apart from PBC autonomy which has a negative effect.

Research limitations – Potential limitations include: a relatively small sample size, self-reported data, and employing intention, not behavior, as the ultimate dependent variable.

Practical implications – This research contributes with a deeper understanding of what drives intention to publish OA research articles, and how innovativeness affects attitudes and PBC autonomy. Support is found for an extended TPB model with decomposed normative and PBC components. This knowledge is essential in creating an impetus for systematic research on OA publishing behavior.

Originality/value – Theory-driven research into understanding OA publishing behavior is rare. Decomposing the normative and PBC constructs is uncommon in TPB research, and a novel approach in OA research. Personal innovativeness has previously not been explored in relation to OA publishing.

Keywords – Open Access, Psychology, Scholarly Publishing, Intention, Theory of planned behavior, TPB, Extended model, Personal Innovativeness

Paper type – Research paper

Published in Journal of Documentation

Received 10 February 2017

Revised 12 July 2017

Accepted 3 August 2017

[Lars Moksness](#), [Svein Ottar Olsen](#), (2017) "Understanding researchers' intention to publish in open access journals", Journal of Documentation, Vol. 73 Issue: 6, pp.1149-1166,
<https://doi.org/10.1108/JD-02-2017-0019>

Understanding researchers' intention to publish in open access journals

Introduction

The amount of research being made available in Open Access (OA) journals is only a small percentage of the total amount of published research (e.g., Solomon, Laakso, & Björk, 2013; Ware & Mabe, 2015). In the early days of digital scholarly publishing, the concern was that the ease of publishing articles electronically would cause the amount of low quality articles to proliferate (Sullivan, 1996), and the sheer amount would somehow “destabilize the practices of scholarly communication” (p. 40). Nowadays, it appears the concerns regarding digital publishing – at least under the traditional model (paper journals going digital, same financial structure) – have diminished, and that researchers are less motivated to publish OA than what is expected from research and educational public authorities.

Most research articles dealing with OA are descriptive in nature (e.g., Dallmeier-Tiessen et al., 2011; Rodriguez, 2014). However, relatively recently some research explain how and why scholars publish or do not publish OA (Dulle & Minishi-Majanja, 2011; J.-H. Park, 2007, 2009). Most studies are exploratory and with an unclear conceptual and theoretical framework (Rodriguez, 2014; Warlick & Vaughan, 2007; Xia, 2010). For example, Rodriguez (2014) investigated cross-disciplinary awareness and perceptions of OA among a sample of faculty and found that authors do possess knowledge about OA, but have limited experience in actual OA usage (enabling OA to their research) an observation reflected by Xia (2010) as well. Other papers suggest that scholars generally view the publication model favorably, although they are reluctant to fully commit to OA (Rowley, Johnson, Sbaffi, Frass, & Devine, 2017). OA is a channel for publishing where scholars' motivation for using this new opportunity are not fully explained or understood. Incentives seem not to be working as intended (e.g., Harnad, 2011), and scholars' attitudes and beliefs toward publishing seem to be in favor of traditional outlets (Togia & Korobili, 2014; Xia, 2010).

Thus, this study contributes to the growing body of research that explains scientific OA publishing by employing an extended version of the Theory of Planned Behavior (TPB) (Ajzen, 1991). The extended TPB model includes both injunctive and descriptive norms (Rivis & Sheeran, 2003), and two dimensions of perceived behavioral control; capacity and autonomy (Fishbein & Ajzen, 2010). Finally, because of OA publishing represents a relatively new channel for the dissemination of research (Suber, 2012), this study includes individual differences in adopting, or accepting, new information technology (Davis, 1989; Venkatesh, Morris, Gordon, & Davis, 2003) in the theoretical framework. Personal innovativeness in the

domain of information technology (PIIT)(Agarwal & Prasad, 1998) is defined as an enduring individual trait intended to tap individuals' tendency to adapt to or avoid change in relation to such technologies.

Theoretical framework

Over the years many studies have been conducted about the attitudes, awareness and acceptance of OA publishing (e.g., Rowley et al. 2017), followed by efforts to synthesize the major trends in the vast literature (e.g., Togia and Korobili 2014). In a review of the research on OA, Togia and Korobili (2014) systematically analyzed how focus has evolved in parallel with the maturation of the publishing model. Several key factors emerge from their research, for example that scholars' attitudes towards OA are predominantly positive and scholars' journal selection criteria primarily gravitate around perceptions of quality, prestige and reputation. Furthermore, they discovered that some misconceptions about OA do exist, specifically concerning article processing charges and the perceived erosion of peer review. A large-scale international survey about scholars' attitudes toward OA conducted by Rowley et al. (2017) largely corroborates these findings and provides further evidence that although attitudes toward OA are generally positive, these attitudes are not necessarily translated into intentions to publish OA. The authors cite lingering confusion and uncertainty about OA as possible causes.

Several perspectives are potential candidates for building the theoretical framework for the investigation of OA publishing intentions. Perhaps the two most widely recognized models that could fill this role are the TPB (Ajzen, 1991) and the technology acceptance model (TAM) (Davis, 1989). The TPB proposes that the intention to perform a behavior is determined by attitudes, perceived norms and perceived behavioral control. The TPB has seen extensive use including to explain and predict several categories of behaviors such as health related behaviors, consumer behavior, environmental behavior, political behavior, organizational behavior or job behavior (see, Fishbein & Ajzen, 2010). One previous empirical study (J.-H. Park, 2009) has used the TPB as a general framework for studying OA publishing.

The TAM is generally recognized as the most influential theory in adoption and acceptance of new information or new technology (Pavlou & Fygenon, 2006). Khalili and Singh (2012) use the Unified Theory of Acceptance and Use of Technology (UTAUT) to explain how attitude/beliefs, anxiety, facilitating conditions, ease of use and social norms

influence the acceptance of OA publishing. Some other recent studies (Masrek & Yaakub, 2015; Tenopir et al., 2016) use similar attitudinal constructs to explain intention to publish or publish OA. The first version of the TAM-model consisted of two factors to predict intended use, perceived ease of use (PEOU) and perceived usefulness (PU). Those two different attitudes proved to be too narrow in explaining or predicting new technology adoption and the theory-integrated social norms and facets of perceived control mechanisms (e.g., Legris, Ingham, & Collerette, 2003). Thus, the TAM is criticized for not adding any theoretical substance to established theories such as the TPB (Benbasat & Barki, 2007), which is also indicated to have better explanatory power than the TAM (Taylor & Todd, 1995). The TPB can conveniently be tailored to explore and explain researchers' intention to publish OA within the bounds of technology acceptance, and for other reasons as well. For this flexible purpose, the TPB is preferred as a general theoretical framework in this empirical study.

Adoption to new technology can also be grounded in several parts of individuals' personality, i.e. extrinsic and intrinsic motivational systems such as personal beliefs, values, emotions, and propensity for risk-taking behavior (Agarwal & Prasad, 1998; Jeyaraj, Rottman, & Lacity, 2006). PIIT is probably the individual trait most used in theories explaining individuals' adoption of new technology including TPB, TAM or innovation diffusion theory (Agarwal & Prasad, 1998; Fang, Shao, & Lan, 2009; Jackson, Mun, & Park, 2013). PIIT is conceptualized as capturing individual differences that predict adoption or rejection of innovations. PIIT can be utilized to identify early adopters that can help facilitate change processes. To our knowledge, this study is the first to explore the role of PIIT within a TPB framework that examines researchers' intention to publish OA.

The basic TPB framework has been extended over years to include different formats of attitudes, norms and control variables (Conner & Armitage, 1998). It is worth noticing that technology acceptance theories such as the TAM also have included normative and other constructs found within the TPB framework such as affect/emotion or self-efficacy (for a review, see Legris et al., 2003). Within this specific stream of research, and based on the more general reasoned action approach (Fishbein & Ajzen, 2010), this study includes a two-dimensional construct of social norms (injunctive and descriptive norms) and perceived behavioral control (capacity and autonomy) in order to obtain a broader understanding of the basic model in explaining intention to publish OA. The causal structure of the TPB suggests that personality traits and values as more general and stable constructs influence the more

specific behavioral attitudes, norms and control constructs (Ajzen, 1991; Fishbein & Ajzen, 2010).

In the following, this article will explore the various theoretical constructs in more detail. The conceptual model is presented in Figure 1.

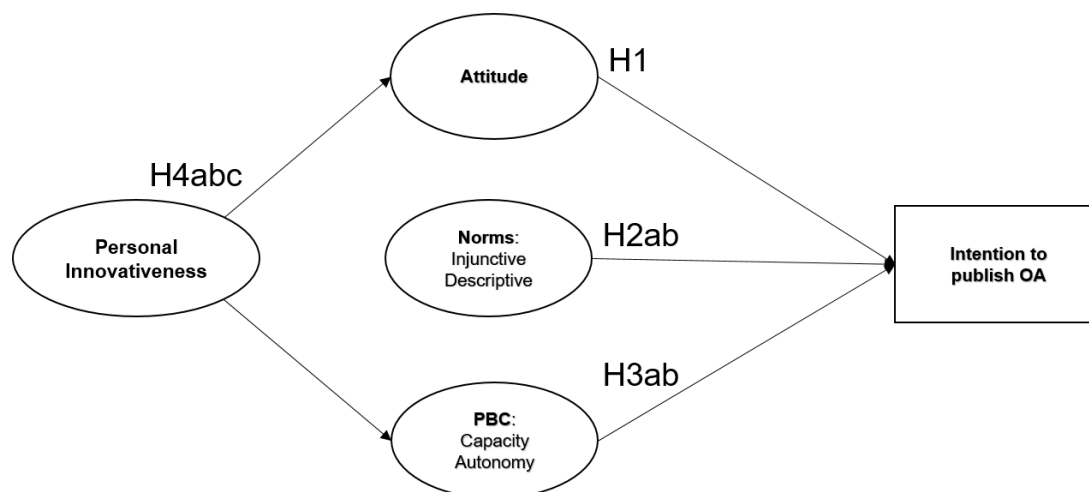


Figure 1. Conceptual model.

Intention to publish

A researcher's intention to publish articles is suggested to be a decision made well in advance of the actual behavior, and not likely to change unless the article is rejected and must be resubmitted (Özçakar, Franchignoni, Kara, & Muñoz, 2012). Intention, in this regard, should be a sufficient predictor of the actual publishing behavior. Intention is most often defined as an indication of how hard people are willing to try, and how much effort they are planning to exert, in order to perform a behavior (Ajzen, 1991). Intention is assumed to capture motivational factors such as goals, behavioral expectations, willingness, and intention to behave (Fishbein & Ajzen, 2010). The TPB makes a theoretical and empirical distinction between behavior and behavioral intention or expectations, where intention is thought to capture the subjective probability of performing a behavior. This distinction is of particular interest for studies aiming to test model capability in predicting behavior from study 1 to study 2. The model assumes that intention, as a person's readiness to act or perform a behavior, is the most important immediate antecedent of behavior. In a meta-analytic review of 185 studies an average correlation of 0.47 was reported between intention and prospective behavior (Armitage & Conner, 2001). Thus, several studies use intention to behave as the

main dependent variable in cross-sectional surveys of the TPB (e.g., Fang et al., 2009; Liao, Chen, & Yen, 2007; Wu & Chen, 2005) as well as studies about adoption of new technologies (Venkatesh et al., 2003).

In terms of scientific publishing, publishing in OA journals is a relatively new behavior, and several scholars have so far not published, or only published very few, OA papers. The frequency of publishing can also be explained by several other non-motivational factors such as rejection rates and time pressure. The time frame involved in publishing research articles may stretch over several months, sometimes years, involving reviewing, editing, even resubmitting to different journals. Thus, there are several reasons to suggest that it is more feasible to measure behavioral intention rather than the actual publishing behavior in the present study. Consequently, this study uses intention as the ultimate dependent variable, and defines it as a summary of scholars' expectations, goals and behavioral intention to publish in OA journals and make research available as OA in repositories (Fishbein & Ajzen, 2010).

Attitudes toward publishing

Within the reasoned action approach, attitudes are defined as “a latent disposition or tendency to respond with some degree of favorableness or unfavorableness to a psychological object” (Fishbein & Ajzen, 2010, p. 76). Attitudes may be measured either directly by asking respondents about their *general degree* of favorableness towards OA publishing, or indirectly by eliciting beliefs about OA to infer a degree of favorableness on *specific beliefs* or attitudinal items (Ajzen, 2006). These could be perceived quality, prestige, speed, or relevance of OA journals (Masrek & Yaakub, 2015). Assessing beliefs or attributes is important if one intends to get a deeper understanding of the basis or formation of attitudes. However, most studies testing the general structure of the TPB define and measure attitude as a general evaluation (Armitage & Conner, 2001). Fishbein and Ajzen (2010) discussed the connection between beliefs and attitudes, explaining that valuable information about the underlying attitude determinants may be lost if attitude beliefs are not elicited properly. However, if the goal is to determine the degree of favorableness or utility of performing a specific behavior such as submitting OA articles, and at a general level, it may be acceptable to abstain from eliciting salient beliefs. Consequently, in the present study attitudes are defined as researchers' favorable or unfavorable general attitudes toward submitting their research articles to OA journals.

Most studies testing the TPB confirm that attitude is the foremost predictor of intention to behavior (Armitage & Conner, 2001; Fishbein & Ajzen, 2010). This is also confirmed in the area of adopting new information technologies (Liao et al., 2007; Pavlou & Fygenson, 2006) and the use of different forms of internet or web-technology (Baker & White, 2010). In the area of academic publishing including OA publishing, most studies refer to the relationship between attitudinal beliefs, intention and/or publishing behavior. For example, Masrek and Yaakub found that perceived career benefits ($r = 0.55$) represented the most important reason for intention to publish OA followed by perceived visible advantage ($r = 0.43$), journal reputation ($r = 0.38$) and topical relevance ($r = 0.37$). It is reasonable to define those beliefs as facets of a global attitude construct. While Dulle and Minishi-Majanja (2011) found that attitudes had a significant impact on intention, the intentions did not translate into actual behavior. A possible explanation may be found in Xia (2010), suggesting that researchers are more supportive towards OA in theory rather than in practice. Xia (2010) also reported that researchers harbor concerns about peer review conducted for OA journals, and that OA literature is not cited as often as regular literature. It is therefore expected that the more positive researchers' attitudes toward enabling OA to research articles are, the stronger is the intention to publish OA. Thus, this study suggests that:

H1: Attitude has a significant and positive effect on the intention to publish OA.

Injunctive and descriptive norms

Another factor contributing to OA publishing intentions is the perceived normative influence researchers experience. For example, Migheli and Ramello (2013) assert that social norms that guide OA behavior may be strongly localized and vary across disciplines. Fishbein and Ajzen (2010) quite simply defined norms as the perceived pressure to perform, or not to perform, a behavior. In most studies, perceived norms are defined and measured as perceptions regarding social rules and standards of conduct (Cialdini & Trost, 1998), and the expectations of significant others in relation to these behaviors (Rivis & Sheeran, 2003). Originally conceptualized as pertaining to social prescriptions (injunctive norms) in reason action and planned behavior theory (Ajzen, 1991), the normative construct grew to include the effects of others' behavior on our own (descriptive norms) (Fishbein & Ajzen, 2010).

There is evidence that the normative factor benefits from separation into its constituent parts (e.g., Cialdini, 2007; N. Park, Jung, & Lee, 2011). This seems reasonable, since social norms pertain to both injunctive and descriptive aspects for researchers who seek recognition

for their work, and are both influenced and guided by the behavior and expectations of peers. In addition, most publications are not the product of individual activity. One or more co-authors are most common nowadays (e.g., Beaver, 2001). Thus, this study contributes to existing literature by exploring if and how a two-dimensional norm construct explains variation in researchers' intention to publish in OA journals.

The normative component has direct effects on intentions, and an indirect effect on intention via attitudes (Fishbein & Ajzen, 2010). For example, if normative referents publish in specific journals they are likely to influence the intentions of others to select this particular publication as well (Migheli & Ramello, 2013). Certainly, some journals are deemed more prestigious than others, and status, funding, and career advancement often follow publishing in these journals. Togia and Korobili (2014) reflected this sentiment, stating that perceived prestige and quality attached to a journal is paramount to researchers concerned about tenure and promotion. Consequently, the present study defines perceived norms as the social influence exerted on a researcher, either through others' expectations or by their actions directly, in terms of OA publishing of research articles.

The influence of perceived norms on intentions is well established in the TPB literature (Ajzen, 1991; Armitage & Conner, 2001; Fishbein & Ajzen, 2010), as well as in the context of information technology acceptance research (Pavlou & Fygenson, 2006; Venkatesh et al., 2003). In a meta-analysis of 21 studies Rivis and Sheeran (2003) reported that descriptive norms have a stronger influence on intentions in some instances, with an average correlation of 0.44. Studies on OA behavior that incorporate a normative component have failed to determine, although theoretically arguing for, a significant relationship between norms and intentions (Dulle & Minishi-Majanja, 2011; Khalili & Singh, 2012; J.-H. Park, 2007, 2009), although an effect on actual OA publishing has been established (Dulle & Minishi-Majanja, 2011). The lack of support for the normative dimension in the OA literature is surprising, possibly pertaining to issues of context, measurement or methodology rather than to an apparent lack of normative pressure on the intention to publish OA. Thus, contrary to findings in the reviewed OA research literature, this study expects that researchers' publication choices are influenced by some form of peer pressure, specifically that researchers' intention to publish OA is positively influenced by both injunctive, and descriptive norms. Thus:

H2a: Injunctive norms have a significant and positive effect on intention to publish OA.

H2b: Descriptive norms have a significant and positive effect on intention to publish OA.

Perceived behavioral control

Perceived behavioral control (PBC) is assumed to take into account the availability of information, skills, opportunities and other resources required to perform the behavior as well as possible barriers that may have to be overcome (Ajzen, 1991). The terms used to identify, define and measure the control constructs vary greatly across studies. Terms such as perception of control, self-efficacy, locus of control, and personal control are common (e.g., Venkatesh et al., 2003), while capacity and autonomy are probably the most used constructs (Fishbein & Ajzen, 2010; Sparks, Guthrie, & Shepherd, 1997). This study defines PBC as researchers' evaluation of own capacity or skill to submit research articles to OA journals (capacity), and whether performing this action is perceived to be completely up to them (autonomy) (Fishbein & Ajzen, 2010). Fishbein and Ajzen (2010) distinguished between actual control and perceived control given that actual control may be difficult to measure, and that it is the perception of control that impacts intentions (Ajzen, 1991). PBC will have no contribution to behavioral prediction over and above intention in situations where volitional control is high (Ajzen, 1991; Armitage & Conner, 2001; Fishbein & Ajzen, 2010). It is reasonable to assume that the degree of volitional control involved in choosing a publishing venue is substantial, and in this regard PBC is expected to mainly contribute to the intention to publish OA.

Research on the TPB confirms the efficacy of the PBC construct in jointly determining intention together with attitude and norms, and under some conditions – together with intention to predict behavior itself (Armitage & Conner, 2001; Fishbein & Ajzen, 2010). This is also reflected in studies on e-commerce adoption and usage (Liao et al., 2007; Pavlou & Fygenon, 2006), and intentions to use social media (Baker & White, 2010; Kim, Lee, Sung, & Choi, 2016). Armitage and Conner (2001) found that the correlation of PBC on intention is substantial ($r = 0.43$) and contributing to 6 % of the variance alone, while the effect on behavior is comparatively weaker ($r = 0.14$), accounting for 2 % of the variance.

In the context of OA publishing, most studies employing a TPB- or TAM-type framework discuss the relationship between perceptions of effort expectancy, self-efficacy and facilitating conditions as the main behavioral control determinants of intentions and actual publishing OA (J.-H. Park, 2009; Togia & Korobili, 2014). Studies built around models of this kind comprise a set of factors (e.g., attitude, social pressure and perceived control) that influence intention and behavior. However, researchers often assign new terms that they believe reflect the factors more accurately. Effort expectancy, in this regard, is similar to PBC

capacity, and reflects whether conducting the behavior is within a person's skillset.

Facilitating conditions, on the other hand, is similar to PBC autonomy, and concerns whether conducting the behavior is within personal control.

Khalili and Singh (2012) failed to determine an effect of effort expectancy on both intention and OA publishing, but on the other hand reported that facilitating conditions had a positive influence on intention to publish OA. The effect was negative for publishing OA. In contrast, Dulle and Minishi-Majanja (2011) found that effort expectancy had a significant impact on intention but not publishing. Furthermore, they did not establish a significant influence by facilitating conditions on intention but demonstrated a positive effect on actual OA publishing. A possible explanation for these results is that the samples are heterogenous and perceptions of organizational and institutional factors in facilitating OA are contextually and temporally sensitive. In this study, skill is conceived as representing internal factors, and expected to positively affect OA intention – while the direction of autonomy is uncertain as it may represent external factors and hence be particularly sensitive to contextual variations (Ajzen, 2002; Fishbein & Ajzen, 2010). Based on the above discussion this study assumes that researchers' intention to publish OA will be stronger when the perception of own skill or capacity to publish OA is high. Intention to publish OA is further expected to be influenced by researchers' perception of control over the decision.

H3a: Perceived behavioral control (PBC) capacity has a significant and positive effect on intention to publish OA.

H3b: Perceived behavioral control (PBC) autonomy has a significant effect on intention to publish OA.

Individual differences in personal innovativeness.

The literature on technology acceptance consists of several useful frameworks on how individuals respond to, and interact with, products and services in a digital environment. For example, a person's disposition towards novel ideas is linked to their level of innovativeness which in turn facilitates or inhibits adoption of a new technology (Agarwal & Prasad, 1998). As such, a disposition towards technological innovativeness in general, may influence intention to participate in, for example, web-surveys (Fang, 2009). Consequently, researchers' general innovativeness is expected to reflect the willingness to use OA and exert influence on their attitudes and perceived control to publish in OA journals. This, in turn, may facilitate or inhibit the intention to publish research articles OA. To understand what drives individuals'

willingness, or resistance, to adapt to and respond to new information technology, several theoretical constructs are used, such as resistance to change (RTC), and domain-specific resistance to change (dsRTC) (Oreg, 2006). This study tests probably the most frequently used individual construct to explain individuals' adoption of new information technology (PIIT scale). PIIT is defined as "the willingness of an individual to try out any new information technology" (Agarwal & Prasad, 1998, p. 206). Information technology is understood as a more general construct than OA publishing/documentation behavior. However, the scale is previously used as a more general construct to explain or predict intention or behavior in a variety of areas, such as web survey participation and adoption of wireless services (Fang et al., 2009; Lu, Yao, & Yu, 2005), and the use of e-commerce systems (Jackson et al., 2013). Its influence on intrinsic and extrinsic motivational factors (Hwang, 2014) has also been established. Furthermore, PIIT is found to positively relate to perceived control traits such as computer self-efficacy ($r = 0.26$) and negatively to computer anxiety ($r = -0.32$) (Thatcher & Perrewé, 2002).

However, to the best of our knowledge, PIIT is not studied in relation to OA publishing behavior. This study assumes that researchers who are open and innovative are also more favorable towards using new information technologies in general, and OA in particular. In this article, PIIT is conceived as capturing individual differences in willingness to adopt IT that escapes the general TPB framework, and to influence intention to publish OA indirectly through attitudes and perceived behavioral control, recently confirmed in a study by Fang et al. (2009) on individuals' intention to participate in web surveys.

It is likely that possessing positive attitudes towards OA in and of itself would facilitate intentions to publish OA. However, researchers' attitudes are believed to be influenced by the degree of innovativeness as well, since this indicates a general disposition towards novelty and specific willingness to engage in the usage of new technologies, thus positively influencing attitudes. PIIT is found to significantly relate to attitudes ($r = 0.40$) toward adopting new IT services (Hung & Chang, 2005), and perceived ease of use in relation to technology acceptance intention ($r = 0.64$) (Yi, Jackson, Park, & Probst, 2006). Fang et al. (2009) also reported a significant correlation between PIIT and attitudes ($r = 0.30$).

It is possible that researchers who are open and innovative also perceive their degree of control more favorably than their less open counterparts. It has previously been noted that PIIT is linked to a positive effect on self-efficacy ($r = 0.26$) (Thatcher & Perrewé, 2002), which is analogous to the capacity dimension of PBC. An adaptation of the PIIT scale, called

web innovativeness, is found to be a positive determinant of PBC ($r = 0.30$) (Fang et al., 2009). A positive influence on PBC capacity may therefore be expected. On the other hand, and in line with the discussion in a previous section, the direction of effects on autonomy is less certain. It should be noted that previous studies have indicated that PIIT may be sample and context specific (e.g., Agarwal & Karahanna, 2000; Lu et al., 2005), producing significant results under one paradigm and not the other. In summary, then, innovativeness is expected to positively influence attitudes, followed by a positive effect on the PBC capacity dimension, while its effect on autonomy can go either way, depending on how researchers in this sample perceive external factors to be influencing their publication options; as such, PIIT is hypothesized to have a significant effect on PBC autonomy.

H4a: Personal innovativeness in the domain of information technology (PIIT) has a significant and positive effect on attitudes.

H4b: Personal innovativeness in the domain of information technology (PIIT) has a significant and positive effect on PBC capacity.

H4c: Personal innovativeness in the domain of information technology (PIIT) has a significant effect on PBC autonomy.

Research methodology

Participants and procedure

The survey was sent by email to 2971 employees at UiT – The Arctic University of Norway. UiT is the third largest in Norway and also the northernmost university of the world. It employs approximately 3000 scientific and administrative staff and 15500 students, more than 20% of which are international. The sample consisted of published or publishing authors of peer-reviewed scientific articles. Email addresses were collected from the University web domain. Anonymity was guaranteed. Participants followed a link in the email and completed a self-report questionnaire that assessed publishing intention, the theory of planned behavior and personal innovativeness. Participants completed the survey during April and May 2016. 322 participants (134 females and 187 males, 1 missing) completed the questionnaire. The response rate was approximately 10 %. Prior to analysis the data set was screened for large amounts of missing data and outliers. Initial screening of data resulted in the deletion of 19 respondents from further analysis, retaining $n = 303$ (176 males and 127 females). The majority of the respondents were professors (>50%) followed by PhD candidates (>20%), and

other staff comprising the rest. Approximately 70% of respondents were between 31 and 60 years old. The sample sizes for the groups are too small for any further meaningful analysis.

Measurement

The intentional items and their antecedents are assessed according to recommendations by (Fishbein & Ajzen, 2010) and adapted to the context of OA publishing. Items are listed in Table 1. *Intention* was measured on 7-point scales, and a sample item is: My goal is to submit my next research article to an open access journal. *Attitude* was measured by 6 adjectives on 7-point bipolar scales where 1 indicates the most negative alternative, and 7 the most positive. The attitude subscale is itself comprised of an affective and an instrumental component. The statement “*For me, submitting research articles to open access journals is...*” preceded each adjective pair. A sample item is: Unenjoyable/Enjoyable. These items have been used in previous studies and found to reflect both the affective and instrumental component of attitudes (Fishbein & Ajzen, 2010; Rhodes & Courneya, 2003).

Perceived norm is measured on 7-point scales intended to tap the *injunctive* and *descriptive* aspects of the normative dimension, with three items comprising each subscale. Sample items assessing injunctive and descriptive norms are: “Most researchers who are important to me would encourage me to submit my research articles to open access journals”; “Of the researchers you know, how many submit their research articles to open access journals regularly?” (Virtually none/Virtually all). Similar items are used in other studies employing those two dimensions (e.g., Esposito, van Bavel, Baranowski, & Duch-Brown, 2016; White, Smith, Terry, Greenslade, & McKimmie, 2009).

Perceived behavioral control (PBC) is measured on 7-point scales intended to reflect the *capacity* and *autonomy* aspects of the control dimension (Fishbein & Ajzen, 2010). Sample items assessing these dimensions are: “How much personal control do you feel you have over submitting your research articles to open access journals” (No control/Complete control); “Whether or not I submit my research articles to open access journals is completely up to me” (Completely false/Completely true). For example, Sparks et al. (1997) employed similarly worded items when assessing the multidimensionality of the PBC construct.

Personal innovativeness is measured according to Agarwal and Prasad (1998). The PIIT scale comprises four items that are designed to measure how individuals adapt to new information technologies. Items are assessed on 7-point Likert-scales where 1 = “Strongly disagree”, and 7 = “Strongly agree”. The items are: “If I heard about a new information

technology, I would look for ways to experiment with it”; “Among my peers, I am usually the first to try out new information technologies”; “In general, I am hesitant to try out new information technologies” (reversed); “I like to experiment with new information technologies”. The PIIT scale has seen extensive use in various areas of technology acceptance (e.g., Fang et al., 2009; Jackson et al., 2013).

Results

Reliability and validity of the measures

The psychometric properties of the measurement model including the seven constructs shown in Figure 1 were evaluated to determine construct validity. Constructs were analyzed by method of factor analysis (CFA) and the results indicate acceptable fit (CMIN/DF = 1.92, df = 208, CFI = 0.96, TLI = 0.95, RMSEA = .055). Generally, a CMIN no larger than 5 is considered acceptable, while a CFI exceeding .90, a TLI exceeding .90, and RMSEA below .08 indicate an acceptable fit (Browne & Cudeck, 1992). Reliability measures are presented in Table 1 and correlations in Table 2. Loadings in Table 1 show that all values are significant and ranging from 0.61 to 0.94, indicating acceptable convergent validity of the constructs. The composite reliability scores and variance extracted all exceed the acceptable thresholds of 0.70 and 0.50, respectively (Fornell & Larcker, 1981). Table 2 displays the correlation matrix for the constructs in the hypothesized model and shows that most correlations are significant at the $p < .05$ level and below 0.70. According to Fornell and Larcker (1981), the levels of the square root of AVE for each construct should be greater than the respective correlation for the constructs to determine discriminant validity. These numbers are displayed in bold in Table 2.

Table 1. Standardized confirmatory factor analysis coefficients and construct reliability.

Constructs and indicators	Factor loadings	Composite reliability	Variance extracted
Attitude			
For me, submitting articles to open access journals is...		.88	.55
...useless/useful	.79		
...foolish/wise	.71		
...ineffective/effective	.75		
...boring/interesting	.69		
...unenjoyable/enjoyable	.73		
...unpleasant/pleasant	.77		
Injunctive norm			
Most researchers who are important to me would encourage me to submit my research articles to open access journals.	.66	.85	.65
I feel under pressure to submit my research articles to open access journals.	.79		
It is expected of me that I should submit my research articles to open access journals.	.94		
Descriptive norm			
Of the researchers you know, how many submit their research articles to open access journals regularly?	.89	.92	.80
Most researchers I know submit their research articles to open access journals regularly.	.94		
Most researchers like me submit their research articles to open access journals regularly.	.85		
PBC capacity			
How much personal control do you feel you have over submitting your research articles to open access journals?	.78	.87	.69
How confident are you that you will be able to submit your research articles to open access journals?	.86		
If I wanted to, I could easily submit my research articles to open access journals.	.86		
PBC autonomy			
Whether or not I submit my research articles to open access journals is completely up to me.	.93	.82	.69
How much do you feel submitting your research articles to open access journals is beyond your control? (r)	.72		
Intention to publish Open Access			
My goal is to submit the majority of my future research articles to open access journals.	.94	.91	.78
I intend to do what I can to submit the majority of my future research articles to open access journals.	.93		
I plan to deposit a version of the majority of my future research articles in open archives.	.78		
Personal Innovativeness			
If I heard about new information technology, I would look for ways to experiment with it.	.86	.86	.61
Among my peers, I am usually the first to try out new information technologies.	.78		
In general, I am hesitant to try out new information technologies. (r)	.61		
I like to experiment with new information technologies.	.85		

Note PBC = Perceived behavioral control.

Table 2. Correlation matrix and descriptive statistics.

N = 303	Mean	SD	1	2	3	4	5	6	7
1. Attitude	4.87	1.05	.74						
2. Inj. norm	3.45	1.34	.41*	.81					
3. Des. norm	3.39	1.32	.50*	.59*	.89				
4. PBC capacity	4.91	1.42	.25*	.32*	.26*	.83			
5. PBC autonomy	4.86	1.60	-.28*	-.15**	-.14**	.22**	.83		
6. OA int.	4.28	1.57	.67*	.57*	.57*	.32*	-.28*	.88	
7. PIIT	4.04	1.26	.14**	-.01	.08	.07	-.10	.15**	.78

* $p < .001$; ** $p < .05$; OA int. = intention to publish Open Access; Inj. norm = injunctive norm;

Des. norm = descriptive norm; PBC = perceived behavioral control; PIIT = Personal innovativeness. Bold numbers in the diagonal indicate the square root of the AVE.

Structural analysis and model testing

The theoretical model presented in Figure 1 was tested using structural equation modeling analysis (SEM). The fit indices for the extended TPB model indicate acceptable fit (CMIN/DF = 2.63, DF = 242, CFI = 0.91, TLI = 0.90, RMSEA = .073, for intention $R^2 = .48$). Results from the tests are presented in Table 3. Hypothesis 1 proposed that researchers' positive attitudes toward making their articles OA would significantly affect the intention to publish OA. This hypothesis is supported by the positive effect of the attitude construct on intention to publish OA ($\beta = 0.47$, $z = 8.34$, $p < .001$). Second, Hypotheses 2a and 2b suggested that perceived injunctive (H2a) and descriptive norms (H2b) influence intention to publish OA. Both hypotheses are supported, indicating that, among researchers, the perception of peers' expectation of own behavior ($\beta = 0.29$, $z = 4.45$, $p < .001$), and the perception of peers' actual behavior ($\beta = 0.22$, $z = 3.58$, $p < .001$), have positive effects on the intention to make research articles available OA.

Hypotheses 3a and 3b outlined the expected influence of perceived behavioral control on intention to publish OA. Specifically, that researchers perceive that enabling OA to their research articles is within their skillset, personal control or capacity (H3a), and whether the decision is completely up to them (H3b). The support for both hypotheses is indicated by the significant and positive effect of capacity ($\beta = 0.15$, $z = 3.02$, $p < .05$), and the significant but negative effect of autonomy ($\beta = -0.15$, $z = -2.82$, $p < .05$) on intention to publish OA.

Hypothesis 4a suggested that innovativeness will positively influence attitudes (H4a), a notion that is supported by the estimated results ($\beta = 0.16$, $z = 2.40$, $p < .05$). Hypotheses 4b

and 4c proposed a direct effect by PIIT on PBC capacity and autonomy, with the direction of 4c being uncertain. Hypothesis 4b is rejected ($\beta = 0.08$, $z = 1.21$, $p > .05$), while H4c is partially supported ($\beta = -0.13$, $z = -1.88$, $p = .06$). The results suggest that while personal innovativeness does not influence researchers' perception of own capacity to publish OA, it has negative impact on autonomy. The model explained 48% of the variation in intention to publish OA, and all the variance of personal innovativeness is mediated (Baron & Kenny, 1986) through attitudes and perceived behavioral control. Results are discussed in further detail below.

Table 3. Testing direct effects for integrated TPB and PIIT.

Path (N = 303)	Hypothesis	Standardized coefficients	p-value	z-value	Conclusion
Attitude → OA int..	H1	.47**	.001	8.34*	Supported
Injunctive norm → OA int.	H2a	.29**	.001	4.45*	Supported
Descriptive norm → OA int.	H2b	.22*	.001	3.58*	Supported
PBC capacity → OA int.	H3a	.15*	.002	3.00*	Supported
PBC autonomy → OA int.	H3b	-.15*	.005	-2.82*	Supported
PIIT → Attitude	H4a	.16*	.015	2.43*	Supported
PIIT → PBC capacity	H4b	.08	.225 ^{ns}	1.21 ^{ns}	Rejected
PIIT → PBC autonomy	H4c	-.13	.061	-1.88*	Partially supported

* $p < .05$; ** $p < .001$; ns = not significant. PIIT = Personal innovativeness; PBC = Perceived behavioral control.

Discussions and implications

This study investigates how attitudes, norms (injunctive and descriptive), and perceived behavioral control (capacity and autonomy) affect the intention to publish OA among a sample of published or publishing researchers at a Norwegian university. The conceptual framework is based on an extended theory of planned behavior (TPB) with the inclusion of the trait of researchers' personal innovativeness (PIIT). Confirmatory factor analysis (CFA) and structural equation modeling (SEM) indicate satisfactory reliability and validity of all constructs. In total, support is found for 7 out of 8 hypotheses.

This study contributes to the existing literature in several ways. Foremost, it is the first study to perform an empirical test of a TPB framework to explain variation in researchers' intention to publish OA. The use of a multi-item operationalization of the theoretical constructs, namely CFA and SEM methodology, further strengthens the robustness of the results (Anderson & Gerbing, 1988). Second, this study treats both the normative and behavioral control constructs as consisting of two distinct, but related, factors – which is a novel approach in research on OA publishing, and uncommon in TPB framework research

(Fishbein & Ajzen, 2010). The influence of both injunctive and descriptive norms on intention to publish OA is also determined by the results. Third, separating perceived behavioral control (capacity and autonomy) into two separate dimensions enabled detection of specific differences in the dependent variable that otherwise would be lost. PBC autonomy is negatively related to intention to publish OA, while PBC capacity suggests a positive relationship. Finally, existing research on OA is extended by investigating the direct effects of PIIT on attitudes (supported), PBC capacity (not significant) and PBC autonomy (partially supported). The findings are discussed in greater detail in the following paragraphs.

Explaining intention to publish Open Access

This study establishes that attitude is a major predictor of intention to publish OA (H1), which is in line with previous OA research employing attitude-type constructs, (e.g., Dulle & Minishi-Majanja, 2011; Khalili & Singh, 2012; J.-H. Park, 2009). These findings are also consistent with a number of studies exploring the relationship between attitude and intention over the years (Armitage & Conner, 2001; Fishbein & Ajzen, 2010). The results also indicate that the integrated and extended TPB model in this study accounts for more of the variance in intention ($R^2 = .48$) than the average reported in previous studies ($R^2 = .39$) (Armitage & Conner, 2001).

When exploring intention to publish OA, most studies which employ a theoretical framework do not base the construction of survey items on the same theoretical assumptions. As such, the items comprising the attitudinal constructs vary from study to study, and as a consequence, meaningful comparisons of the instruments, apart from at face-value, become challenging. For example, attitudes, in this study, are based on both instrumental and affective items, and adjective pairs comprising the scales emanate from established theory (Fishbein & Ajzen, 2010). It is not surprising to find attitude as the foremost predictor of intention in this context. Perhaps the singularly most important aspect of OA is to provide equitable access to research articles (Togia & Korobili, 2014) – hence, subjective evaluations of OA as being inherently useful or effective are fundamental to researchers when deciding how and where to publish.

A likely explanation of possible non-existence or weak relationships between social norms and intention lies in weak measurements and use of single items (Armitage & Conner, 2001). An additional explanation is that social norms are multi-dimensional (Rivis & Sheeran, 2003). This study addresses both of these concerns. The present study finds evidence for the influence of both aspects of the normative construct on intention to publish OA (H2a, H2b).

Potential reasons why Dulle and Minishi-Majanja (2011) and Khalili and Singh (2012) found a non-significant relationship between social norms and intention can be explained by how the constructs are framed. For example, Khalili and Singh (2012) use recommendations from different persons (peers, superiors, editorial boards, grants and co-authors), while Dulle and Minishi-Majanja (2011) use requirements from a combination of funding bodies, leading researchers and close colleagues. In this study, the results suggest that when it comes to scientific publishing, researchers' intentions are indeed dictated by the expectations and behaviors of researchers who "are important to me", as suggested by the majority of studies using the TPB to assess the reflective construct of norms (Ajzen, 2006). Researchers participating in this study indicate that although they are influenced by the observed OA publishing behavior of their peers, a larger effect on intention is observed by the perceived pressure, encouragement, and expectations emanating from them. After all, would there be prestige associated with getting articles accepted in certain journals unless there are no social norms assigning status to that particular achievement? Naturally, it is possible that the findings indicate sample-specific variations in culture or habits unique to this research context (Migheli & Ramello, 2013). Future studies can address this issue by employing the same research framework across contexts to assess local variations, reducing errors and incompatibility issues resulting from utilizing different measures and designs.

The results further demonstrate support for both PBC hypotheses (H3a, H3b) and thus evidence for treating the PBC variable as two conceptually and operationally distinct sub-factors. The analysis reveals that the variables influence intention to publish OA differently. These findings are congruent with some studies that suggest the PBC construct may benefit from being treated separately (Armitage & Conner, 1999; Kidwell & Jewell, 2003). In the present study, the results further suggest that if respondents feel they possess the ability to publish in OA journals, it positively influences intention. Results correspond to those of Dulle and Minishi-Majanja (2011) and J.-H. Park (2009), and are in contrast to findings reported by Khalili and Singh (2012). However, any comparison between the present study and previous research should be made with caution. For example, J.-H. Park (2009) defined self-efficacy (capacity) as pertaining to the perception of whether an article will be *accepted* by an OA journal, and not the general perception of possessing the ability to use OA as a publication method. Dulle and Minishi-Majanja (2011), and Khalili and Singh (2012), on the other hand, focused on the skillset necessary to *use and understand* OA as a system in their

operationalization of effort expectancy (capacity). It may be argued that these are conceptually different constructs.

The direction of the capacity aspect, however, is not surprising. Published, or publishing, researchers are essentially being asked whether they believe they control the decision to make their research OA. One would expect this to be a decision under volitional control. Even if other variables are taken into account, such as publication venue being decided by the research group or by some other arrangement, researchers can still perceive that they are able to publish (other research) where and how they want. The PBC sub-factor of autonomy shows a negative influence on intention in this study. This facet of PBC pertains to whether the decision to publish OA is perceived to be completely within researchers' control. Results suggest researchers perceive that this is the case, however it does not increase their intention to publish OA – but actually weakens it. This could be due to the notion that publishing in OA journals is thought to be too easy, signaling low quality, as some previous research has suggested (J.-H. Park, 2009). However, results differ from some of the reviewed work, possibly pertaining to the operationalization of constructs or sample contexts. In other studies, autonomy (i.e., controllability/facilitating conditions) is found to range from no significant effect (Dulle & Minishi-Majanja, 2011) to a moderately positive effect (Khalili & Singh, 2012) on intention to publish OA. However, J.-H. Park (2009) reports a negative impact of controllability on intention, which is in line with the current research.

Finally, this study finds evidence for PIIT influencing attitudes towards OA. The results suggest that researchers' innovativeness in relation to using new IT may be an important precursor of perceptions toward OA. In turn, these attitudes play a significant role in the intention to publish OA (Dulle & Minishi-Majanja, 2011; Khalili & Singh, 2012). Previous studies have shown that innovativeness is positively linked to an open predisposition (Nov & Ye, 2008), which in turn may facilitate acceptance of, for many, a relatively novel publishing paradigm such as OA. Furthermore, Jackson et al. (2013) found that PIIT is an important determinant of user perceptions – and indicated the utility of identifying these early adopters in facilitating change processes in an organization. As such, identifying which researchers are innovative or not may be an important first step in understanding who are willing to expend the effort required with change. The results indicate no significant effect on PBC capacity, although the direction of the effect is as hypothesized. This study also finds partial support for a negative effect on PBC autonomy. A possible explanation may be that innovative researchers perceive OA journals as a less desirable venue for publishing given

misconceptions about the relative ease of having articles accepted; that OA is essentially a pay-to-publish model, associated with low prestige or poor quality of peer review (Togia & Korobili, 2014; Xia, 2010).

Limitations and implications

There are potential limitations of this study that should be addressed. The sample is relatively small, and this study relies entirely on self-report in the data collection. Self-report surveys are subject to biases and may cause uncertainty in the generalization of results (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Biases in self-report are partially alleviated through statistical procedures. The sample is localized at one university. Even though knowledge about OA as a concept is increasing and relatively well dispersed in the general research population, as indicated by descriptive studies, a study of this kind would benefit from a larger sample collected from several different universities. Furthermore, the theoretical framework in this study only includes intention as the ultimate dependent variable, it does not include observed publishing behavior. Another potential limitation concerns the specificity in the dependent variable. Survey-items measure intention to publish in OA journals, and intention to deposit manuscripts in open archives, but not whether the intention is guided by institutional policy or, for example, an APC pre-payment membership scheme. Future studies could address this issue by expanding the intentional variable, and possibly capturing more of the variance in intention. As previously discussed, Fishbein and Ajzen (2010) recommend eliciting salient attitudinal beliefs in order to capture as much of the information about the underlying attitude determinants as possible, and refraining from this may be a potential limitation. Given that the measures in this study are general it may be acceptable to abstain from eliciting salient beliefs. However, a general approach is perhaps better suited if a measure is to be administered to a larger research population spanning several different institutions, or even as a preliminary study at a single institution.

This study has some implications for researchers engaged in investigating OA publishing, and contributes to the reasoned action literature by finding support for an extended model with decomposed belief-based constructs of norms and behavioral control in order to achieve a more substantial and practical understanding of what forms those general constructs (Ajzen, 2006; Fishbein & Ajzen, 2010). This approach will allow for better application of the framework with respect to designing studies and running targeted interventions post analysis. It also shows that the PBC dimension may be comprised of sub-constructs with opposite valence. Furthermore, the present study finds evidence for the direct effect of personal

innovativeness, which suggests that it is a key contributor in attitude formation and one aspect of behavioral control. Other individual traits or values, such as openness to experience, or resistance to change, should be considered in future studies.

Powerful incentives are still in place for researchers to choose traditional publishing, and these are not likely to change any time soon. Although more stringent OA policies are increasingly being implemented, radical policy changes may be met with resistance if the causes of the resistance are not alleviated first. For example, in Norway approved journals are ranked (level 1 and 2, whereby level 2 journals are of higher quality) and higher ranked publications generate more funds for the institution. The number of highly ranked OA journals is much smaller than the number of subscription-based journals, and as a consequence the incentive system indirectly rewards traditional publishing. More stringent OA policies will therefore not benefit institutions if the incentive system is not amended in accordance. Indirectly, this may also influence perceptions of OA – after all, if OA publications lack the associated ranking of traditional outlets, adoption will suffer. Researchers respond to such changes by modulating attitudinal, normative and control aspects of the associated behaviors. In order to reach a more fundamental understanding on how these factors interact, more research is needed into the psychological mechanisms involved in publishing scientific articles. This article contributes to this fledgling research stream by providing a framework and preliminary results regarding the identification and effects of factors involved in the behavior of scholarly publishing.

Furthermore, more work is required to develop a comprehensive framework that may be used in the entire process ranging from measurement to changing behavior. For instance, conducting a survey based on the framework sketched out in this article gives researchers and administrators the opportunity to identify the strength and direction of attitudes, social norms, and behavioral control aspects. The knowledge can then be used to ultimately increase OA publishing at their respective institutions. If, say, social norms prove to be a powerful contributor to intention, interventions could target mechanisms that foster inter-personal or group processes. On this point, institutions may strongly benefit from working together. A strategy to chart publishing behavior based on a common framework is bound to be more efficient than localized studies of various theoretical and analytical content. Cooperation of this kind may also include the development and implementation of behavioral change interventions. If governments, universities, and funding bodies wish to move forward with

increasing OA publishing, it is worthwhile to amend and unify strategies in order to achieve this goal.

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