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Faber, Roel; de Reuver, Mark

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CONSUMER STUDIES ON DIGITAL PLATFORMS ADOPTION AND CONTINUANCE: A STRUCTURED LITERATURE REVIEW

Research paper

Roel Faber, Delft University of Technology, Delft, Netherlands, roelmfaber@gmail.com

Mark de Reuver, Delft University of Technology, Delft, Netherlands, g.a.dereuver@tudelft.nl

Abstract

As digital platforms have become the locus of competition and innovation in the digital economy, it is imperative to understand consumer decisions on adoption and usage. Digital platforms have unique traits, as they are extensible and often mediate between users. These traits may require understandings to move beyond generic (post-)adoption theories. This paper reviews the rapidly growing body of empirical consumer studies on digital platforms in order to identify emerging trends in this field. After a structured literature review, we conduct a network analysis using the hypotheses that are supported in the papers. We find a wide variety of over 130 concepts is considered. Factors from generic (post-)adoption theories are often studied, alongside factors related to the concept of network effects. We find differences between the importance of direct, indirect, local and global network effects. We find that studies pay relatively little attention to characteristics that arise from the extensibility of digital platforms, such as openness, control, security and privacy. We posit that IS researchers have the important task of opening up this black box of digital platform characteristics and theorize how notions of extensibility and generativity affect consumer decisions, going beyond mainstream theories on adoption and continuance.

Keywords: Digital platforms, Adoption, Network effects, Multi-sided platforms, Continuance

1 Introduction

Digital and multi-sided platforms have become a mainstream research topic in information systems (IS) (De Reuver, Sorensen and Basole 2018; Constantinides, Henfridsson & Parker 2018). Competition and innovation increasingly revolves around digital platforms, in industries ranging from gaming and mobile applications to payment and social media. By their nature, many platform markets tend to become monopolies and oligopolies (Economides and Flyer 1997; Gawer and Cusumano 2008). Once massively adopted platforms often provide lucrative rents to their providers, evidenced by the fact that the five most valuable firms in the world all provide digital platforms. Hence for understanding competition and innovation in the digital economy, it is crucial to study how consumers make decisions regarding their adoption and continued use of digital platforms.

While adoption and continuance research in IS has a long history (e.g. Davis 1985), digital platforms are a distinct class of digital artefacts in at least two theoretically important ways (cf., De Reuver et al 2018). First, digital platforms often *mediate* between users: they mediate between consumers (e.g. social media) or between consumers and third parties (e.g. game consoles). Consequently, the value of platforms for users depends on the number of users, which is referred to as network effects (Katz and Shapiro 1985). Second, a specific sub-class of digital platforms are *extensible* software systems (e.g. operating systems) on which third parties can develop complementary offerings (e.g. mobile apps) (Tiwana, Konsynski & Bush 2010). For extensible platforms, consumer value depends on the openness of a platform towards third party complements (Ondrus, Gannamaneni & Lyytinen 2015). As extensible platforms also enable low-quality complements, value for consumers also likely depends on control mechanisms (Wareham, Fox & Cano Giner 2013) and privacy and security assurances (Nikou, De Reuver and Bouwman 2012). We argue that, because of the mediating role and extensibility of digital platforms, understanding consumer decisions requires going beyond generic adoption factors.

The goal of this paper is to explore which types of factors are being considered in empirical consumer studies on digital platforms. Based on the work on platforms cited above our hypothesis is that to be successful in explaining consumer decisions, studies need to move beyond generic adoption factors (e.g. perceived usefulness, perceived behavioural control, quality) and include factors related to network effects as well as openness, control, privacy and security of digital platforms. We conduct a structured literature review on empirical consumer studies of digital platforms (Vom Brocke et al. 2009), and analyse the hypotheses in these papers through a network analysis approach (Van de Wijnngaert, Bouwman and Contractor 2014). A comprehensive structured literature review on adoption and continuance factors for digital platforms is not yet available in the literature, even though the base of empirical papers is growing rapidly. Existing literature reviews and meta-analyses are either limited to specific adoption factors (Wang, Min and Han 2016; Babić Rosario et al. 2016) or specific sub-types of digital platforms (Connolly et al 2012; Coursaris and Kim 2011).

Scoping our research is challenging since digital platforms come in many forms and definitions (De Reuver et al 2018). We focus on platforms that are mediating between users and/or extensible. A mediating platform facilitates interactions within or between user groups, whereas an extensible platform provides the codebase and associated organizational processes and standards, which allow adding complementary third-party modules (De Reuver et al 2018). Within the scope of our study, platforms are included that are mediating (e.g. social networks), extensible (e.g. operating systems) or both (e.g. operating systems with app stores). We focus exclusively on consumers; hence complementors (e.g. app developers) are outside our scope.

Section 2 provides a concise theoretical background on adoption and continuance theories, network effects and extensibility. Section 3 details the method of our structured literature review and network analysis. Section 4 provides the descriptive results, followed by a network analysis on the hypotheses which can be found in Section 5. The findings are discussed in Section 6, followed by conclusions in Section 7.

2 Background

This section provides a short background on adoption and continuance theories, network effects and digital platforms. Each of these topics could be discussed in a review article by itself. Here, we limit ourselves to discussing those core concepts and theories that are required for interpreting the results of our structured literature review.

2.1 Adoption and continuance theories

Models of the adoption or acceptance of technology have been proposed, studied, re-examined and critiqued for decades (e.g. Benbasat and Barki 2007). One family of models has been particularly influential: the Theory of Reasoned Action (TRA, Fishbein and Ajzen 1975) and its two extensions: the Theory of Planned Behavior (TPB, Ajzen 1985), and the Technology Acceptance Model (TAM, Davis 1985). TRA, TPB and TAM all build upon concepts from psychology, and explain actual behaviour as a consequence from intentions. In TRA, behavioural intention depends on behavioural and normative beliefs, which in turn depend on external variables (Fishbein and Ajzen 1975; Ajzen 1985). TPB extends TRA by adding the concept of behavioural control (Madden, Ellen and Ajzen 1992). TAM specifies these theories to the information systems domain, adding perceived usefulness and perceived ease of use as determinants of attitude and behavioural intention (Davis 1985; Davis, Bagozzi and Warshaw 1989). Besides these three models, the UTAUT model has been proposed as a more comprehensive explanatory model (Venkatesh, Thong and Xu 2012).

For studies on why people continue to use digital artefacts, expectation-confirmation theory (ECT) is often used as a basis (Bhattacharjee 2001).

Adoption and continuance theories have been critiqued (Turner et al 2010; Legris, Ingham and Collette 2003) and the many extensions have had different degrees of success (Marangunić and Granić 2015). One main point of critique is that contextual factors should be taken into account (Turner et al 2010) and that the technology characteristics should be explicitly considered (Orlikowski and Iacono 2001). A main thrust of this paper is to examine to which extent concepts from generic adoption theories dominate the literature on consumers and digital platforms.

2.2 Network effects

Platforms often mediate between users, either in the same user group (e.g. social media) or different user groups (e.g. operating systems). Network effects occur when an increasing number of users directly or indirectly increases the utility of a platform (Katz and Shapiro 1985). Because of network effects, platforms need to attain a critical mass of users before they create sufficient added value (Evans and Schmalensee 2010). Today, considerable debate persists in marketing and strategy literature on the relative importance of attaining network effects, for instance as compared to product quality (McIntyre and Srinivasan, 2017). One determining factor is the degree of compatibility: if a platform is compatible with that of competitors, the user base of the whole industry creates network effects, which makes the installed base of the focal platform less important (Katz and Shapiro 1985).

Different types of network effects can be distinguished. Direct network effects occur between users of the same user group (e.g. consumers on social media), while indirect network effects stem from interactions between different user groups (e.g. developers and users of apps on an app store) (Clements 2004). Indirect effects result from complementary relations between the two sides of the network (Birke 2009). Network effects depend on the network size, i.e. the installed base of users. Yet, not all network effects are created equal. First, the subset of users close to the focal user create local network effects, which may be more important than global network effects (Sundararajan 2007; Katona, Zubcsek and Sarvary 2011). Second, certain users may create disproportionately large network effects, such as the producers of popular games on a gaming platform, referred to as marquee users (Eisenmann, Parker and Van Alstyne 2006). Both phenomena attest to the importance of the structure of a network, alongside its size.

2.3 Extensibility and openness, control, privacy and security

Digital platforms are comprised of an extensible codebase to which complementary modules can be added (Tiwana et al 2010). Inherent in this definition is the notion that digital platforms are editable and open (cf. Kallinikos, Aaltonen and Marton 2013), which creates generativity (Zittrain 2006). Generative platforms allow third parties to create add-on modules with functionality unanticipated by the platform provider (Tilson, Lyytinen and Sorensen 2010; Yoo et al 2010).

The openness of platforms may affect consumer decisions, as open platforms attract a greater diversity and volume of complementors (Ondrus et al 2015; Nikou et al 2014). Openness is generally the extent to which there are no restrictions for third parties to access the resources of a platform (West 2003; Karhu, Gustafsson and Lyytinen 2018). Yet, openness also creates risks of low-quality complements which may deter users (Boudreau 2010). Such low-quality or malicious complements may create risks that negatively affect adoption and continuance, such as privacy and security risks.

3 Method

Our structured literature review starts by following the recommendations for collecting and classifying papers in Webster and Watson (2002) and Vom Brocke et al. (2009). Next, we focus on the hypotheses and concepts used in these papers, following a network analysis approach proposed by Van de Wijngaert et al (2014). The network analysis approach allows uncovering patterns in the hypotheses posed and tested in the papers. Through co-membership analysis, we can further uncover clusters of theoretical concepts, and examine whether these reflect the theoretical streams discussed in Section 2.

3.1 Data collection

The main database for our literature review is Google Scholar, which covers a broader array of sources than controlled databases such as Web of Science and Scopus. Being aware of the concerns over indexing in Google Scholar (Halevi, Moed and Bar-Ilan 2017), we reran our search query in Scopus, which did not yield additional results.

We selected papers based on three decision criteria. First, we only included papers focusing on consumers. Hence, we excluded papers studying complementors decisions (e.g. app developers). Second, we only included papers that focused on digital platforms. Specifically, we required that the artefact studied should be extensible with complementary offerings and/or mediate between or within user groups. Third, since our purpose is to analyse the empirically tested hypotheses in the papers, we only consider studies with explicit hypotheses and an empirical component. For instance, purely conceptual papers without empirical tests were omitted. Papers with simulation models are included, as long as these are informed by or validated with empirical data; however, we did not encounter any simulation studies in the papers.

We tried out multiple keywords in our search strings. While we focus on digital platforms in general, several authors do not use these terms explicitly, but rather cover sub-types of platforms such as social media or app stores. Therefore, we adopted the main sub-types of digital platforms within our keywords. Given that we are specifically interested in security and privacy, which are concerns resulting from the extensibility of digital platforms, we add these terms to the search string. We used the following search query: *(Digital Platform) (Network effects Externalities "Critical Mass" Compatibility Complementarity) AND (Security Privacy) AND empirical AND (Consumer Customer adoption use acceptance) ("Social Network" OR "App Store" OR "Game Console" OR "Payment platform")*

The query was run in August 2018 and returned 349 hits. Since quality of Google Scholar sources may vary (Halive et al 2017), we only retained papers in peer-reviewed journals and conferences. Doctoral dissertations were screened on contents and details of the methods reported, to decide upon eligibility. While screening the papers, first the title was examined. When the title appeared to meet our three selection criteria, the abstract was accessed online. When the abstract sufficed our selection criteria as

well, the full paper was downloaded. The retained papers were read in full, once more assuring our selection criteria were met. In total, 27 papers were retained. A subset of the 322 papers that were not selected addressed digital artefacts that do not suffice our criteria of digital platforms (i.e. being either extensible or mediating between users). Another subset was excluded since there was no clear empirical component in the paper. Next, snowballing was applied in two ways: papers were added that were either (1) indicated to be 'related' by either Google Scholar or the publisher's website or (2) cited or citing the focal papers. The added papers were screened in the same manner as the initially found papers, upon which a second round of snowballing was done with the same procedure. This process led to a final sample of 67 papers.

We created two databases. In the first database, the unit of analysis is the papers. We extracted information for each paper on year of publication, type of outlet, author names and citation counts. In addition, content-related information was added for each paper: theories used, research method, instrument, digital platform type studied, country of data collection and sample size. A second database was created with the hypotheses as unit of analysis. The hypotheses were extracted from the papers, including the strength and significance per hypothesis tested. This resulted in a database with 645 hypotheses posed, of which 517 were supported.

3.2 Network analysis approach

A hypothesis network was created following the steps in Van de Wijngaert et al (2014). Their approach is especially attractive in visualizing and analysing large sets of hypotheses in an exploratory way. The base unit of analysis is a hypothesis that directly relates two concepts. Hypotheses are represented as edges in the network, with the independent variable as source and the dependent variable as receiver. Only supported hypotheses are included in the network analysis.

An important step is homogenizing concepts that are labelled slightly differently across studies. Homogenisation was done by carefully considering definitions and the way concepts are used. For instance, subjective norms and social norms were combined under one label as the given definitions in the papers are very similar. The resulting hypothesis network is analysed through network analysis statistics. Besides the occurrence of nodes, which indicates the prevalence of certain concepts, network metrics such as in-degree and out-degree were computed to examine whether concepts are used as independent, dependent or mediating variables.

As an extension of the method in Van de Wijngaert et al (2014), we construct a co-membership network. Co-membership networks are useful for identifying subgroups in a network, for instance by considering the relative frequency of ties among members compared to non-members (Wasserman and Faust 1994). In our case, the co-membership network contains undirected ties between concepts that are used in the same paper. In this way, we can elicit relatively cohesive groups of concepts that are often used together in papers, which can point out patterns in the literature.

4 Descriptive results

4.1 Background characteristics of papers

The two oldest papers in our sample date from 2002 and 2006. Starting in 2009, a gradual increase can be seen from 2-3 papers per year until 8 papers per year in 2013. This number has been stable in the period 2013-2018.

Most papers study platform users in Asia (40 papers), North-America (10) and Europe (9) and Australia (1). No South American or African countries were used for sampling. Seven papers use data gathered from multiple continents. Specific countries that are often studied are China (13), Taiwan (11), United States (8) and South Korea (6). Most papers use self-collected survey data, while others use archival or secondary data. Secondary data is especially used to analyse gaming console platforms.

The type of digital platform studied differs in our sample. The most often studied platform type is social networks (22 papers, of which 2 are academic social networks). Other types are mobile telecommunications (8 papers), microblogging (6), game consoles (5), smart devices (5), e-commerce (3), online games (3), mobile applications (3) and IoT services (2). Some instances of digital platforms may span across multiple categories: for instance, we categorize studies on Twitter as microblogging, whilst they might be considered social networks too. As can be inferred, most of the digital platforms studied mainly exhibit direct network effects (e.g. social networks, microblogging) whereas others mainly create indirect network effects (e.g. game consoles, mobile applications, online games and social commerce).

Finally, we consider the publication outlet. 59 papers are published in peer-reviewed journals, whereas the other papers are conference publications (5 papers) and doctoral dissertations (3). Journals with multiple papers are *Computers in Human Behavior* (9 papers), *Information and Management* (5), *Telecommunications Policy* (4), *International Journal of Information Management* (3), *Telematics and Informatics* (3), *Internet Research* (3), *Information Technology and People* (2), *Technological Forecasting and Social Change* (2) and *Aslib Journal of Information Management* (2). Strikingly, the most frequently occurring journals are multidisciplinary and information sciences journals rather than IS journals. In the mainstream IS journals, only three papers were found: *MIS Quarterly*, *Information Systems Frontiers* and *Decision Support Systems*.

4.2 Concepts used

In total over 130 unique concepts were used in supported hypotheses found in the papers, indicating a large variety. Most concepts are related to generic adoption and continuance theories (e.g. perceived usefulness, 22 unique concepts in total), network effects (e.g. network size, 12 concepts), quality and value (e.g. functional value, 11 concepts), privacy and security (e.g. perceived privacy risk, 7 concepts) and control variables (e.g. gender, 13 concepts).

When zooming in on generic theory concepts, we find that especially adoption, continuance intention, loyalty and intention to use are used often as the final dependent variable. Perceived usefulness and perceived ease of use are often used together, although perceived usefulness is used by more papers. Perceived enjoyment and satisfaction, which are central to ECT, are used as well, but less often. Subjective norms as found in TRA and TPB are often used. While attitude appears in TRA, TPB and TAM, this concept is included less often.

Regarding network effects papers take varying approaches, using different concepts and relations between concepts. Concepts of network size, number of users, number of members and number of peers are often defined in nearly identical ways, referring to the actual or perceived installed base of a platform. Some authors do distinguish the overall network size from the number of peers, defining the latter as being close to the user (Xiao, Fu and Liu 2018). Sometimes network effects are divided into direct and indirect network effects, which is consistent with the underlying theories. Some authors use these concepts directly in their hypotheses, while others use proxies. For instance, Hsu and Lin (2016) use the Number of IoT services and Critical mass to represent the higher-order concept of Direct network externalities.

Platform-specific characteristics, such as openness and control, are considered only sparsely by a small number of papers. Hence, patterns across papers cannot be observed here. Concepts related to privacy and security were also considered only sparsely in the papers, often using overarching concepts like Privacy Concern, Security or Risk. A few papers further specified variables influencing privacy concern or privacy control, such as Institutional Privacy Assurance or Improper Access.

5 Hypothesis network

In total 645 hypotheses are posed in the papers, of which 517 are found to be significant, equalling a support rate of 80%. We separate our analyses between hypotheses focusing on adoption, and those

focusing on continuance. Figure 1 (see Appendices) visualizes the structure of the supported hypotheses for both subsets, using Gephi. Each hypothesis is represented by a directional tie between the independent and dependent variable. The size of the nodes and their labels indicates their weighted degree (i.e. the number of times a node appears in the 517 hypotheses). The size of the ties indicates the number of papers in which this specific hypothesis was supported. The positioning of a node on the x-axis depends on whether the concept was mainly used as an independent (left-hand side) or dependent (right-hand side) variable. The positioning on the y-axis indicates the number of papers in which a node was used, whereas the most frequently used ones appear in the middle of the y-axis. The nodes are coloured based on the theoretical streams discussed in Section 2: generic adoption theory, network effects, privacy and security, and quality and value. Openness is not considered a separate category due to the low occurrence in our database. We add control variables (e.g. age, gender) as a separate category considering their prevalence in the papers.

5.1 Analysis of concepts

To examine the concepts, we consider the degree of each node. The in-degree and out-degree represent the number of times the focal concept is the dependent variable and independent variable of a hypothesis, respectively. Concepts that are largely endogenous thus have a higher in-degree than out-degree, while the opposite holds for exogenous variables; mediating variables have both a high in-degree and out-degree (Van de Wijngaert et al 2014).

Table 1 lists the concepts with high out-degree and those with high in-degree. Network effects related variables, such as complementarity, number of peers and critical mass, are generally used as exogenous variables in continuance studies. These concepts are linked to mediator variables such as perceived usefulness and functional value or directly to endogenous concepts such as adoption or continuance intention. Variables related to quality are exogenous concepts, in the adoption studies. The concepts that are mostly endogenous are largely part of adoption and continuance theories: continuance intention, adoption, intention to use and behavioural intention are all part of TAM, TRA, TPB and ECT.

	Adoption papers			Continuance papers		
	Concept	In-degree	Out-degree	Concept	In-degree	Out-degree
Exogenous concepts	Perceived Ease of Use	4	13	Network Size	0	22
	Complementarity	2	8	Confirmation	4	16
	Image	1	7	Number of Peers	0	12
	Costs	1	6	Social Interactivity	0	11
	System Quality	0	6	Social Norms	3	10
	Complementarity	0	24			
Endogenous concepts	Adoption	68	0	Continuance Intention	76	1
	Intention to Use	36	3	Loyalty	10	2
	Behavioural Intention	12	2	Sense of Belonging	9	3

Table 1. *Exogenous and endogenous concepts for adoption (left) and continuance (right)*

In Table 2, ten mediating variables are given, defined by having both a high in-degree and out-degree. In the adoption papers, generic concepts are high on the list, such as perceived usefulness, attitude and functional value. In the continuance papers, authors consider network externality to be a mediator affected by network size and complementarity. Also, privacy concerns is a reoccurring mediator for continuance.

Adoption papers			Continuance papers		
Mediators	In-Degree	Out-Degree	Mediators	In-Degree	Out-Degree
Perceived Usefulness	18	17	Flow	13	10
Trust	11	9	Attitude	10	5
Attitude	12	6	Privacy Concerns	4	6
Functional Value	7	5	Network Externality	4	5

Table 2. *Mediators: Concepts with a high in-degree and out-degree*

5.2 Edge analysis

Support rates of hypotheses are different when comparing the main theoretical streams, see Table 3. In general, hypotheses involving generic adoption concepts are supported most often. Network effects, quality/value and privacy and security concepts are supported less often, although the support rate is higher for continuance than adoption. Control variables such as gender, age and income have low support rates.

Theoretical stream	Adoption papers		Continuance intention papers	
	Number of hypotheses	Support rate (%)	Number of hypotheses	Support rate (%)
Generic adoption / continuance theories	70	89	99	91
Network effects	49	69	108	82
Quality and value	23	91	29	69
Privacy and security	20	60	10	90
Control variables	21	67	19	32
Other	90	77	93	86

Table 3. *Support rate for hypotheses, specified for theoretical discourse*

Zooming in on network effects, we see a high diversity of concepts. Table 4 displays those concepts used in at least four hypotheses in one of the groups of papers. For both types of papers, concepts of network size and complementarity are frequently used, and often supported. Concepts of critical mass, number of peers and number of members are used more often in continuance intention papers, with different levels of support. Some concepts that appear to be closely related show differences in support rates (e.g. network externality vs network effects; number of peers vs number of members).

Theoretical concept	Adoption papers		Continuance intention papers	
	Number of hypotheses	Support rate	Number of hypotheses	Support rate
Network Size	12	75%	28	79%
Complementarity	9	89%	28	86%
Network Externality	6	83%	6	83%
Network Effects	6	50%	4	75%
Indirect Network Effects	4	100%	3	67%
Critical Mass	3	67%	9	89%
Compatibility	2	100%	4	75%
Number Of Peers	2	100%	12	100%
Number Of Members	1	0%	7	57%

Table 4. *Support rate for network effects concepts*

5.3 Co-membership analysis

Considering the broad variety of concepts being used, we further explore which concepts have been used conjointly in papers. This shows whether sub-sets of the papers focus on specific theoretical streams. We conduct this analysis on the combined adoption and continuance hypotheses sets. For this concept of co-membership, a new undirected network graph is created; the nodes represent the concepts, and the ties represent the number of times that they are used in the same paper. A visual inspection of the resulting graph does not show any clear patterns and is therefore omitted from this paper.

As a next step, we quantitatively examine whether meaningful subgroups of concepts can be elicited, using the community detection algorithm by Blondel et al (2008). This algorithm can be run with varying resolutions. Starting with the standard resolution of 1, we decreased the resolution until a meaningful set of subgroups was found. This resulted in a final resolution of 0.85, which contained seven sub-groups. The sub-groups denote concepts that are often used in the same paper, see Table 5.

Sub-group	Number of concepts	Most frequently used concepts
1	35	Continuance intention; Satisfaction; Enjoyment; System Quality
2	28	Adoption; Costs; Informativeness; Network Effects
3	28	Network size; Complementarity; Privacy Concerns; Functional Value
4	18	Intention to use; Social norms; Attitude; Image;
5	14	Trust; Security; Need for Cognition; Neuroticism
6	13	Age; Gender; Experience; Service Quality
7	12	Perceived Usefulness; Perceived Ease of Use; Behavioral Intention; Risk

Table 5. *Subgroups found in co-membership network of hypotheses*

The four smallest groups in Table 5 have a clear focus. Sub-groups 4 and 7 mainly contain generic adoption factors. While sub-group 4 uses concepts from TRA and TPB, sub-group 7 has mainly concepts from TAM. Group 5 contains platform-specific concepts (e.g. trust and security) as well as more idiosyncratic concepts (e.g. need for cognition and materialism). Group 6 contains almost all control variables, suggesting researchers either include none or multiple demographics in their models.

The three largest subgroups in Table 5 combine concepts from the different theoretical streams. Table 6 zooms in on these subgroups. A main difference between the three largest subgroups is the generic factors they focus on; whereas the first focuses on continuance intention, the second focuses on adoption. The subgroups also treat network effects in a different way. The first subgroup focuses on direct network effects relating to peers and critical mass, while the second subgroup distinguishes direct from indirect network effects. The third subgroup distinguishes network size from complementarity.

	Sub-group 1	Sub-group 2	Sub-group 3
Generic adoption / continuance factors	Continuance Intention Satisfaction	Adoption	Loyalty
Network effects factors	Network Externality Number of Peers / Members Critical Mass	Network Effects (In)Direct Network Effects Local Share; Global Share	Network Size Complementarity
Privacy and security			Privacy Concerns Improper Access
Quality and value	System Quality Content Quality	Informativeness	Functional / Social / Emotional Value

Table 6. *Main concepts used in the three largest sub-groups*

6 Discussion

This paper explored which factors and theories are being used in consumer studies on digital platforms, by conducting a structured literature review on 67 papers. Our expectation was that, as digital platforms are a distinct class of digital artefacts (Yoo et al 2010), research on consumer adoption and continuance would have to move beyond generic factors, and include platform-specific factors such as network effects, openness, privacy and security. However, our findings imply that this is only partially the case.

Overall, we found that generic factors largely dominate the empirical studies, especially in adoption studies. Hypotheses that employ generic adoption factors from TRA, TPB and TAM have the highest rates of support in the papers we examined, and a subset of the papers focuses almost exclusively on these generic adoption theories. Our co-membership network analysis does show that authors are selective: they typically adopt a few concepts from these generic theories for their models rather than incorporating these models one-on-one. As it thus appears, researchers rely on popular adoption and continuance theories.

Consistent with our expectations, we did find that theory on network effects has a large impact on especially continuance studies on digital platforms. Typically, authors add network effects as exogenous variables to mainstream theories. We make four observations regarding network effects here. First, the studied papers use a large variety of conceptualizations for capturing network effects, with 12 unique concepts across the studies. As some concepts have almost identical definitions, there is still room for conceptual clarity in this area. Second, within this variety of conceptualizations, there are considerable differences between local and global network effects, and between direct and indirect effects. Hence, it is important to distinguish the different types of network effects, and their relative importance likely depends on the particular type of digital platform studied. Third, few authors systematically compare network effects to other antecedents of digital platforms, such as the quality of the platform. This limits the ability to make conclusions on the relative importance of network effects (McIntyre and Srinivasan 2017). Fourth, authors take perceptions or expectations on the presence of network effects as exogenous, and do not examine the antecedents of network effects, such as platform openness.

In contrast to our expectations, we hardly found any factors being used that are specific for the extensible and generative nature of platforms (cf. Tilson et al 2010). Privacy and security concerns are found in a small subset of the papers. Openness, governance and control against low-quality platform add-ons were found in hardly any of the papers. Hence, while openness, governance and control are central concerns in IS literature on digital platforms (e.g. Tiwana et al 2010; Wareham et al 2014; Ondrus et al 2015), these ideas have yet to find their way into consumer studies on adoption and continuance.

We suggest three explanations for the lack of attention to the specific characteristics of digital platforms in consumer studies. One explanation is that only 3 out of the 67 papers found were published in mainstream IS journals, while the other papers were in information and communication science or interdisciplinary journals. Possibly, by not being embedded in the IS community, researchers are simply not aware of the importance of openness, governance and control. This explanation may be scrutinized through a co-citation analysis, which is beyond the scope of this paper. The implication of this explanation is that IS researchers have a major role to actively contribute by engaging in platform adoption studies.

A second explanation is that many of the platforms considered in our 67 papers mainly exhibit network effects rather than innovation capabilities. For instance, social network sites are studied in much more papers than operating systems or app stores. 'Matchmaking' platforms such as social network sites primarily add value by connecting users, and their ability to drive innovation (e.g. social games) is less prevalent. We cannot infer from our data what the direction of causality is here: does the choice to study mainly matchmaking types of platforms lead researchers to focus on network effects, or does the focus on network effects lead to disproportional attention to matchmaking platforms?

A third explanation is that network effects are considered as proxies for characteristics of openness, governance and control. In this view, the more open a platform, the more complementary providers it attracts, and thus the larger network effects are obtained (Boudreau 2012). Yet, such an approximation leads to problems in theorization. The very nature of generativity is that one cannot foresee what complements will be developed on top of a digital platform (Tilson et al 2010), and that malicious or low-quality complements may generate negative network effects or privacy and security concerns.

Regardless of which explanation is valid, we posit that the lack of attention to digital-specific factors leads to missed opportunities for the field. A focus on network effects leads to a one-sided and rather economistic framing of the value-creation logic of digital platforms. While matchmaking or brokering between user groups is an important way in which digital platforms create value, platforms also create value by enabling innovation, for instance through generic and reusable components. This generative potential of digital platforms is what makes them unique artefacts, enabling unforeseeable rates and diversity of innovation (Tilson et al 2010; Kallinikos et al 2014). Yet, exactly these characteristics are ignored by the studies we examined. Further, a risk is that the resulting theories lack in practical utility. Network effects cannot be directly steered by platform owners, whereas digitality-specific characteristics of platform openness and control can be directly influenced. In a field where design theories are scarce (Spagnoletti, Resca and Lee 2015) and generally called for (De Reuver et al. 2018), this is an important omission.

On a more general note, our findings resonate the more general debate on adoption theory and research in IS. Generic adoption theories have high success rates in terms of support for hypotheses, and pose a sound (and safe) basis for theory-development. The practice we observed, of adding external variables such that adoption and continuance theories are updated to new phenomena, is not new and has been said to lead to a false sense of progress (Benbasat and Barki 2007). The flip-side of the success story of mainstream theories is that authors have little incentive to look into the black box of the digital artefact under examination (Orlikowski and Iacono 2001).

A limitation of the analyses in this paper is that we used Google Scholar to search for relevant papers. Given that the algorithms in Google's search engine are not fully transparent, and also subject to change over time and personalization, this puts limits on the repeatability of the analyses. Yet, we are confident in the findings as we conducted searches as well in Scopus, which did not yield additional papers. A second limitation is that, although we focus specifically on consumer decisions regarding digital platforms, a few of the papers study adoption or continuance decisions of consumers as well as complementors (e.g. app developers). Hence, some of the hypotheses in our networks may cover app developer decisions too.

7 Conclusion and outlook

This paper reported a structured literature review on factors affecting consumer adoption and continuance of digital platforms. We used a structured literature review approach combined with an advanced network analysis on the hypotheses tested. We show that especially adoption studies on digital platforms largely rely on mainstream adoption theory concepts. Continuance studies also incorporate concepts related to network effects and privacy concerns. Overall, specific characteristics of digital platforms, such as openness, control, security and privacy, are far less studied. We discussed several explanations for these observations, and argued how this one-sided focus on network effects leads to a lack of theorizing on the nature of extensibility and generativity of platforms.

We argue that IS researchers have an opportunity (and perhaps even a duty) to contribute to the discourse. So far, the contributions in mainstream IS literature on consumers and digital platforms have been limited to a handful of papers. By bringing in the understanding of the digitality, generativity and extensibility of digital platforms, IS researchers are in a unique position to disentangle how the specific characteristics of digital platforms affect their adoption and continued use.

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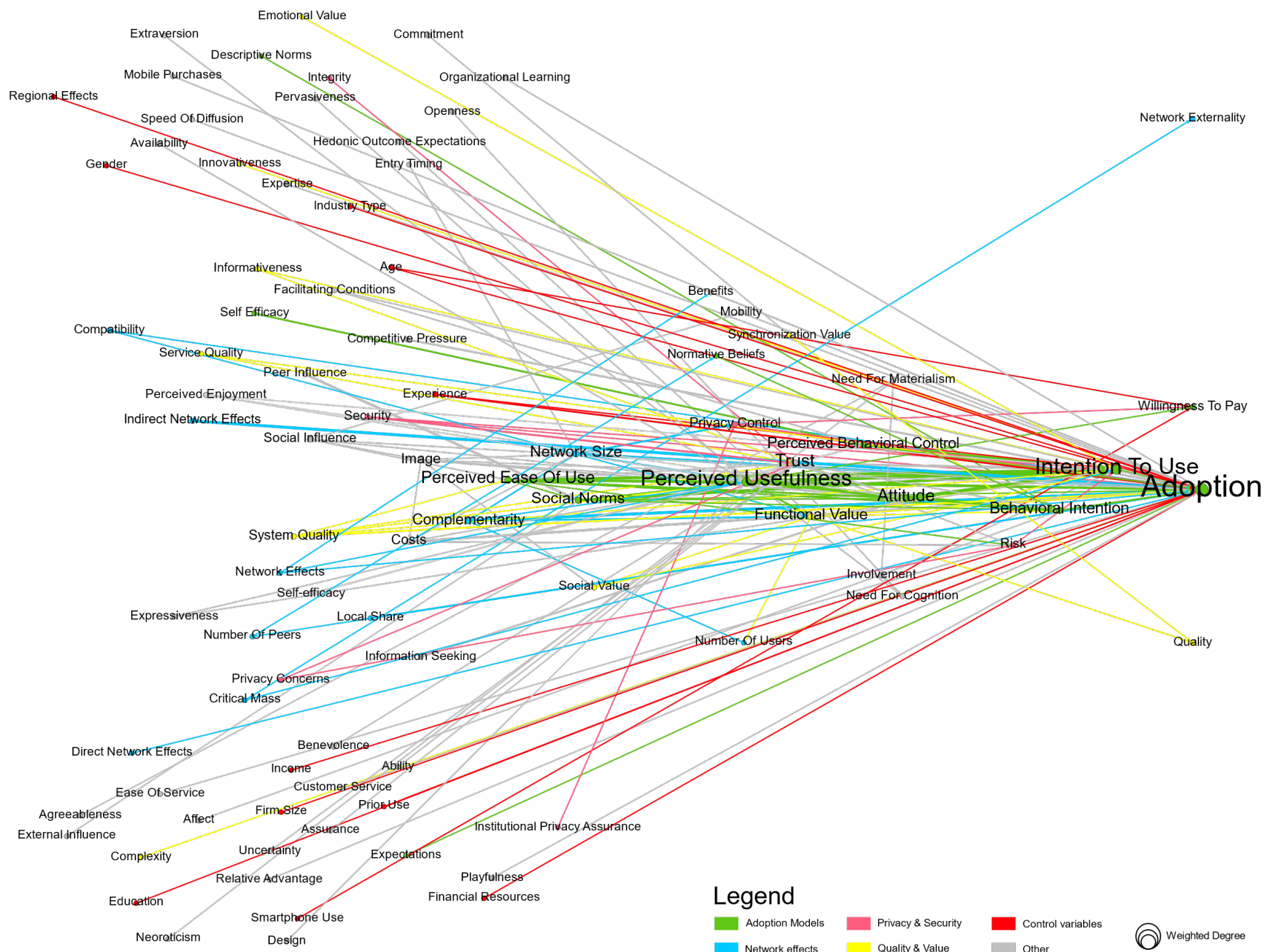


Figure 1a. Network of supported hypotheses: Adoption papers

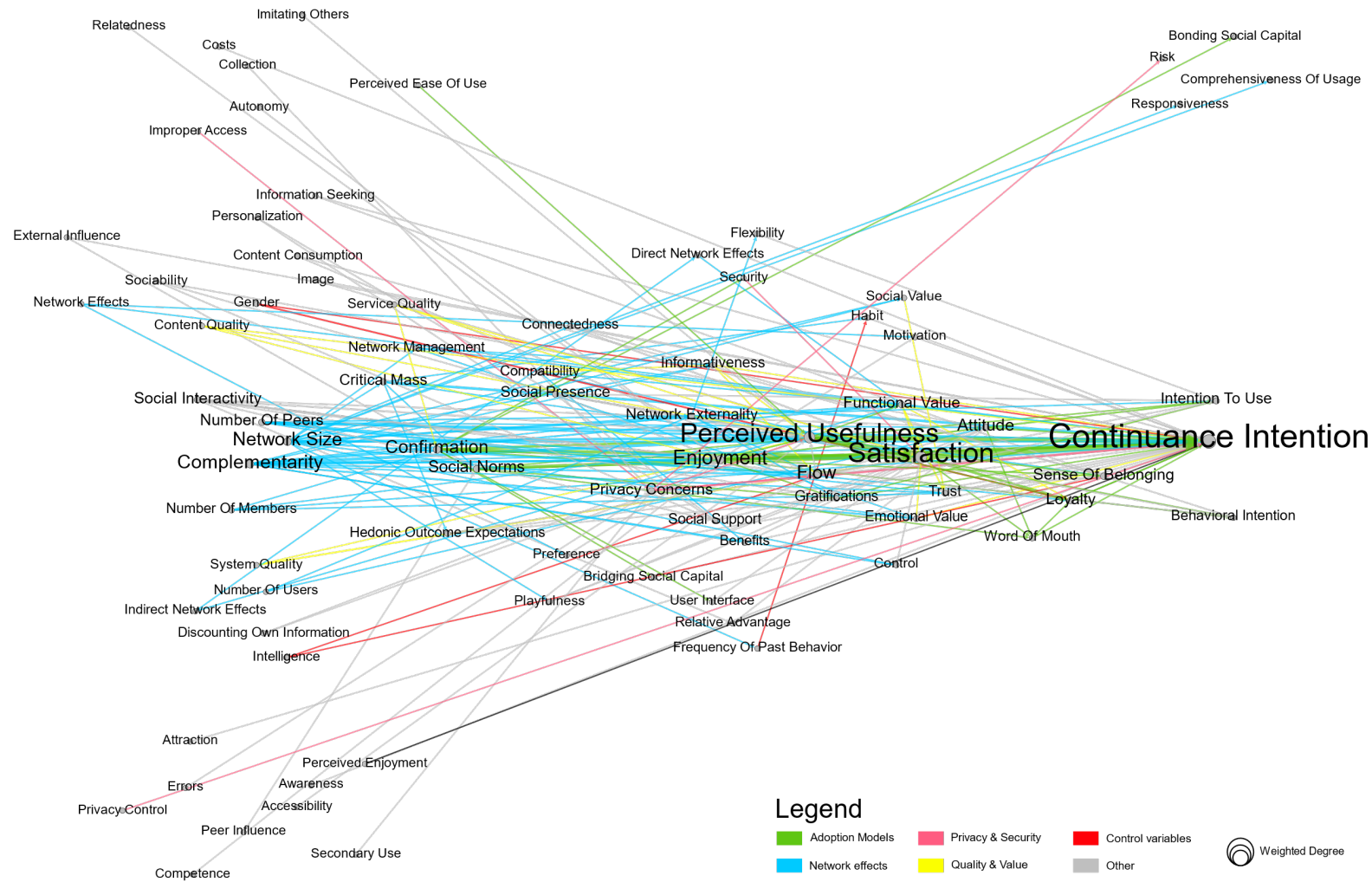


Figure 1b. Network of supported hypotheses: Post-adoption papers