

# Towards an understanding of consumers' FinTech adoption: the case of Open Banking

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## Abstract

**Purpose** – This study aims to identify key factors driving consumers' adoption of Open Banking. It extends the Unified Theory of Acceptance and Use of Technology (UTAUT) by integrating perceived risk, initial trust and financial literacy into an overarching conceptual model.

**Design/methodology/approach** – Measurement items of the theoretical constructs included in the conceptual model were adapted from related literature and a set of hypotheses was developed. The hypotheses of the conceptual model were subsequently assessed with partial least squares structural equation modeling using a dataset of 456 Australian survey respondents.

**Findings** – The model has strong explanatory power with an  $R^2$  of 69.5%. Performance expectancy, effort expectancy, social influence and perceived risk are direct antecedents of consumers' usage intention of Open Banking. Social influence has a strong mediating effect on usage intention through performance expectancy. The effect of perceived risk is alleviated by effort expectancy and initial trust, while initial trust positively affects the effects of performance expectancy and effort expectancy on consumers' usage intention of Open Banking. Finally, financial literacy lowers initial trust towards Open Banking, possibly inducing consumer skepticism.

**Practical implications** – The results suggest that practitioners should focus on performance expectancy as a primary driver of Open Banking adoption, while understanding the role of other drivers, such as social influence and perceived risk in developing marketing strategies. Policy makers are recommended to adopt a governance approach to build initial trust amongst consumers.

**Originality/value** – This research contributes by providing an integrated and comprehensive model for explaining consumers' FinTech adoptions by extending the existing technology adoption model UTAUT to the Open Banking domain and integrating perceived risk, initial trust and financial literacy, thereby advancing and enriching the conceptual horizon of the extant literature.

**Keywords** Innovation adoption, Financial literacy, FinTech, Trust, Open banking, Perceived risk

**Paper type** Research paper

## 1. Introduction

This paper aims to improve the current understanding of the key factors that explain consumers' intention to use Open Banking, an innovation with the potential to radically change consumers' banking behavior and the competitive dynamics of the wider banking industry (Borgogno and Colangelo, 2020; Brodsky and Oakes, 2017; PWC Australia, 2018). The current competitive dynamics in the banking industry can be described in terms of a power imbalance between incumbent financial service providers and consumers on the one hand, and incumbent financial service providers and new providers on the other (Fleeting, 2019; Larsson, 2018). A key reason for this situation relates to the underlying arrangements of the traditional banking model, whereby consumers' personal financial data are controlled by incumbent providers with which consumers have established relationships (Borgogno and Colangelo, 2020; Fingleton Associates, 2014).

However, under these arrangements, both consumers and new providers are disadvantaged. It can be challenging for consumers to easily switch to competing for financial products or services. Borgogno and Colangelo (2020) argue that switching costs are one of the major reasons attributable to the switching inertia of banking consumers in the UK, for example. By the same token, incumbent providers' control of consumers' personal



financial data also means that complete datasets representing a consumer's personal profile are effectively locked in by these providers. That is, competing, new providers are only able to assess a prospective consumer to the extent that the consumer shares their historical financial information which, in practice, is often limited to snapshots of their transaction history. Consequentially, prospective consumers' profiles are often based on incomplete data, and consumers may thus not necessarily benefit from the most competitive products or services. These conditions reinforce the existing competitive dynamics in the banking industry, where incumbent financial services providers retain market power (Arner *et al.*, 2020).

In response to this situation, regulators across major jurisdictions around the world have intervened with regulations and directives intended to address these data portability issues to reduce switching costs (Borgogno and Colangelo, 2020). For example, the EU's General Data Protection Regulation (GDPR) [1] and Payment Services Directive (PSD2) [2] empower consumers to have greater control of their accounts and related information and allow third-party providers to use the information. More recently, President Biden signed an executive order in July 2021 for similar regulation in the US (FDATA North America, 2021). These regulations share the common goal of attempting to create conditions that facilitate greater consumer control of data to balance the competitive dynamics in the banking industry.

Open Banking is a financial technology innovation that facilitates the practical implementation of regulations such as GDPR and PSD2. Enabled by a common technology standard application programming interface (API), Open Banking provides the means for banking consumers to control their own account information and reduce switching costs by facilitating sharing of information with selected financial service providers. Consumers have incentives to share their account information, such as transactional data, with other providers for a range of reasons, including to easily open new accounts, access and compare product offers or easily aggregate transaction history from existing or past providers to strengthen their bargaining power to negotiate better terms for existing or new services (Deloitte, 2019; Manthorpe, 2018).

Open Banking is unique and markedly different from traditional banking arrangements. Traditional banking is effectively based on *closed* and *fragmented* systems, that is, systems that are owned and controlled by individual financial service providers. A key, major consequence is that consumer data are effectively locked in by individual providers. By contrast, Open Banking calls for greater systems *openness*, meaning that providers will have a greater capacity to share consumer data with other providers via their APIs (Mansfield-Devine, 2016). Although data sharing requires the consumers' explicit consent, the underlying Open Banking arrangements are also associated with unique vulnerabilities, such as greater exposure to new types of risks including fraud, challenges in assigning liability when payments fail and greater risk of consumer privacy loss due to the increased scope for a larger digital footprint that consumers leave behind due to expanded online interactions in Open Banking settings (Borgogno and Colangelo, 2020; Eysers, 2018; Kehoe, 2019) [3]. The potential materialization of these vulnerabilities increases the risk of violating established privacy legislation (Arner *et al.*, 2020).

Extant Open Banking research has predominantly focused on technical implementation issues, the rationale and strategic implications from the regulators' and financial services providers' perspectives (Guibaud, 2016; Krivoruchko and Lopatin, 2018; Moysan and Rudnicki, 2019; Ramdani *et al.*, 2020). However, this stream of research has largely neglected the consumers' perspective (Borgogno and Colangelo, 2020; Buckley *et al.*, 2020; Dratva, 2020). This limitation is problematic because both Open Banking and underlying regulation were specifically designed with the aim of fostering greater consumer engagement outcomes.

The need to better understand the consumers' perspective becomes even more pronounced when Open Banking is being driven and promoted internationally but wide

adoption is yet to be realized. For example, Open Banking is currently developed in major jurisdictions such as the EU, UK, Australia, Hong Kong, Japan, India, and South Korea (Australian Government, 2017; Badour and Presta, 2018; EMEA Center for Regulatory Strategy, 2021; Hong Kong Monetary Authority, 2018). However, limited early evidence suggests consumer demand for and uptake of Open Banking in these jurisdictions are yet to be known. For example, the UK is the first jurisdiction to offer Open Banking since 2018, yet uptake by consumers remains limited (Open Banking Implementation Entity, 2021). UK consumers have indicated that they are reluctant to share their data with providers other than their main bank, citing concerns of risks related to fraud, data protection and cyber-attacks as key reasons (Borgogno and Colangelo, 2020). Clearly, these concerns are related to the unique aspects of Open Banking, which are thus also seen by consumers to be vulnerability sources (Borgogno and Colangelo, 2020; Mansfield-Devine, 2016).

We address the shortcomings in the existing research by pursuing the research question concerning the factors that influence consumers' intention to use Open Banking. To this end, we explain Open Banking, develop and empirically test a conceptual model based on the argument that Open Banking is an innovation and that the selected model reflects key consumer concerns relevant to the nature of this innovation. Specifically, our model builds on key constructs from the established technology adoption model Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh *et al.*, 2003), which we also extend with constructs including perceived risk, initial trust and financial literacy. We find empirical support for the proposed model using a dataset collected from Australian respondents.

Our research contributes both to theory and practice in several ways. First, to the best of our knowledge, our study is amongst the first attempts to address the gaps in extant research by providing a comprehensive and integrated model to understand consumers' adoption intention of modern financial technologies (i.e. FinTech), specifically using Open Banking as an exemplar. The unique technical arrangements of this technology allow for a greater role of consumers and enhanced data sharing capacity, which together offers significant benefits but also new (perceived) risks. Accordingly, existing adoption models for understanding technology adoption need revision and we extend prior innovation adoption literature by integrating in an overarching conceptual model key constructs related to perceived risk, consumer trust and financial literacy, which are of specific relevance to Open Banking. Our empirical results underscore not only the importance of the inclusion of these constructs but also highlight insightful interactions between these key constructs to better explain consumers' uptake of Open Banking. The identification of the latter also advances and enriches the extant body of knowledge on innovation adoption while making important theoretical inroads for future research.

Second, in practical terms, our findings offer actionable insights to various stakeholders including business professionals, technology experts, marketing staff and regulatory bodies. The findings pertaining to the relationships between, on the one hand, key constructs such as performance and effort expectancy, social influence, perceived risk and initial trust and, on the other hand, consumers' intention to use Open Banking reinforce the critical role of the trust financial services providers must convey for Open Banking to be a marketplace success (Dratva, 2020). Our findings also provide implications for marketing strategy and policy formulation of financial services firms, developers and governments interested in increasing the competitiveness and adoption of Open Banking. Our findings may be in particular useful to providers of new financial services in terms of stressing the need for tailoring strategies that foster performance expectancy, while challenging the traditional belief of the role of social influence in financial services.

Third, while our current findings and contribution are specifically related to the Open Banking context, they may be transferable or applicable more widely to other settings where

the open data concept is considered such as other FinTech applications, “RegTech” or “SupTech” applications [4] in the public and private sectors (Arner *et al.*, 2020; Australian Government, 2017; OECD, 2020), thereby potentially improving engagement and participation by citizens in new technology that could improve their daily lives and foster new economic opportunities (Charalabidis *et al.*, 2018). In particular, the effect on usage intention of such constructs as structural assurance, firm reputation *vis-à-vis* effort expectancy, etc. demonstrates the role regulators can play to establish facilitating conditions and a conducive environment for FinTech applications to succeed.

## 2. Related literature

In defining the appropriate literature domain, we first review the nature of Open Banking. Open Banking is a technology that is based on government regulation and policy. Governments around the world are developing regulations based on the desire to promote greater competition and consumer fairness in banking. However, regulation and policy require a *means* to facilitate achieving intended outcomes. In the case of Open Banking, the application programming interface (API) technology was specifically developed and implemented to do so. Our study focuses on how consumers adopt this Open Banking API technology, not the regulation itself. Innovation can be defined as a “technological development of an invention combined with the market introduction to end users through adoption and diffusion” (Garcia and Calantone, 2002). Accordingly, we argue that Open Banking is a technology innovation that has the potential to change existing banking practices. As an innovation, Open Banking is expected to progress through a process of adoption by individual consumers and to wider diffusion (Baregheh *et al.*, 2009; Dynes, 2018; Manthorpe, 2018). There is a technological, practical novelty in Open Banking that consumers must learn about, for example, how they can give consent to a provider of financial services via an Open Banking app to release their historical transaction data to other providers, and how in turn, consumers will obtain information about competing offers, accept such offers and switch between providers. These practicalities are new and specifically available and accessible to Open Banking consumers via dedicated APIs. While the government regulation may require providers of financial services to allow Open Banking, the regulation cannot guarantee that consumers will adopt Open Banking. Consumer adoption of Open Banking is voluntary. As early experience has shown, consumers in the UK are reluctant to share data with providers other than their banks (Borgogno and Colangelo, 2020). Meanwhile how the Open Banking API is presented to the consumers may affect the extent to which consumers believe it offers value to them, and in turn, are prepared to trial and adopt Open Banking.

As our study focuses on the consumers’ adoption intention of Open Banking, we look into related technology adoption theories and constructs. Innovation diffusion theory (IDT) (Rogers, 1962) sets out adoption as the first hurdle of getting an innovation diffused to a critical mass. Among different technology adoption models, there are a few widely accepted and tested models including UTAUT (Venkatesh *et al.*, 2003), the technology acceptance model (TAM) (Davis, 1986) and the task technology fit model (Goodhue, 1995; Goodhue and Thompson, 1995) which have been used to explain innovation adoption in various contexts (Judith *et al.*, 2010; Kaushik and Rahman, 2015; Kijsanayotin *et al.*, 2009; Marques *et al.*, 2011; Zuiderwijk *et al.*, 2015).

We chose UTAUT for two main reasons. First, UTAUT has synthesized different adoption models and has been cross-validated in many prior studies. Accordingly, UTAUT is well-established for its explanatory power across different technologies and adoption domains and settings. In particular, UTAUT has been successfully used in explaining consumer adoption (intentions) of key banking technology innovations including Internet

banking and mobile banking (Baptista and Oliveira, 2015; Martins *et al.*, 2014; Sarfaraz, 2017; Shaikh and Karjaluto, 2015; Yu, 2012). Second, UTAUT focuses both on individuals' perceptions about technology or innovation-based factors (e.g. performance expectancy and effort expectancy), and on wider contextual factors such as social norms that have long been established to influence individual technology adoption intentions. As IDT posits, a diffusion process involves social norm considerations (Rogers, 1962). Open Banking has been primarily driven by the government for its wider societal benefits. Accordingly, UTAUT is an excellent, established theory to use, which could help explain the role of wider, contextual factors on consumers' intention to adopt Open Banking.

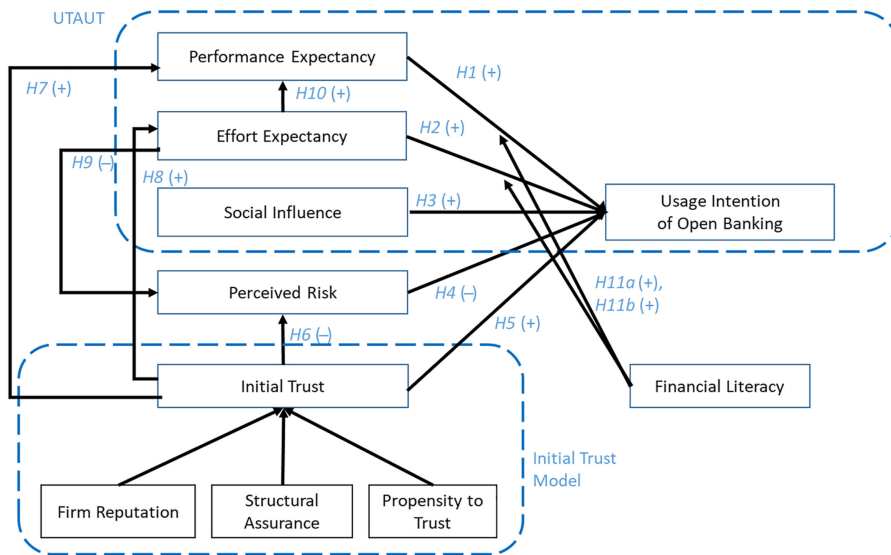
The original model of UTAUT is structured in a way that the three main constructs (performance expectancy, effort expectancy and social influence) are antecedents to usage intention, and usage intention and facilitating conditions are antecedents to actual usage. We adopt the UTAUT model constructs except that we adopt usage intention instead of usage behavior as the dependent variable. Studying intentions instead of behavior is supported by the theory of reasoned action, which shows that consumers' usage intentions are a good predictor of their actual usage behavior (Ajzen, 1980; Davis, 1989). Our choice to focus on usage intentions is also motivated by methodological considerations. Open Banking has a low penetration across markets where it is available (Dratva, 2020). Identifying and recruiting actual Open Banking users is thus challenging. Accordingly, the conceptual model has three antecedents to consumers' usage intentions: performance expectancy, effort expectancy and social influence.

### 3. Conceptual model and hypotheses development

Building on UTAUT, we extend the model to examine the effects of other relevant constructs on usage intention. First, given the inherent risk associated with financial technology and since the perceived risk is a counter consideration to innovation adoption (Laukkanen, 2016), we will study the effect of it on usage intention. On the other hand, trust is a separate, counteracting factor to perceived risk (Jøsang and Presti, 2004) and, therefore, we will study the effect of trust – and specifically initial trust which is more applicable for innovations (Gao and Waechter, 2017), on perceived risk and usage intention. Trust has been found to be a particularly relevant factor to include in models trying to understand consumers' adoption of new banking products and services (Hoffmann *et al.*, 2012). While we synthesize the constructs from different theories, we go further to hypothesize the possible relationships between them (e.g. whether effort expectancy has an effect on perceived risk), so as to achieve an integrated understanding of the model. Furthermore, Open Banking is an innovation with financial implications to individuals, and financial literacy has been identified as an antecedent of many financial decisions (e.g. Allgood and Walstad, 2016). Accordingly, we examine the role of financial literacy in the proposed model. The hypotheses are discussed in detail in the following sections. Figure 1 summarizes the conceptual model and the hypotheses.

#### 3.1 Performance expectancy and usage intention

Performance expectancy is the degree to which individuals believe that using a system will help improve job performance (Venkatesh *et al.*, 2003). It is a consistent and predominant factor affecting adoption in Internet banking and mobile banking studies (Lin, 2011; Oliveira *et al.*, 2014; Tarhini *et al.*, 2016; Wessels and Drennan, 2010; Yu, 2012). As innovation adoption often involves behavioral change, there must be perceived benefits to justify adoption. We hypothesize that if consumers perceive Open Banking to be useful, they have more intention to adopt:



**Figure 1.**  
Conceptual model

*H1.* Performance expectancy positively influences the usage intention of Open Banking.

### 3.2 Effort expectancy and usage intention

Effort expectancy is the degree of ease associated with system use (Venkatesh *et al.*, 2003). It helps explain which applications will be more or less likely to be adopted. For example, mobile banking studies find that perceived ease of use explains the consumers' intention to use mobile banking applications (Farah *et al.*, 2018; Lin, 2011; Shaikh *et al.*, 2018; Wessels and Drennan, 2010). We hypothesize that higher effort expectancy (i.e. higher perceived ease of use) will increase consumers' usage intention of Open Banking:

*H2.* Effort expectancy positively influences the usage intention of Open Banking.

### 3.3 Social influence and usage intention

Social influence is the degree to which one perceives others believe they should use a new system (Venkatesh *et al.*, 2003). Arguably, social influence would not be a relevant factor to personal financial services because they involve confidential data that might not be visible to others (Oliveira *et al.*, 2014). However, Hoffmann and Broekhuizen (2009) show that even with financial products, consumers are susceptible to interpersonal influence. Moreover, IDT points out that early adopters rely more on their social participation for communication (Rogers, 1962). As Open Banking is a new concept, there may not be sufficient information readily available and early adopters may rely on their social network to form usage intentions. Hence, we hypothesize:

*H3.* Social influence positively influences the usage intention of Open Banking.

### 3.4 Perceived risk

Perceived risk refers to the negative consequences that consumers perceive to be associated with situations of uncertainty (Mitchell, 1992). IDT posits that innovation decisions can also be outright rejections that lead to a failure to adopt. Indeed, it argues that past diffusion



research is often characterized by a pro-innovation bias in the sense that an innovation is assumed to be good and will be adopted (Rogers, 1962), resulting in an underestimation of consumer rejection and the potential reasons thereof. The innovation resistance model (Ram, 1987) subscribes to this pro-innovation bias critique and introduces perceived risk to help explain why some people reject mobile and Internet banking (Laukkanen, 2016). Indeed, the benefits of Open Banking hinge upon how personal consumer data are handled and thereby also raise data privacy and security concerns (Dynes, 2018; Evers, 2018; Riley, 2019). Even though in the consent process, consumers do not need to release their login credentials, they need to rely on the API provider (whom they may not necessarily be familiar with) in sharing their information. Such concerns were also confirmed in a UK survey in which only 13% of respondents were comfortable allowing a third party to access their financial data (Dynes, 2018). The nature of Open Banking means that there are risk perceptions associated with finances, data security and data sharing. More specifically, performance risks (e.g. will Open Banking perform properly?), financial risks (e.g. will I lose money due to any fault or error?) and privacy risks (e.g. will the data be technically secured and not leaked to others on an unwilling basis?) need to be examined closely. We thus hypothesize that higher perceived risk will lower consumers' usage intention:

*H4. Perceived risk negatively influences the usage intention of Open Banking.*

### 3.5 Initial trust

While perceived risk refers to the associated negative consequences in situations of uncertainty, trust is the extent to which one party is willing to depend on another with a feeling of relative security (Jøsang and Presti, 2004). Trust and risk are thus separate constructs and the decision to engage in a risk-bearing relationship is the net outcome of both constructs (Jøsang and Presti, 2004; Mayer *et al.*, 1995). For example, consumers may perceive a high risk of using Internet banking that may result in financial loss, but their trust towards a reputable bank may ease this concern and make them willing to adopt it nonetheless.

The traditional view of trust such as the one in the knowledge-based trust model (Mayer *et al.*, 1995) posits that trust is built over time and through experience. The initial trust model (McKnight *et al.*, 1998), in contrast, posits that initial trust between parties will not be based on experience but rather on an individual's disposition to trust or institutional cues that enable a person to trust without first-hand knowledge. The nature of innovation means it involves no prior experience. Accordingly, the initial trust model is better suited in innovation adoption (e.g. Gao and Waechter, 2017; Kim *et al.*, 2009; Oliveira *et al.*, 2014; Zhou, 2011) and has been applied in prior research (e.g. mobile banking adoption research) (Kim *et al.*, 2009; Oliveira *et al.*, 2014). We argue that given the novelty of Open Banking and the associated risks, the initial trust model is more appropriate than other established trust constructs (see e.g. Pavlou, 2003). Specifically, the initial trust model posits that trust propensity, structural assurance and firm reputation are antecedents to initial trust which influences usage intention. The extent to which these antecedents influence initial trust in Open Banking is a matter for empirical enquiry. However, each of these antecedents can be related to Open Banking and can therefore potentially influence the extent to which initial trust affects consumers' Open Banking adoption intentions. Trust propensity refers to a person's disposition to rely on others to take various actions (Kim *et al.*, 2009). In Open Banking, it is expected that if a person has more trust toward technology, they will be more likely to adopt Open Banking. Structural assurance involves agreements, regulations, policies, laws or guarantees that can enhance initial trust (Kim *et al.*, 2009). Structural assurance can alleviate adopters' apprehension even when they have no prior experience with the innovation. The UK government, for example, drives compensation policies to instill consumer trust in Open Banking. Firm reputation

refers to consumers' perception towards the service provider and the derived assumption of reliability when there is no prior experience to rely on (Kim *et al.*, 2009). In Open Banking, the provider can be a technological third party with which consumers do not have prior experience. Based on these considerations, we hypothesize that initial trust towards Open Banking increases consumers' usage intention:

*H5. Initial trust positively influences the usage intention of Open Banking.*

While initial trust and perceived risk are not always considered as separate and counter-working constructs, the directionality of their causal relationship is also not clearly established (Pavlou, 2003). For a long time, there have been different views – whether the trust is an antecedent of risk, the same as risk or a by-product of risk (Kim *et al.*, 2008). A study investigating trust and risk in electronic commerce adoption finds that for trust to take effect, risk must exist at the beginning (Pavlou, 2003). Pavlou (2003) demonstrates that trust is a significant antecedent of perceived risk, but the reverse is not true. This finding supports the conceptual argument that perceived risk must exist at the beginning for trust to be operative and an outcome of trust-building leads to a reduction in perceived risk (Mitchell, 1999). For Open Banking, even though there may be perceived risk of using it, we hypothesize that the initial trust driven by the provider (i.e. firm reputation), government policies (i.e. structural assurance) and personal disposition to trust (i.e. propensity to trust) can reduce perceived uncertainty:

*H6. Initial trust negatively influences perceived risk.*

Performance expectancy is how one perceives the usefulness of an innovation. As it is a perception, it can be subjectively affected by other factors like the trust towards the provider or the technology. Initial trust, to some extent, acts as a subjective guarantee of the benefits or usefulness that the consumer expects to receive (Luo *et al.*, 2010). Prior e-service studies suggest that trust can reinforce performance expectancy or perceived usefulness (Gao and Waechter, 2017; Pavlou, 2003). For Open Banking, as it is very new and there is no prior knowledge of its usefulness, we expect that initial trust is a key factor in influencing performance expectancy. For example, if Open Banking is provided by a trusted bank, consumers may assume that it is more useful compared to a provider that they do not know. Therefore, we hypothesize:

*H7. Initial trust positively affects performance expectancy.*

Similar to performance expectancy, effort expectancy is a perception that can be affected by the trust. Trust reduces consumers' need to understand, monitor and control the situation (Pavlou, 2003). If there is a high level of initial trust, the potential adopter perceives it is easy to use an e-service (Gao and Waechter, 2017). In the Open Banking context, if there is an assurance from the government and/or industry, adopters may perceive lower uncertainty and greater ease of use. By contrast, if a provider is not known nor trusted, consumers may be more cautious and the effort to understand the implication of each step is likely to increase. Thus, we hypothesize:

*H8. Initial trust positively affects effort expectancy.*

### *3.6 Perceived risk, effort expectancy and performance expectancy*

Perceived risk exists when there is uncertainty. If an application is easy to use, it alleviates the feeling of uncertainty and the perceived risk will be lower. A similar conjecture is discussed in the context of mobile services (Wang *et al.*, 2006) and Internet banking (Martins *et al.*, 2014). It follows that if Open Banking is perceived as easy to use (lower effort expectancy), the



perceived uncertainty of how the app may perform and how data are managed will be reduced, potentially diminishing perceived risk. Therefore, we hypothesize:

*H9. Effort expectancy negatively affects perceived risk.*

Ease of use is a direct antecedent of perceived usefulness in TAM (Davis, 1986, 1989; Davis *et al.*, 1989). That is, ease of use can reinforce usefulness perceptions. Prior mobile banking and Internet banking studies confirm this conjecture (Alalwan *et al.*, 2017; Kesharwani and Singh Bisht, 2012; Pavlou, 2003; Zhou *et al.*, 2010). Less effort to operate Open Banking to perform functions such as comparing offers and switching between financial institutions should make consumers feel it is more useful. Hence, we hypothesize:

*H10. Effort expectancy positively influences performance expectancy.*

### *3.7 Financial literacy*

Financial literacy refers to how well an individual can understand and use personal finance-related information to make decisions (Huston, 2010). It has been shown that financial literacy affects a wide range of financial decisions such as retirement planning, investment choices, debt management and financial education (Allgood and Walstad, 2016; Greenberg and Hershfield, 2018; Hoffmann and Otteby, 2018; Lusardi and Mitchell, 2009; van Rooij *et al.*, 2011). While Open Banking is technology innovation, it is intended to be used for the *purpose of financial management*. Accordingly, consumers' decision to adopt Open Banking will also depend on factors beyond technology, specifically pertaining to consumers' financial literacy. Arguably, consumers' financial literacy may influence the extent to which a consumer can understand and appreciate the extent to which the Open Banking API might be valuable to them. Specifically, in this study, financial literacy is not about what Open Banking is and how it works but rather relates to the knowledge to comprehend the information that Open Banking can offer.

We hypothesize financial literacy as a moderator rather than a direct antecedent to usage intention based on the following reasons. A moderator is a construct that will strengthen or weaken a relationship rather than directly affect another construct. As the aforementioned literature reveals, financial literacy affects financial decisions. However, the adoption of Open Banking is not a financial decision by itself (but a decision to adopt a tool that can help improve financial decisions), therefore we do not hypothesize it is a direct antecedent to usage intention. Rather, we hypothesize that financial literacy will affect the effect of two constructs (performance expectancy and effort expectancy) on usage intention. For example, Open Banking may provide options for saving interest on one's loans. Even if the same content is shown and the same usefulness (performance expectancy) is perceived, individuals with higher financial literacy may be more motivated to adopt Open banking than those with lower financial literacy as they are more capable to comprehend the nature of interest savings content or information provided by the Open Banking API and consequentially know how to associate such information with their financial well-being (i.e. financial literacy strengthens the effect of performance expectancy on usage intention). Similarly, if two persons see the same content and perceive the same effort to use Open Banking, the one with higher financial literacy may be more motivated to adopt it, as they may better be able to link the effort to justify their financial benefits than the one with lower financial literacy (i.e. financial literacy strengthens the effect of effort expectancy on usage intention). As such, we hypothesize:

*H11a. Financial literacy positively moderates the relationship between performance expectancy and usage intention.*

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*H11b.* Financial literacy positively moderates the relationship between effort expectancy and usage intention.

## 4. Methodology

### 4.1 Research design

We adopt a quantitative approach to empirically test the hypotheses and give statistical support to generalize findings for further applications (Creswell, 2014; Williams, 2011). We used a structured, self-administered, online questionnaire to collect data from potential consumer adopters. Before entering the main section of the survey, we presented respondents with an introduction of the Open Banking concept extracted from a public website [www.finder.com](http://www.finder.com) (Barry, 2019) to ensure they understand the basics of Open Banking. Next, we showed them a set of screenshots to envisage a use case of Open Banking (Appendix 1). After this information, we asked them to answer two questions to check that they correctly understood the nature and use of Open Banking (Appendix 2). Of the 1,253 respondents who answered the verifying questions, 777 were able to understand the essence of Open Banking and continued the survey.

### 4.2 Measurement instrument

The items and scales are adapted from existing scale measures, with wording adjusted to fit this study's context. For instance, UTAUT was originally used in an organizational context with social influence items related to senior management (Venkatesh *et al.*, 2003), which is not applicable to Open Banking. Therefore, we adapted the social influence items from a mobile banking study (Oliveira *et al.*, 2014). Table 1 summarizes the constructs and measurement items.

### 4.3 Sampling frame and data collection

We conducted our study in Australia to represent a context in which Open Banking is newly introduced. Australia is considered well-positioned for leading the Open Banking development (Littlejohn, 2019). Respondents are between 18 and 65 years old with at least one bank account to represent the general public who can reasonably understand new technology [5]. We used Qualtrics for recruiting a panel of respondents and used quotas to ensure a nationally representative sample in terms of age, gender and region. From the 777 respondents who correctly understood Open Banking, we further excluded those who had unreasonably short completion times for the whole survey, contradictions in their socio-demographic information or straight-lined their answers. After data cleaning, we had 456 quality responses for analysis (Appendix 3 for details on socio-demographics). In terms of age, 15.4% of respondents were between 18 and 24 years, 24.3% between 25 and 34 years, 21.1% between 35 and 44 years, 21.7% between 45 and 54 years and 17.5% between 55 and 64 years. In terms of gender, 51.8% of respondents were female, 47.8% was male and 0.4% identified as another gender. In terms of highest education, 22.4% of respondents have a high school degree; 35.7% has some college; 32.5% has a completed college or associate degree; and 9.4% has a completed post-graduate degree. In terms of annual before-tax income, 19.3% of respondents earned less than \$18,200; 22.1% between \$18,201 and \$37,000; 39.7% between \$37,001 and \$90,000; 16.4% between \$90,001 and 180,000; and 2.4% earned more than \$180,001. Most respondents have relationships with more than one financial institution and own multiple bank accounts. We measured the time that respondents spent on completing the survey end-to-end, which includes reading the Open Banking screenshots, background, information and answering the questions. On average, they spent 20.6 min on the survey.

Construct	Items
<i>Usage Intention</i> (Venkatesh <i>et al.</i> , 2003)	UI1. I intend to use Open Banking in the future UI2. I predict I would use Open Banking in the future UI3. I plan to use Open Banking in the future
<i>Performance Expectancy</i> (Venkatesh <i>et al.</i> , 2003)	PE1. I expect to find Open Banking useful in my financial management PE2. Using Open Banking would enable me to accomplish financial tasks more quickly PE3. Using Open Banking would increase my efficiency in financial management PE4. If I would use Open Banking, I increase my chances of getting more competitive banking offers
<i>Effort Expectancy</i> (Venkatesh <i>et al.</i> , 2003)	EE1. I expect that my interaction with Open Banking would be clear and understandable EE2. I expect that it would be easy for me to become skillful at using Open Banking EE3. I expect that I would find Open Banking easy to use EE4. I expect that learning to use Open Banking would be easy for me
<i>Social Influence</i> (Oliveira <i>et al.</i> , 2014)	SI1. My friends and family would value the use of Open Banking SI2. I expect that the people that influence me would use Open Banking SI3. I expect that Open Banking would be trendy SI4. I expect that using Open Banking would make me look professional in managing my finances
<i>Initial Trust</i> (Kim <i>et al.</i> , 2009)	IT1. I expect that Open Banking would always provide accurate financial services IT2. I expect that Open Banking would provide reliable financial services IT3. I expect that Open Banking would always provide secure financial services
<i>Perceived Firm Reputation</i> (Kim <i>et al.</i> , 2009)	FR1. I expect that the financial data administrators (i.e. firms involve in providing and handling my financial data in the process) FR2. of Open Banking would have a good reputation FR3. I expect that the financial data administrators of Open Banking would be recognized widely FR4. I expect that the financial data administrators of Open Banking would offer good services
<i>Perceived Structural Assurance</i> (Kim <i>et al.</i> , 2009)	SA1. I expect that the financial data administrators of Open Banking would have a compensation policy for monetary losses that might occur during service usage SA2. I expect that the financial data administrators of Open Banking would have a policy on personal information SA3. I expect that the financial data administrators of Open Banking would have a policy on the protection of transaction data SA4. I expect that the financial data administrators of Open Banking would have a policy on customer protection from accidents
<i>Propensity to Trust</i> (Kim <i>et al.</i> , 2009)	PT1. I am cautious when using new technologies to manage my finances PT2. If possible, it is better to avoid using new technologies for managing my finances PT3. I have to be careful to use Open Banking until I see evidence of it being used by others
<i>Performance Risk</i> (Featherman and Pavlou, 2003)	PR1. Open Banking might not perform well and create problems with my accounts PR2. The security systems built into Open Banking are not strong enough to protect my accounts PR3. What is the likelihood that there will be something wrong with the performance of Open Banking or that it will not work properly? (Low/high functional risk) PR4. Considering the expected level of service performance of Open Banking, it would be ____ for me to sign up and use it. (Not risky at all/risky) PR5. Open Banking may not perform well and may process transactions incorrectly
<i>Financial Risk</i> (Featherman and Pavlou, 2003)	PR6. What are the chances that you stand to lose money if you use Open Banking? (Low/high chance) PR7. Signing up for and using Open Banking would lead to a financial loss for me PR8. Using Open Banking subjects my accounts to financial risk. (Improbable/probable)
<i>Privacy Risk</i> (Featherman and Pavlou, 2003)	PR9. What are the chances that using Open Banking will cause you to lose control over the privacy of your banking information? (Improbable/probable) PR10. Signing up for and using Open Banking would lead to a loss of privacy for me because my personal information would be used without my knowledge. (Improbable/probable)

**Table 1.**  
Constructs and  
measurement items

(continued)

Construct	Items
<i>Financial Literacy</i> (Allgood and Walstad, 2016) *correct answer	FL1. Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years how much do you think you would have in the account if you left the money to grow? (a) more than \$102*; (b) exactly \$102; (c) less than \$102 FL2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in the account? (a) more than today; (b) exactly the same; (c) less than today* FL3. If interest rates rise, what will typically happen to bond prices? (a) they will rise; (b) they will fall* (c) they will remain the same; (d) there is no relationship between bond prices and the interest rate FL4. A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less. (a) true*; (b) false FL5. Buying a single company's stock usually provides a safer return than a stock mutual fund. (a) true; (b) false*

Table 1.

## 5. Analysis and results

This research adopts the partial least squares structural equation modeling approach (PLS-SEM) using SmartPLS 3. SEM is suitable for this study which has a relatively complex model with multiple layers of causal relationships and latent constructs such as attitudes and intentions (Haenlein and Kaplan, 2004; Hair, 2017). Furthermore, PLS-SEM is used because this study is to explore structural relationships that can best explain and predict the dependent variable, and PLS-SEM seeks to maximize the explained variance of the dependent variable by adjusting the model parameters (Hair, 2017). This study follows the two-step approach in first assessing the measurement model and subsequently the structural model (Hair *et al.*, 2011).

### 5.1 Measurement model and reliability and validity

We conducted a confirmatory factor analysis (CFA) to assess the reliability and validity of the reflective model (Nusair and Hua, 2010). To accept item reliability, factor loadings should be above 0.70 (Benitez *et al.*, 2020; Hair *et al.*, 2011). Table 2 shows the CFA results. All items have good factor loadings with the majority above 0.80, except 3 items (SI3, PR1 and PR7). In case an item has a loading between 0.40 and 0.70, it should only be considered for removal if doing so leads to an increase in composite reliability (Hair *et al.*, 2011). Consequently, SI3 and PT1 are deleted from the scale. To assess construct reliability for PLS-SEM, composite reliability is argued to be more suitable than Cronbach's alpha, with values above 0.70 considered satisfactory (Hair *et al.*, 2011). All constructs show satisfactory results with composite reliability well above the 0.70 cut-offs.

For measurement validity, convergent validity and discriminant validity should be assessed (Benitez *et al.*, 2020; Hair *et al.*, 2011). An average variance extracted (AVE) value higher than 0.50 indicates sufficient convergent validity, meaning the latent variable is able to explain more than half of the indicators' variance (Benitez *et al.*, 2020; Fornell and Larcker, 1981). As shown in Table 3, the AVE of all constructs (the values on the diagonal) are well above 0.50, providing evidence of the convergent validity of the scales.

To assess discriminant validity, we use the Fornell-Larcker criterion, which posits that a latent variable should share more variance with its own construct's indicators than with other latent variables, and, therefore, the AVE of the construct should be higher than its squared correlation with other constructs (Fornell and Larcker, 1981). Another common assessment is to observe the cross-loadings, whereby an indicator should have higher loading with its own construct than with other constructs (Hair *et al.*, 2011; Henseler *et al.*, 2016). Tables 3 and 4 show that the measurement items have satisfactory discriminant validity.

	Factor loadings	p-value	Composite reliability		Item decision	Final loadings
			Original	Remove <0.7 items		
<i>Usage Intention</i>			0.975			
UI1	0.959	0.000				0.959
UI2	0.962	0.000				0.962
UI3	0.969	0.000				0.968
<i>Performance Expectancy</i>			0.95			
PE1	0.912	0.000				0.911
PE2	0.924	0.000				0.924
PE3	0.933	0.000				0.933
PE4	0.864	0.000				0.866
<i>Effort Expectancy</i>			0.951			
EE1	0.858	0.000				0.858
EE2	0.933	0.000				0.933
EE3	0.935	0.000				0.935
EE4	0.912	0.000				0.912
<i>Social Influence</i>			0.882	0.898		
SI1	0.854	0.000				0.873
SI2	0.861	0.000				0.87
SI3	0.658	0.000			Remove	
SI4	0.843	0.000				0.847
<i>Initial Trust</i>			0.962			
IT1	0.945	0.000				0.946
IT2	0.954	0.000				0.954
IT3	0.937	0.000				0.936
<i>Firm Reputation</i>			0.886			
FR1	0.914	0.000				0.914
FR2	0.87	0.000				0.87
FR3	0.92	0.000				0.92
<i>Structural Assurance</i>			0.886			
SA1	0.788	0.000				0.788
SA2	0.798	0.000				0.798
SA3	0.838	0.000				0.838
SA4	0.827	0.000				0.827
<i>Propensity to Trust</i>			0.807	0.839		
PT1	0.578	0.000			Remove	
PT2	0.913	0.000				0.925
PT3	0.776	0.000				0.771
<i>Perceived Risk</i>			0.943	0.937		
PR1	0.762	0.000				0.762
PR2	0.809	0.000				0.81
PR3	0.809	0.000				0.809
PR4	0.812	0.000				0.813
PR5	0.789	0.000				0.788
PR6	0.783	0.000				0.782
PR7	0.682	0.000			Retain	0.68
PR8	0.829	0.000				0.829
PR9	0.812	0.000				0.813
PR10	0.803	0.000				0.804

**Table 2.**  
Measurement model:  
construct reliability

	Effort expectancy	Firm reputation	Structural assurance	Initial trust	Perceived risk	Performance expectancy	Propensity to trust	Social influence	Usage intention
Effort Expectancy	0.91								
Firm Reputation	0.623	0.902							
Structural Assurance	0.433	0.52	0.813						
Initial Trust	0.622	0.791	0.497	0.946					
Perceived Risk	-0.476	-0.5	-0.289	-0.549	0.79				
Performance Expectancy	0.564	0.586	0.382	0.607	-0.467	0.909			
Propensity to Trust	0.392	0.269	0.189	0.306	-0.527	0.355	0.851		
Social Influence	0.528	0.62	0.324	0.613	-0.458	0.721	0.296	0.864	
Usage Intention	0.548	0.532	0.372	0.57	-0.466	0.817	0.403	0.67	0.963
<b>Note(s):</b> AVE (diagonal) should be greater than squared correlation for satisfactory convergent validity									

**Table 3.**  
Measurement model:  
convergent and  
discriminant validity



Table 4.  
Measurement model:  
item cross loadings

	Effort expectancy	Firm reputation	Structural assurance	Initial trust	Perceived risk	Performance expectancy	Propensity to trust	Social influence	Usage intention
EE1	0.858	0.652	0.434	0.634	-0.442	0.51	0.311	0.538	0.491
EE2	0.933	0.565	0.419	0.576	-0.446	0.536	0.371	0.482	0.524
EE3	0.935	0.539	0.364	0.537	-0.422	0.5	0.352	0.448	0.483
EE4	0.912	0.506	0.355	0.513	-0.419	0.503	0.392	0.452	0.493
FR1	0.55	0.914	0.478	0.744	-0.477	0.506	0.224	0.538	0.453
FR2	0.546	0.87	0.442	0.641	-0.379	0.517	0.27	0.538	0.479
FR3	0.588	0.92	0.483	0.747	-0.488	0.563	0.237	0.6	0.508
SA1	0.365	0.481	0.788	0.441	-0.274	0.353	0.152	0.307	0.334
SA2	0.386	0.391	0.798	0.351	-0.209	0.274	0.207	0.209	0.257
SA3	0.316	0.399	0.838	0.401	-0.245	0.318	0.163	0.255	0.316
SA4	0.344	0.41	0.827	0.411	-0.206	0.288	0.1	0.269	0.292
IT1	0.59	0.746	0.465	0.946	-0.504	0.568	0.299	0.572	0.518
IT2	0.553	0.737	0.493	0.955	-0.519	0.582	0.262	0.576	0.538
IT3	0.621	0.76	0.452	0.936	-0.534	0.57	0.307	0.591	0.56
PR1	-0.424	-0.386	-0.239	-0.47	0.762	-0.4	-0.469	-0.412	-0.399
PR2	-0.388	-0.37	-0.163	-0.465	0.81	-0.391	-0.456	-0.402	-0.43
PR3	-0.41	-0.441	-0.271	-0.451	0.809	-0.413	-0.38	-0.374	-0.39
PR4	-0.412	-0.469	-0.278	-0.475	0.813	-0.396	-0.417	-0.395	-0.406
PR5	-0.365	-0.333	-0.2	-0.385	0.788	-0.378	-0.429	-0.343	-0.361
PR6	-0.308	-0.34	-0.227	-0.389	0.782	-0.318	-0.413	-0.279	-0.301
PR7	-0.313	-0.361	-0.329	-0.361	0.68	-0.359	-0.365	-0.273	-0.319
PR8	-0.414	-0.389	-0.179	-0.423	0.829	-0.362	-0.481	-0.383	-0.387
PR9	-0.347	-0.433	-0.182	-0.443	0.813	-0.338	-0.356	-0.373	-0.336
PR10	-0.347	-0.413	-0.231	-0.448	0.804	-0.315	-0.377	-0.345	-0.324
PE1	0.535	0.52	0.328	0.549	-0.455	0.911	0.386	0.689	0.832
PE2	0.488	0.5	0.349	0.53	-0.41	0.924	0.315	0.63	0.717
PE3	0.509	0.524	0.338	0.544	-0.412	0.933	0.306	0.659	0.736
PE4	0.515	0.588	0.375	0.581	-0.417	0.866	0.276	0.64	0.675
PT1	0.415	0.287	0.258	0.313	-0.432	0.385	0.925	0.319	0.426
PT2	0.213	0.141	0.006	0.187	-0.499	0.178	0.771	0.153	0.22
SI1	0.507	0.572	0.327	0.543	-0.396	0.621	0.264	0.873	0.567

(continued)

	Effort expectancy	Firm reputation	Structural assurance	Initial trust	Perceived risk	Performance expectancy	Propensity to trust	Social influence	Usage intention
SI2	0.397	0.476	0.256	0.475	-0.373	0.583	0.254	0.87	0.579
SI4	0.462	0.555	0.255	0.566	-0.415	0.661	0.248	0.847	0.588
UI1	0.556	0.508	0.358	0.559	-0.453	0.78	0.4	0.628	0.959
UI2	0.511	0.504	0.361	0.535	-0.456	0.796	0.385	0.648	0.962
UI3	0.517	0.526	0.355	0.552	-0.438	0.785	0.379	0.66	0.968
Note(s): Items should have the highest loadings with their own construct for satisfactory discriminant validity									

Table 4.

5.2 Structural model and hypotheses testing

After assessing the measurement model, each hypothesis is tested by running the PLS algorithm and performing bootstrapping analyses. We assessed the structural model for its overall fit, coefficient of determination  $R^2$  and predictive power  $Q^2$  (Hair *et al.*, 2011; Henseler *et al.*, 2016). We use standardized root mean square (SRMR) for assessing model fit as it is considered the most appropriate index to identify model misspecification in our structural equation modeling setting (Benítez *et al.*, 2020; Henseler *et al.*, 2016; Hu and Bentler, 1998) [6]. The SRMR for our final model (Figure 2) is 0.084, indicating adequate model fit (Henseler *et al.*, 2016; Hu and Bentler, 1998). The adjusted  $R^2$  of the dependent variable usage intention is 0.695, indicating that 69.5% of the variance of usage intention can be explained by the relationships included in our model. This is a strong value (Benítez *et al.*, 2020; Hair *et al.*, 2011) and better than most models in prior technology adoption papers, which usually report an  $R^2$  in the 0.30 to 0.50 range. Lastly, the predictive power of the model,  $Q^2$ , is 0.611, which well exceeds the recommended benchmark of 0.35 (Hair, 2017).

The path coefficients and their significance for all hypotheses are summarized in Table 5. This table shows that all hypotheses are supported, except H5 and H11. Table 6 shows the direct and total effects of the different constructs on usage intention. In addition to the hypotheses, we observe the following findings. First, social influence has a strong effect on performance expectancy (0.518,  $p < 0.001$ ), which is in fact stronger than its direct effect on usage intention (0.13). When the indirect effect of mediation through performance expectancy is taken into account, its total effect becomes 0.465, making it the second most important factor to explain usage intention after performance expectancy. Second, given that initial trust is the third most important factor in terms of its total effect (0.273), we further investigated what drives initial trust to provide additional nuanced insights. Firm reputation, structural assurance and propensity to trust are all significant and firm reputation has a dominant effect of 0.619 to initial trust. Surprisingly, structural assurance does not play a role as important as expected (0.13). It implies that in the Open Banking context, firm reputation is more important than structural assurance (e.g. by government policy). Third, while the moderating hypotheses for financial literacy are rejected ( $p = 0.57$  for H11a and  $p = 0.11$  for H11b), further investigation of its relationship with initial trust shows that the path coefficient of financial literacy to initial trust is  $-0.099$  ( $p < 0.001$ ). In other words, financial

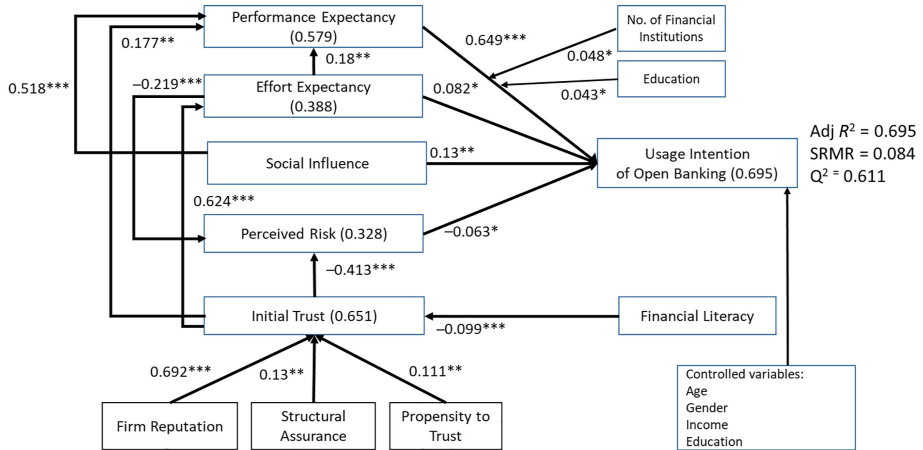


Figure 2.  
Final model

Note(s): \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , two-tailed test

Hypothesis	Conclusion	Path coefficient	Open banking adoption
H1 Performance expectancy positively influences usage intention	Supported	0.649***	<div>903</div> <div> <b>Table 5.</b>  Structural model:  hypothesis testing  results </div>
H2 Effort expectancy positively influences usage intention	Supported	0.082**	
H3 Social influence positively influences usage intention	Supported	0.13**	
H4 Perceived risk negatively influences usage intention	Supported	−0.063*	
H5 Initial trust positively influences usage intention	Not supported		
H6 Initial trust negatively influences perceived risk	Supported	−0.413***	
H7 Initial trust positively influences performance expectancy	Supported	0.177**	
H8 Initial trust positively influences effort expectancy	Supported	0.624***	
H9 Effort expectancy negatively influences perceived risk	Supported	−0.219***	
H10 Effort expectancy positively influences performance expectancy	Supported	0.18**	
H11a Financial literacy is a moderator to the relationship of H1	Not supported		
H11b Financial literacy is a moderator to the relationship of H2	Not supported		
<b>Note(s):</b> * <i>p</i> -value < 0.05, ** <i>p</i> -value < 0.01, *** <i>p</i> -value < 0.001, two-tailed test			

	Direct effect	Total effect	<b>Table 6.</b> Structural model: direct and total effect of key constructs on usage intention
Performance Expectancy	0.649	0.649	
Social Influence	0.13	0.465	
Initial Trust		0.273	
Effort Expectancy	0.082	0.213	
Firm Reputation		0.189	
Structural Assurance		0.035	
Propensity to Trust		0.03	
Financial Literacy		−0.027	
Perceived Risk	−0.063	−0.063	

literacy has a direct, negative effect on initial trust. To verify whether the magnitude of this effect is substantial, we review its effect size  $f^2$ . The  $f^2$  of this path is 0.027, which is greater than 0.02, indicating that the effect is of practical relevance (Benitez *et al.*, 2020; Henseler *et al.*, 2016). Thus, the more financial knowledge one has in terms of financial literacy, the more skeptical one is and the lower the initial trust towards Open Banking.

### 5.3 Other moderating effects

We also tested the moderators from the original UTAUT model, age and gender, but they were not significant. We also gathered demographic information including consumers' level of education, annual income and banking relationships. We find that education and the number of financial institution relationships moderate the effect of performance expectancy on usage intention. That is, people with higher education and more diversified banking needs are more prone to use Open Banking than others given the same level of performance expectancy. The latter echoes the design intention of Open Banking, which is to facilitate comparing and switching financial institution products and offers. Table 7 summarizes these additional findings.

## 6. Discussion of results

Our evidence offers strong support for the conceptual model with only 2 out of 11 hypotheses not being supported by the data, namely, initial trust as a direct antecedent to usage intention, and financial literacy as a moderator to performance expectancy and effort expectancy on usage intention. Figure 2 presents the final model.

Our findings suggest that the four theories applied – UTAUT, initial trust, perceived risk and financial literacy – are all relevant in explaining the usage intention of Open Banking. We find that the UTAUT constructs of performance expectancy, effort expectancy and social influence are significant influencers of consumers’ usage intention, with performance expectancy being the predominant driver. In contrast to most UTAUT studies, which usually show some but not all factors are significant, these results suggest that as Open Banking is new, consumers form their judgment based on multiple factors to make an informed decision, even though they still largely rely on the rational, utilitarian justification of performance expectancy.

Besides, our confirmed hypotheses in the conceptual model provide new insights below. First, the less discussed effects of effort expectancy on performance expectancy and perceived risk are revealed. On the one hand, effort expectancy can strengthen performance expectancy (the easier to use, the more useful the technology will be perceived). On the other hand, effort expectancy can reduce perceived risk (if the technology is easy to use, it will mitigate some of the uncertainties users face) which in turn increases adoption intention. The positive effect of effort expectancy on performance expectancy is not established in the original UTAUT model but echoes a few prior mobile banking and Internet banking studies (Alalwan *et al.*, 2017; Kesharwani and Singh Bisht, 2012; Pavlou, 2003; Zhou *et al.*, 2010). However, the effect of effort expectancy being able to reduce perceived risk is scarcely discussed in the literature (Martins *et al.*, 2014) and the result of this study thus reinforces this novel relationship which is particularly relevant for financial technology adoption.

The more remarkable total (0.213) than direct effect (0.082) of effort expectancy implies that its implications should be considered in totality on multiple facets. Nowadays, an average smartphone owner uses 30 apps per month relating to many aspects of their daily life (Blair, 2019). It is expected that apps will be simple to use and the interaction to be user-oriented (Hamilton, 2019). When ease of use is taken for granted, effort expectancy may become low or significant (Baptista and Oliveira, 2015). While the previous literature focuses on the direct effect of effort expectancy, this study suggests that its total effect should be taken into consideration. Indeed, as our results show, effort expectancy may have a less direct impact on usage intention but its influence is through increasing performance expectancy and lowering perceived risk. In other words, making a financial innovation easy to use will also make it to be perceived as more useful and less risky.

With regards to perceived risk, we hypothesized it has a negative influence on usage intention. While this relationship is confirmed, its influence is relatively minor and can be alleviated by effort expectancy and initial trust. Open Banking performs financial functions that critically rely on the exchange of personal financial data, so the relatively mild impact of perceived risk on the adoption intention found in this study is somewhat unexpected. The results in our research show the adoption decision of Open Banking by Australians is only modestly influenced by their perceived risk of this financial innovation. As empirical evidence shows perceived risk can be influenced by factors like culture and market contexts

**Table 7.**  
Structural model:  
additional findings

Result	Path coefficient
Financial literacy is a direct antecedent to initial trust	−0.099***
Social influence is a direct antecedent to performance expectancy	0.518***
Firm reputation is a direct antecedent to initial trust	0.692***
Structural assurance is a direct antecedent to initial trust	0.13**
Propensity to trust is a direct antecedent to initial trust	0.111**
Education is a moderator to performance expectancy on usage intention	0.043*
Number of financial institutions is a moderator to performance expectancy on usage intention	0.048*
<b>Note(s):</b> * <i>p</i> -value < 0.05, ** <i>p</i> -value < 0.01, *** <i>p</i> -value < 0.001, two-tailed test	

(Park and Jun 2003; Zhao *et al.*, 2008), we suggest that the low impact of the perceived risk should not be taken as universal but revalidated in different markets.

We hypothesized initial trust will have a direct positive impact on usage intention but the relationship is not supported. Rather, its effect acts more strongly through another hypothesized mediating relationship, that is, through offsetting perceived risk to influence usage intention. As revealed in the literature review, past studies have not reached a univocal conclusion on the relationship between trust, risk and usage intention. The directionality of initial trust to a perceived risk that we identify builds on earlier seminal work (Mitchell, 1999; Pavlou, 2003) and provides a strong case that future adoption studies should investigate along with this notion. Indeed, the multi-faceted influence of initial trust makes it the third most important construct to explain usage intention in terms of total effect in our study.

In addition to the hypotheses validated, we found two new insightful relationships. The first one pertains to the mediating effect of performance expectancy between social influence and consumers' intention to use Open Banking. Some prior research argues that social influence works on the basis of observability and therefore it would be effective for some financial decisions (e.g. charity giving programs) but not others (e.g. retirement savings and insurance purchase) (Lieber and Skimmyhorn, 2018). Financial technology adoption is regarded as being of a private nature and many past adoption studies show social influence is not a significant factor (Alalwan *et al.*, 2017; Baptista and Oliveira, 2015; Oliveira *et al.*, 2014; Sarfaraz, 2017). Some also expect that the more developed a society, the less social influence plays a role due to social parity (Baptista and Oliveira, 2015). Our findings indicate that social influence plays an important role but rather than through a direct impact on usage intention, it influences performance expectancy. Given that the traditional UTAUT model solely posits social influence as a direct determinant of usage intention, prior literature also only investigates this notion of a direct relationship. The findings of this study suggest that the impact of social influence could have been underestimated if only the direct rather than the total effect is investigated. Only one prior Internet banking adoption study examined an effect of social influence on performance expectancy (Kesharwani and Singh Bisht, 2012). It explains social influence is of informational (as opposed to normative) nature, which is to accept information from another as evidence about reality. The strength of the effect of social influence on performance expectancy in our research confirms and strongly supports an informational, signaling effect – consumers will tend to adopt an innovation not simply because they see others using it, but because usage by many others signals that they might be achieving benefits such as performance improvement outcomes, which in turn influences usage intention.

The second new insightful finding is that financial literacy negatively affects initial trust. An earlier study finds that financial literacy affects the perceived helpfulness of personal financial blogs (Hoffmann and Otteby, 2018), suggesting that financial literacy plays a role in forming one's perception toward external information. While we have found no evidence in published adoption research looking into the role of financial literacy on adoption or usage intention, our results echo those previous related findings in a way that financial literacy affects people's trust toward Open Banking. When one is more financially literate, one tends to be more skeptical about Open Banking which in turn undermines initial trust. This finding offers a fresh perspective on both the role of financial literacy and the influencing factors of initial trust in innovation adoption.

## 7. Research implications

### 7.1 Theoretical implications

This research extends the application of UTAUT by including additional relevant constructs to explain the adoption of Open Banking, an emergent, exemplar “FinTech” innovation. Specifically, our contribution is providing a comprehensive and integrated model for



explaining the key factors influencing consumers' usage intention of Open Banking. We argued that UTAUT originated from an organizational IS context and that we needed to consider other relevant factors that reflect the specifics of Open Banking and the context in which it operates. We adopted relevant constructs including perceived risk, initial trust and financial literacy to synthesize an integrated model. The integrated model has high explanatory and predictive power and it has offered new insights.

We find that all three UTAUT constructs satisfactorily explain usage intention and reinforce that they are useful in explaining financial technology adoption and should continue to be considered as core attributes in future research. We also discover that the constructs have interesting, interactive relationships that extend prior studies. We discussed earlier that the role of social influence might have been underestimated if not taking the mediation effect into consideration and effort expectancy plays multiple effects on reducing perceived risk and increasing performance expectancy. These interactions provide new thoughts and paths for researchers to consider in future work. Moreover, we argue that perceived risk and initial trust should be an integral part of technology adoption studies. Consumers increasingly note risk concerns when it comes to new financial technology. The global financial crisis and negative incidents in its aftermath contributed to feelings of consumer distrust. Our findings suggest that while both risk and trust are important but separate considerations, initial trust reduces perceived risk in affecting usage intention.

Furthermore, this study widens technology adoption understanding by including a new, cross-disciplinary financial perspective and demonstrating it has an effect on financial technology adoption. While financial literacy has been of wide interest in various financial behavior studies, it receives rare (if any) consideration in technology adoptions which may lead to a change in financial behavior. The results of our study show that financial literacy plays a role in reducing initial trust which in turn is an important factor in adopting Open Banking.

In sum, our research has provided an integrated, holistic model for explaining and predicting Open Banking adoption by individual consumers. The model also offers new insights pertaining to the interaction of key factors. Given the emergence of new consumer-driven technologies, the value of our study lies in extending an existing theory towards more complex financial technology settings, and the identification of some new interesting relationships also provides good directions for future research.

## *7.2 Practical implications*

For practical implications, we provide actionable insights to different stakeholders in the banking industry that might be considering participating in Open Banking implementations, as well as to clarify some emergent opportunities and pitfalls. Our research helps business managers make informed decisions on entry strategies – their first priority should be to make a compelling value proposition (performance expectancy) as to the benefits for consumers of using Open Banking. A clear case should be built for easy articulation, given that social influence has a large effect on performance expectancy. While initial trust is generally understood to be important to consumers, the critical point is it is primarily driven by firm reputation rather than structural assurance, meaning that trusted brands are likely to have a marketplace advantage. After the global financial crisis, customers' trust towards banks is decreasing, while trust towards technology firms is increasing (Arner *et al.*, 2016; Deloitte, 2019). Firms should examine and understand consumers' trust levels and leverage their reputations. Less-recognized brands may compete by focusing on outperforming established providers on the attributes that make people excited to share in their social networks, overcoming their brand disadvantage.

To marketers of Open Banking, our results challenge the traditional perception of social influence being less important for inducing usage of financial services due to their private

nature. On the contrary, our results suggest that marketers should largely leverage social influence to help advocate and promote the benefits of Open Banking. Another positive finding is that perceived risk is not as critical in deterring people from using Open Banking as expected and, in fact, can be offset by the trust. Therefore, marketers can also leverage their brands as trusted brands to induce consumer trials. In terms of targeting, the findings from our research show that consumers' age, income and gender play no significant role in Open Banking adoption. This finding contradicts the industry belief that Open Banking appeals to the higher income group (Swinton and Roma, 2018). To attract early adopters, those with higher education and multiple financial institution relationships should be targeted. However, this group is also likely to be financially literate, and they may be less inclined to trust the new Open Banking players. It means more effort is required to convince and build trust with this consumer segment.

For Open Banking developers, it is advisable that they pay attention to consumers' effort expectancy. Effort expectancy has positive effects on performance expectancy and can reduce perceived risk. The strong overall effect of this construct means that its importance cannot be understated. Accordingly, technical developers should therefore strive to make Open Banking APIs useable, intuitive and self-guided. If learning to use Open Banking takes less effort and the interaction is seamless, consumers will likely view it as more useful and less risky, stimulating their adoption intentions.

Lastly, different governments embrace different philosophies in driving and regulating Open Banking. Some believe that a centralized, regulatory-driven approach will provide trust and protection to consumers which will help adoption, while others see a decentralized, market-driven approach will provide more flexibility to the market and speed up adoption (EMEA Center for Regulatory Strategy, 2021). The findings from this study suggest that the centralized approach of providing an accredited list of Open Banking providers could be more advantaged, as it may contribute towards building initial trust by enhancing firm reputation. At the same time, the centralized approach of applying a standardized technical standard can enhance interoperability, an element important for data exchange (Charalabidis *et al.*, 2018) and can stimulate effort expectancy in facilitating consumer adoption of Open Banking.

## 8. Limitations and future research

Like all research, this study has some limitations which provide avenues for future research. First, given the relative absence of Open Banking products in the current financial marketplace, we focused on consumers' perceptions of Open Banking as a concept rather than their actual experience. Our survey required consumers' comprehension and possibly some imagination of how Open Banking works. There is no real product to show to respondents, although various measures have been used to aid their understanding, such as the aforementioned information screens when respondents start the survey. When Open Banking is available in the market to consumers, future research can use experiments to present to consumers a real Open Banking setting and draw findings on actual interaction experiences in a service ecosystem.

Second, in our survey, Open Banking is presented as an independent, standalone concept. In reality, it will mostly work as an integral part of a financial services ecosystem comprising of different parties and interactions. For example, a neobank (i.e. online-only bank) can partner with an Open Banking provider in approaching new customers. Once a customer provides consent, the neobank can access their financial information, then tailor and compare an offer with their current banks to facilitate a product decision and account switching. In this process, Open Banking is working transparently behind the scenes without the need to flag the identity of Open Banking. As such, how Open Banking exists in the ecosystem could alter the adoption intention as compared to purely a concept on its own.

Third, the dataset used in this study was collected from Australian participants. Accordingly, the findings may be transferable to other developed countries that are similar to Australia in terms of banking industry, consumer protection legislation and consumer education levels including financial literacy, adoption trends of online banking products and services and national culture. Nonetheless, researchers and practitioners must be cautious when generalizing the findings of this study to other countries/regions that are not of similar economical and industrial settings. Further research is needed to validate our findings in other countries and jurisdictions.

### Notes

1. Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC [2016] OJ L 119/1. Available: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679>
2. Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on Payment Services in the Internal Market, Amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010 and repealing Directive 2007/64/EC, 2015 O.J. (L 337) 35. Available: [https://ec.europa.eu/info/law/payment-services-psd-2-directive-eu-2015-2366\\_en](https://ec.europa.eu/info/law/payment-services-psd-2-directive-eu-2015-2366_en)
3. To exemplify, the operationalization of Open Banking calls for the involvement of new actors such as account servicing payment service providers (AISPs) and payment initiation service providers (PISPs) who use their specific technologies to facilitate payment processes. New actors, technologies and processes open up possibilities for new vulnerabilities and points of failure and exposure to fraud (Mansfield-Devine, 2016).
4. “RegTech” refers to technology developed for industry to address regulatory challenges. “SupTech” describes the use of technology by supervisory and regulatory agencies to improve efficiency in their duties overseeing the industry.
5. Participants under 18 were not targeted in this research and therefore not included in this sample, because they are considered minors and cannot open a bank account in their own names in Australia. Similarly, participants over 65 were not targeted and therefore not included in our sample as they are classified as elderly in Australia and banks must take extra care in introducing services (including technology) to them (Australian Banking Association, 2020).
6. While NFI and CFI have been traditionally applied as model fit indicators for regression models, they have been evaluated along the evolvement of PLS-SEM with some deficiencies identified and SRMR is therefore preferred.

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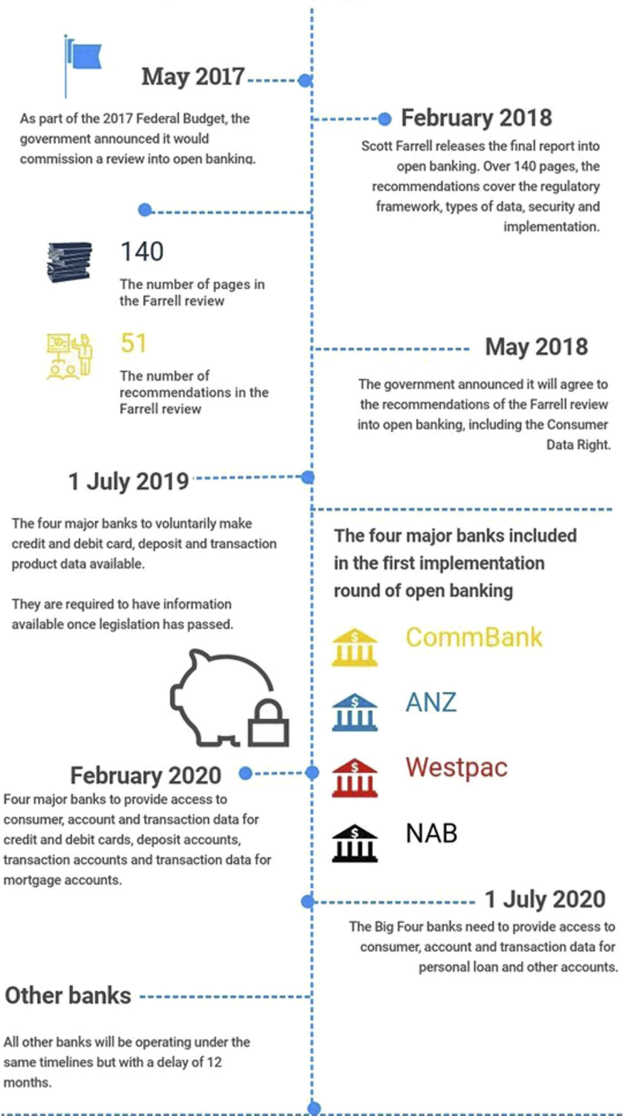
## Appendix 1

### Open Banking Introduction in Questionnaire

Open Banking is a financial service innovation enabled by a technology that allows the exchange of information between different parties. It comes as an app useable on computers or smartphones. Please read the information below. (Source: [www.finder.com.au/open-banking](http://www.finder.com.au/open-banking), by Elizabeth Barry. Last updated: 6 August 2019).

# Open Banking in Australia

Our financial system is changing, here is how and when.





## What products are included in open banking?

- Savings accounts
- Call accounts
- Term deposits
- Current accounts
- Cheque accounts
- Debit card accounts
- Transaction accounts
- Personal basic accounts
- GST and tax accounts
- Cash management accounts
- Farm management accounts
- Pensioner deeming accounts
- Mortgages
- Business finance
- Personal loans
- Lines of credit
- Overdrafts
- Consumer leases
- Credit and charge cards
- Asset finance and leases
- Mortgage offset accounts
- Trust accounts
- Retirement savings accounts
- Foreign currency accounts

For the latest on open banking  
[finder.com.au/fintech](https://finder.com.au/fintech)

## Which organisations can I send my data to and from?

Authorised deposit-taking institutions (banks) will be automatically included in open banking. Other companies able to receive and hold data will need to be authorised in order to accept and hold data through open banking. This is so they adhere to the security standards set by the government.

## What's an example of how open banking will work?

There are myriad possibilities for open banking. One is signing up for a new product. Right now, it's easier to sign up for a product such as a loan or credit card with your current bank because they have all of your transaction history and identification documents in their system. With open banking, you will be able to direct that your bank sends that information to any bank or lender so that signing up for a new product will be just as easy anywhere.

## How much will open banking cost me?

Open banking will be free for all consumers.

## Is sharing my financial data safe?

Safety has been the main concern of the open banking debate. Financial institutions and other companies that participate in open banking will need to adhere to strict security standards when accessing and storing your data and will be subject to the privacy act. These organisations will also only be able to access your data at your request and do what you want with it.

## When is open banking happening in Australia?

Open banking [began on 1 July 2019](#). This is the date the Big Four banks – CommBank, NAB, ANZ and Westpac – started to provide data for beta testing of the system. You will be able to access transaction account, credit and debit card, deposit account and mortgage account data from February 2020. You can see the timeline above for other types of data and when the other banks are required to provide access.

## Is Australia the only country to do it?

No. The UK has mandated open banking, with the sharing of customer and transaction data via open APIs having been in operation since 1 January 2018.

The European Union has also mandated open banking, with payment initiation and account data retrieval by third parties having come in effect in May 2018.

Various other countries, including the US and Singapore, are taking steps towards open banking, data sharing and open APIs.

Appendix 2

Screening Questions

Question 1: Which of the following is true about Open Banking?

- (1) Open Banking is a bank
- (2) Open Banking is a financial innovation that allows the exchange of your banking information between different parties (correct answer)
- (3) Open Banking is a payment system that facilitates transfer between different banks
- (4) None of the above

Question 2: How could you use Open Banking?

- (1) Your bank will inform you to participate via their website
- (2) Any technology company can provide the service to you. You sign up and the technology company will automatically retrieve the data from your banks
- (3) You download an app from an accredited provider, then give consent to release your banking data to operate on Open Banking (correct answer)
- (4) None of the above

Appendix 3

	%
<i>Age</i>	
18–24 years	15.4
25–34 years	24.3
35–44 years	21.1
45–54 years	21.7
55–64 years	17.5
<i>Gender</i>	
Female	51.8
Male	47.8
Others	0.4
<i>Education</i>	
High school degree	22.4
Some college	35.7
Degree/associate degree	32.5
Post-graduate degree	9.4
<i>Annual income (AUD) (before tax)</i>	
<=\$18,200	19.3
\$18,201 – \$37,000	22.1
\$37,001 – \$90,000	39.7
\$90,001 – \$180,000	16.4
=>\$180,001	2.4
<i>No. of financial institution relationships</i>	
1	43.4
2	31.8
3	17.1
4	5.3
5	1.3
<i>Total no. of bank accounts currently owned</i>	
<=6	18.2
7	18.2
8	22.4
9	15.4
=>10	25.9

Table A1.  
Participants' socio-  
demographic profile

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