



Progress on Technology Use in Tourism

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Abstract

Purpose: With the rapid development and implementation of cutting-edge information technologies in tourism and hospitality, it is necessary to update the progress of technology *use* in the past 18 years and set up research agenda for future research. Adopting Information Systems (IS) as a reference discipline, this article aims to create a literature review of technology and tourism papers around the theme of *use*.

Design/methodology/approach: Following the systematic literature review process of Aguinis *et al.* (2018), 314 papers were downloaded to determine how they applied the concept of technology *use*.

Findings: Three themes about technology use emerged: types of processing, organisational use, and users. Among various types of technology processing, interactive and online are largely addressed in the tourism and hospitality literature. The organisational use theme explores how the competitive and strategic use of technology provides management support for organisations. There was a large amount of research focussed on direct users, such as individual characteristics, user attitudes, and user behaviour. The theories of TAM and UTAUT have been widely applied in these studies.

Originality/value: This paper provides a review of key issues which has been discussed in tourism research in relation to technology use. By applying the scheme developed in the IS discipline, this study provides new insights into the development of technology in tourism. In addition, it also gives us the opportunity to suggest a research agenda by identifying research gaps and future research collaboration opportunities between these two fields.

Keywords: processing, users, organisational, information systems, tourism, technology use

Article Classification: Literature Review

1. Introduction

Information technology use is one of the most explored areas in tourism technology since the 1980s (Buhalis and Law, 2008). With the rapid development and implementation of cutting-edge information technologies in tourism and hospitality, it is necessary to update the progress of technology *use* in Tourism in the past 15 years, and set up research agenda for future research. In the past 18 years, there have been other review articles in a similar vein carried out (Buhalis and Law, 2008, Law *et al.*, 2009, Daniel Leung *et al.*, 2013, Navío-Marco *et al.*, 2018). While some reviews

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3 focus on the specific use of mobile technology and social media in the tourism industry (Liang *et al.*,
4 2017, Daniel Leung *et al.*, 2013) others provide a more generic overview of the advancement of
5 eTourism in this timeframe (Buhalis and Law, 2008, Navío-Marco *et al.*, 2018). In contrast to these
6 review papers, our paper specifically focusses on the technology use in tourism. Technology *use* has
7 been recently touted as among the most central constructs in the Information System (IS) discipline
8 (Straub and del Guidice, 2012). Subsequently, we believe a similar approach can be taken from a
9 tourism technology perspective. Adopting IS as a reference discipline (Baskerville and Myers, 2002)
10 enables a rigorous and comprehensive understanding of the progress on tourism technology *use*.
11 Therefore, in this article, we aim to create a literature review of technology and tourism around the
12 theme of *use*. The next section introduces the systematic literature review process followed in this
13 research. The subsequent sections outline the key findings of the literature review process. Finally, the
14 conclusion summarises the key research gaps and suggests opportunities for future research.

23 **2. Methodology**

24 We followed the systematic literature review process of Aguinis *et al.* (2018) as detailed below.

25 **Step 1: Determine Goal and Scope of Review**

26 The aim of this literature review focuses on the technology use, which has been recently touted as
27 among the most central constructs in the Information System (IS) discipline (Straub and del Guidice,
28 2012). We apply this in the context of tourism research.

29 **Step 2: Determine Procedure to Select Journals Considered for Inclusion**

30 We downloaded papers from the following journals: Journal of Travel Research (JTR), Tourism
31 Management (TM), Annals of Tourism Research (ATR), and the Journal of Sustainable Tourism
32 (JST). These tourism journals were selected based on their high rankings (4* Academic Journal Guide
33 2018) within the Association of Business School's (ABS) journal rankings. We also selected two key
34 specialised technology and tourism journals, the Journal of Hospitality and Tourism Technology
35 (JHTT) and Information Technology & Tourism (ITT). We also reviewed 6 review papers in this
36 domain.

37 We downloaded papers based on a keyword search of "technology" within the title, abstract, or
38 keywords for each journal using Scopus. We acknowledge that this keyword search may not retrieve
39 all relevant papers, but it is the most widely used keyword and is often part of other terms such as
40 "Information and Communication Technology". Using this keyword also provided a more
41 manageable sample. We downloaded papers from the years 2000 to October 2018 from Scopus (to
42 ensure the most current research was included). The total number of papers downloaded for each
43 journal is illustrated in table 1.

<<Table 1 to appear about here>>

Step 3: Calibrate Source Selection Process through Inter-coder Agreement

Downloaded articles were then imported into NVivo for analysis. We ran a keyword query of the papers using the ‘use’ keyword list from Barki *et al.* (1993) and use terminology from (Burton-Jones *et al.*, 2017). Based on the keywords discovered by the query, we then manually checked to see if the keyword was used in the correct context. If the context was incorrect, then the paper was disregarded. The authors discussed the keywords and the context to ensure that we were in agreement for a paper to be included or disregarded. The list of keywords used, and the number of codes matched to them, can be found in the appendix.

Step 4: Select Sources using Process Identified in Step Three

Each author took a sub-section of the keyword list and reviewed all papers within that section across all years and all journals:

- Author 1: Organizational Use of IS
- Author 2: Type of Support, Type of Processing
- Author 3: Users

Note: our keyword query did not find any papers from the sub-section Type of IS Access.

Step 5: Calibrate Content Extraction Process through Inter-coder Agreement

All authors read samples of the other authors’ codes and discussed and compared notes from the selected articles, and to ensure that we addressed the evidence of our codes within the correct context.

Step 6: Extract Relevant Content using Multiple Coders

Each author read the full text of each paper coded within their sub-section and made notes about how to ensure the code was being used correctly. Based on themes emerging from the coding process, each author re-structured and grouped their codes to ensure papers with a similar context and code were considered together. For example, we found that some papers within the ‘Type of Support’ category were better suited in the ‘Organisational Use’ or ‘Users’ category, based on the focus of each paper. All authors then reviewed the coding structure and agreed on the recommendations made by each author. All authors agreed on the common themes found in the paper and used this to structure the literature review.

3. Type of Processing

Information Systems can facilitate information processing, which includes data collection, processes for data analysis, knowledge transfer, and information display for organisations and consumers. In our

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3 sample, we found tourism papers predominantly explored this from an interactive, online and real-
4 time processing perspective.
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6 7 *3.1 Interactive*

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9 Interaction, among other factors, is an important issue for tourism, for example, e-commerce hotel
10 bookings (Bilgihan *et al.*, 2014), and social media marketing efforts (Tatar and Eren-Erdoğan,
11 2016). In an early study of the use of the Internet in travel agents, Buhalis and Licata (2002) argued
12 that tourism intermediaries must reengineer their business processes to remain competitive. Many of
13 the studies examined interactivity from a tourism marketing perspective. Özturan and Roney (2004)
14 examined the Internet use of travel agencies in Turkey, and found that their websites did not have the
15 interactive features required for Internet marketing. Young Chung *et al.* (2011) explored the use of
16 interactive thematic maps on tourist perceptions, using a network analysis. They found that interactive
17 maps can play an important role in tourists' planning behaviour, and for online tourism marketing.
18 Online interactive processing of information as used by marketers can also apply to other technologies
19 such as virtual worlds used for building destination images (Yu-Chih Huang *et al.*, 2013), or to
20 knowledge-based network participation in destination and event marketing (Breukel and Go, 2009).
21 Interactive reservations received through direct channels and online travel agencies, cause tourism
22 service providers to interface with new intermediaries (Digiorgio, 2016), while smart tourism
23 destinations improve the co-creation of tourism experiences, and encourages greater interaction with
24 tourists, and sharing of experiences (Buonincontri and Micera, 2016).
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35 Other uses of interactivity were studied by image research and mobile devices. From the differences
36 and commonalities between images of destinations, Govers *et al.* (2007) presented an interactive
37 measurement approach for image research. From a study of mobile device use in private clubs,
38 Morosan and DeFranco (2014) linked club members' demographic and behavioural characteristics to
39 their use of mobile devices in clubs. There were a number of differences between the types of clubs,
40 as well as the origins of the participants. More recent studies of interactivity have focussed on
41 interactive decision-making tasks to find a destination to travel as a group (Delic *et al.*, 2018), and the
42 impact of digital technology on public governance processes for destination management (Kalbaska *et*
43 *al.*, 2017).
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50 51 *3.2 Online*

52 Online was by far the most common type of processing in our sample, and from a very wide range of
53 topics. We were able to categorise our sample into further, but related, categories:
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56 **Information sharing** – in the earliest research, electronic word of mouth (eWoM) was considered as
57 a cost-effective means for tourism and hospitality marketing, but ethical issues must be considered to
58 engage with eWoM technologies (Litvin *et al.*, 2008). However, it is useful for targeting new
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3 customers and planning effective marketing strategies (Rong *et al.*, 2012). User-generated content
4 (UGC) has increasingly been considered a credible form of eWoM (Stepchenkova and Zhan, 2013),
5 and the sharing of videos has become more popular as a means to mediate tourist experiences
6 (Tussyadiah and Fesenmaier, 2009). Photos are also a popular means of information sharing. People
7 who post photos online tend to have higher incomes, are better educated, and from younger
8 generations (Lo *et al.*, 2011). Other forms of UGC include blogs, which can be used to help build a
9 destination image (Tseng *et al.*, 2015). Online information sharing can also be considered to model
10 behavioural intentions to follow online travel advice from online communities (Lee and Hyun, 2015).
11 These sources of information online can be further categorised in terms of specialization,
12 endorsement, and other users' star ratings (Choi *et al.*, 2018). Two other examples of information
13 sharing in tourism focussed on interoperability solutions for online tourism distribution (Reino *et al.*,
14 2016), and the effect of management response in engaging customers (Chunyu Li *et al.*, 2017).

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23 **Information gathering** – initial research of technology use in tourism focussed around the
24 apprehension toward Internet use (Susskind *et al.*, 2003) for gathering information for tourism
25 purposes, i.e. trip planning. In 2005, an analysis was completed to understand how information search
26 for travel information behaviours evolved (Beldona, 2005). Earlier research also focussed on the
27 accessibility of information online for disabled tourists (Shi, 2006), and how to identify the challenges
28 and potential solutions for online marketing of travel destinations (Xiang *et al.*, 2008). Another stream
29 of research focused on the representation of information online and the understanding of travellers'
30 information needs as expressed through search engine queries (Xiang *et al.*, 2009), and the effects that
31 online information search had on tourists' destination image development (Xiang Li *et al.*, 2009),
32 destination image formation (Llodrà-Riera *et al.*, 2015), and how tourists' search for information
33 through alternative channels for more authentic and profound experiences (Xiang *et al.*, 2015). More
34 specific types of information are also sought, for example for the promotion of sustainable tourism for
35 visiting world heritage sites (Garbelli *et al.*, 2017), and for exchanges between hosts and guests in the
36 sharing economy, for example couchsurfing (Germann Molz, 2013). While all of these studies
37 focussed on the tourist or manager perspective, one study focused on the gathering of information by
38 using advanced information technology for fire detection systems for protecting cultural heritage
39 tourism resources (Joo *et al.*, 2009).

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50 **Websites** – an important tool related to information sharing and information gathering is the website.
51 We found examples of tourism research from our sample which specifically discussed issues relating
52 to the influence of website characteristics for planning a trip, (Kaplanidou and Vogt, 2006), how the
53 design of a hotel website influences appeal and likelihood to purchase (Bender Stringam and Gerdes
54 Jr, 2010), and how tourism websites influence consumer innovativeness for information search,
55 purchasing, and communication (Couture *et al.*, 2015).
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3.3 Real Time

Real time processing is another, although less researched area of technology use in tourism, but is an important issue, especially regarding the use of mobile travel services (Bouwman *et al.*, 2011). From the perspective of creative tourism, Ihamäki (2012) explored the use of geocaching in adventure tourist destinations, and provided broader implications for adventure tourism. Joo *et al.* (2009) examined a real time fire detection system for protecting cultural heritage resources. Daigle and Zimmerman (2004) described visitor characteristics using real time bus information, to address transportation problems. Zheng *et al.* (2017) focussed on the prediction of a tourists' next location using GPS. Their research contributes towards tourist attraction administration and real time crowd control. Recognising the importance of this area, Hardy *et al.* (2017) developed a methodological approach for tracking tourists' movements through smartphones and global positioning systems.

4. Organisational Use

Recently, a paper manifesto arising out of a JITT conference identified pivotal research topics in eTourism (Werthner *et al.*, 2015), in this paper the authors paid special attention to the increasing strategic use of ICTs in Tourism. For this reason, in this paper, we also include organisational use of IT as one of our key topic areas. From our analysis of the organisational use of IS, we found research relating to *support*, *competitive IS* and *strategic IS*. Organisations, regardless of the industry they operate in, their location or size, depend on the strategic use of IS to become and remain competitive. In particular, technology affects competitive advantage as it determines the relative cost position or differentiation of organisations (Buhalis, 1998, Arvidsson *et al.*, 2014).

4.1 Corporate or Management Support

The number of papers which focussed on corporate support or management support for ICT was sparse, and from a wide range of technologies and domains. Technology adoption that entails the commitment of substantial resources is typically viewed as a strategic decision by top management (Cheng and Lok, 2015). In their study, the authors found that the recognition of the ability of IT to generate revenue and reduce costs was vital before management support could be sought for any investment in new IT (Cheng and Lok, 2015). In a comparative study, Reino *et al.* (2011) found there were differences in inter-firm technology adoption in rural and urban accommodation establishments in Scotland. They use their study to theoretically explain different levels of adoption between the two settings. Additionally, from a corporate level of support, travel intermediaries can use ICT to maintain a competitive advantage, obtain information capabilities, and focus on their critical success factors to enhance travel supply chains through inter-organizational collaboration (Lin, 2016). In the food service industries, managers use multiple ICT innovations, and differing rates of diffusion stages than was previously thought. IT adoption and implementation in this industry also related to significantly sufficient capital (Fareed Ismail *et al.*, 2013). Tourism managers may use Internet-based marketing

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3 decision support systems. The use of these systems is highly dependent on a manager's perceived ease
4 of use, perceived usefulness, their experience in using similar systems, their attitude to ICT in general,
5 and the complexity of the task and time pressures in the work environment (Woeber and Gretzel,
6 2000).
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9 10 4.2 Competitive IS

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12 There is a dual focus in the competitive use of IS, that of the enhancing the guest experience and of
13 improving the revenue of tourism organisations through the more innovative use of technology.
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16 In the first instance, Bilgihan and Wang (2016) interviewed vice presidents, CTO/CIOs of hotels,
17 CEOs of hospitality technology vendors and academics who focus on hospitality technology research.
18 They found that IT-induced competitive advantage is possible when hotels choose to integrate all the
19 possible technologies in the organization with a harmony that creates synergy. Similarly, another
20 study announces a paradigm shift away from away from management-facing technology to the new
21 customer-facing technology, where the customer's expectation of technology is at the forefront (Anne
22 Coussement and J. Teague, 2013). Another study examined the use of interactive mobile technologies
23 in enhancing the experiential value of guests (Wendy Zhu and Morosan, 2014). Tajeddini and
24 Trueman (2014) provided a slightly different view, they investigated the role that national culture can
25 play in using innovative technologies to retain competitive advantages.
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33 The uptake of e-commerce has been well accepted as a means of gaining competitive advantage in the
34 tourism industry (Hong-bumm Kim *et al.*, 2009, Tsai *et al.*, 2005). In terms of new technologies
35 enhancing competitiveness from a management perspective, Buhalis and Licata (2002) discussed how
36 traditional eMediaries must reengineer their business processes in order to survive and remain
37 competitive by embracing the 3 new ePlatforms - the Internet, interactive digital television and mobile
38 devices. Similarly, Höpken *et al.* (2015) discuss a novel way to utilise business intelligence to
39 increase the competitiveness of a Swedish mountain destination. Fevzi Okumus (2013) discussed
40 how organizations can facilitate knowledge management (KM) and thus gain a competitive edge
41 through information technology (IT) tools. In order to achieve this, hospitality organizations not only
42 need to create a supportive organizational culture and structure, but also train and motivate their team
43 members to manage knowledge through IT applications. Another study investigated how social
44 networks can become the primary tool for promoting tourist destinations and reaching a wider range
45 of potential visitors to create competitive advantage in the market (Di Pietro *et al.*, 2012).
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54 A study based in Taiwan found different types of travel operations have different evaluation
55 considerations for an application service provider (ASP) adoption. Travel intermediaries can devote to
56 their core competencies, and acquire information support services through an ASP. On the other hand,
57 ASPs can use differentiation strategies and allocate limited resources by focusing on these critical
58 success factors to enhance inter-organizational collaboration in the travel supply chain (Lin, 2016).
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3 Further studies focus rather more on more explanatory factors that relate to improving
4 competitiveness, for example, why do tourist organisations adopt e-Marketing (El-Gohary, 2012),
5 why are internet based marketing decision support systems successful (Woeber and Gretzel, 2000).
6 Interestingly, the majority of these studies rely on the Technology Acceptance Model (Davis, 1989) to
7 provide theoretical support for their studies.
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11 4.3 Strategic IS

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13 The continuing development and widespread adoption of information technology (IT) have deeply
14 influenced the tourism and hospitality industry, especially on a strategic level (Tae Goo Kim *et al.*,
15 2008, Garces *et al.*, 2004).
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19 Cabiddu *et al.* (2013) examined how IT enables value co-creation and strategic advantage in tourism
20 and why some players appear to appropriate the value co-created in the partnership more successfully
21 compared to others. Similarly, Buonincontri and Micera (2016) discuss how involving tourists as
22 active co-creators of their own experiences has given rise to a new kind of destination, a smart tourist
23 destination, where technologies are so embedded in all tourist experiences that leads to the increased
24 competitiveness of the destination. The importance of maintaining a successful network of actors is
25 important for this to occur, Breukel and Go (2009) suggested that modern ICT may offer support to
26 establishing hospitality networks that shape a physical and virtual environment for the delivery of
27 services to developing client demands. Some studies indicate the importance of using technologies in
28 a strategic manner especially in terms of social media and online presence. For example, Xi Y Leung
29 *et al.* (2017) and Wozniak *et al.* (2017) examined the importance of strategic social media message
30 strategies while Baggio *et al.* (2011) focused on general online web presence strategies. Also
31 important are other IT solutions such as the adoption of interoperability solutions for online tourism
32 distribution (OTD) (Reino *et al.*, 2016), the vast number of applications that near field communication
33 technologies have for the tourism industry (Egger, 2013), the use of intelligent context-aware
34 recommender system that takes into account temporal and social context in tour guide applications
35 (Meehan *et al.*, 2016) or the strategic use of Customer Relationship Management systems in tourism
36 as a whole (Vogt, 2011, Mohammed *et al.*, 2017).
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48 The use of ICT to promote sustainable tourism has garnered some attention from scholars too (Ali and
49 J. Frew, 2014, Garbelli *et al.*, 2017, Isacsson and Gretzel, 2011, Ali and Frew, 2014). Ali and J. Frew
50 (2014) talked about the ability of ICTs to provide novel ways of approaching marketing, energy
51 monitoring, waste management, and communication for destinations, while Garbelli *et al.* (2017)
52 suggested how ICTs could be used in order for a destination to offer a proper and complete online
53 communication, to educate travellers about the several implications of being a WHS and about a
54 sustainable and responsible behaviour in case they choose to visit it. Finally, Isacsson and Gretzel
55 (2011) discuss how Facebook can be used to engage students in learning about sustainable tourism.
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3 On the other hand, we only found a few studies that looked at the use of ICTs for strategic purposes in
4 destination marketing (Buhalis, 2000, Ali and Frew, 2014, Gon *et al.*, 2016, Dickinger and Lalicic,
5 2016).
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8 Another thread in this area of research was exploring what kind of firms are more likely to embrace
9 different types of technology for strategic purposes. Spencer *et al.* (2012) explored the factors
10 influencing the decision to engage in technology adoption in small owner-managed travel firms. El-
11 Gohary (2012) indicated that environmental pressures significantly affect the perceived benefits and
12 barriers of e-commerce adoption, in addition to having an indirect effect on adoption behaviour in
13 tourism SME's in developing countries. Siguaw *et al.* (2000) concluded that luxury and upscale hotels
14 adopted more IT than economy and budget hotels. Eugenia Ruiz-Molina *et al.* (2013) explored the use
15 of ICTs in established and emerging tourist areas. They found that the reasons for making use of ICT
16 may differ: while hotels located in established tourist destinations may use technology in order to
17 differentiate themselves from the competition in the local market, hotels in emerging destinations may
18 try to attract Western tourists who are looking for something different. Finally, Hsu *et al.* (2016)
19 explored how established inbound tour operators (ITOs) are increasingly forced to embrace
20 technology-enabled innovations to keep up with their increasingly digital savvy tourists.
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29 Studies also found that the use of IT does not occur in a uniform manner, instead, there are different
30 stages of adoption within organisations. For example, Yuan *et al.* (2006) found that advancements in
31 IT in American convention and visitor bureaus did not spread uniformly across four information
32 activity dimensions and appear to occur in five recursive and sequential stages, namely: substitution,
33 enlargement, gestation, reconfiguration, and setback. Fareed Ismail *et al.* (2013) investigated how
34 three organizational factors – affiliation, sufficient capital and company age – related to 323
35 Malaysian foodservice companies' diffusion of six information technology (IT) applications. Their
36 study highlights multiple diffusion stages for multiple technological innovations in organisations.
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43 **5. Users**

44 Information Systems are used by users at all levels of an organisation and can provide various types of
45 support. There was a large amount of research focussed on users and sub-categories such as individual
46 characteristics, user attitudes, user support, and end-user attitudes and behaviour.
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50 *5.1 Individual Characteristics*

51 Studies find that individuals' backgrounds, demographic profiles and intentions largely determine the
52 various patterns of technology use. Comparing the differences between travellers from Australia,
53 China and the US in terms of technology readiness (TR) and customer satisfaction with travel
54 technologies, Yi-Shun Wang *et al.* (2016) found out the relationships between perceived quality and
55 satisfaction of technology-enabled services, overall satisfaction, and further behaviour were stronger
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3 among travellers with high TR and varied across countries. San Martín and Herrero (2012) found that
4 the higher level of innovativeness of users, the more likely they purchase rural tourism products.
5 Darley *et al.* (2017) investigated senior caravan travellers' characteristics and behaviours for SNS use
6 in Australia.
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10 Segmentations are proposed to develop a more strategic targeting plan in various contexts. Four user
11 categories of mobile travel services were identified by Eriksson (2014) to provide insights for travel
12 service providers. Lalicic and Weismayer (2016) categorised three types of tourists in terms of their
13 emotional engagement with their mobile phones. Yuan *et al.* (2003) classified American convention
14 and visitor bureaus into five adopter groups, and two paths of technology use. Morosan and DeFranco
15 (2014) used actual mobile devices data to offer a systematic operationalization to distinguish private
16 club members' behavioural and demographic characteristics in different types of clubs as well as
17 different regions in the USA. Using cluster analysis, Lo *et al.* (2011) classified 5 cohorts of users in
18 terms of different travel motivations, demographic profiles and the choice of online platforms to share
19 travel photos. This finding provides implications for destination promotions.
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26 5.2 User expectations

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28 User expectations of technologies have been widely explored in various contexts. In the context of e-
29 learning in the tourism and hospitality course, students' expectations from Egypt are influenced by
30 interpersonal, external and instructor these three social factors (Abbas, 2016). Some studies provide
31 implications for organisations to meet users' expectations. By gaining emotional insights of
32 passenger's airport experiences, Straker and Wrigley (2016) suggested airports can generate suitable
33 digital channel engagement content to meet passengers' expectations. On a conceptual level,
34 Coussement and Teague (2013) addressed the paradigm shift from management-facing technology to
35 the new customer-facing technology in the hospitality industry. This helps the industry better manage
36 customers' expectations by developing suitable mobile technologies.
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43 Providers are required to integrate desirable features when developing new technologies to meet
44 users' expectations. In the tourism and hospitality context, user requirements focus on conditions and
45 criteria to develop new applications. Content requirement, functional requirement, comfort,
46 experience and resistance are significant user requirement for developing the wearable AR museum
47 application (tom Dieck *et al.*, 2016). Given the heavy reliance of location-based recommendation in
48 tour guide application, Meehan *et al.* (2016)'s study found that environmental, temporal and social
49 these three contextual conditions at a significantly higher level of influence in mobile recommender
50 systems.
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5.3 User Support

In terms of research into ICT from a perspective of user support, studies investigated the supportive role of interactive mobile technologies in hotel guests' facilitation of transactions. The adoption of these technologies can mediate the experiences of guests in hotel service settings, with importance placed on cognitive absorption, playfulness, and security (Wendy Zhu and Morosan, 2014). Virtual worlds, such as Second Life, can provide visual 3D representations of destinations, and have also been used in the travel and tourism industry for marketing tourism destinations, and business management. The experience and behavioural intentions of tourists' to use virtual worlds is related to positive emotions, enjoyment, emotional involvement, and flow experience. Social media sites also allow for visual representations of destinations through user-generated content such as the sharing of images. User-generated content has become a new and credible form of word of mouth, as tourists share their images and travel experiences with their social networks. The types of images uploaded by destination marketing organisations, when compared with those uploaded by users, can provide a useful means for tourists' destination image (Stepchenkova and Zhan, 2013). Ribeiro *et al.* (2018) explored the potential of mobile technologies can provide supports for disabled tourists to engage in tourist activities.

5.4 End User Attitudes and Behaviours

When looking at consumers, most studies focus on direct users and end users given the increasing user confidence and the improvement from providers. Influential factors of consumers' intentions and satisfaction were largely explored in the context of online reservation systems (Woo Gon Kim *et al.*, 2006, San Martín and Herrero, 2012, Gregorash, 2016), firm-hosted online travel communities (Casaló *et al.*, 2010), implementation of eVisa (Çakar *et al.*, 2018), and registered traveller biometric system in air travel (Morosan, 2013). Other research has explored the factors affecting intentions for online purchasing generally (Amaro and Duarte, 2015), and more specifically the intentions of purchasing flights from low-cost carrier websites (Escobar-Rodríguez and Carvajal-Trujillo, 2014). Oppositely, Huertas (2018) and Dinholpl and Gretzel (2016) look at how the use of new technology (videos) influence and construct tourists' travel behaviour and experiences. Related to consumer behaviour, the idea of trust has been emphasised (Agag and El-Masry, 2017, Jungsun Kim *et al.*, 2017) when perceiving new technologies. Content providers, such as tourism boards, are considered the able information providers, however, user-generated content appears to be the most trustworthy, although not necessarily the most informative (Dickinger, 2011).

Technology Acceptance Model (TAM) has been widely adopted to discuss users' attitudes and behavioural intention. It has been utilised as a theoretical construct to understand factors that influencing users' attitudes and intentions of technology use, such as the interrelationship of travellers' attitudes towards travel mobile applications with utilitarian and hedonic motivations, and

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3 self-identity (Young Im and Hancer, 2014), gender differences in terms of technology acceptance in
4 the high-power conditions (Lu Zhang *et al.*, 2014), factors that influence tourists' acceptance of
5 mobile electronic tourist guides (METG). TAM also used as a useful model to explain why many
6 customers not using mobile applications from the hospitality firms (Kwon *et al.*, 2013).
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11 Some studies extend and modify TAM with other variables and/or theories to investigate users'
12 attitudes and behavioural intentions in their contexts. Balouchi *et al.* (2017) examined influences of
13 TAM and variables of perceived enjoyment, perceived source credibility and perceived risk in the
14 behavioural intention in accepting consumer generated contents (CGC) in the context of Iran. Park *et*
15 *al.* (2014) looked at how franchise support, which is not included in the original TAM, affects
16 attitudes towards franchise intranet usage in quick service restaurants (QSR). Straker and Wrigley
17 (2016) developed the TAM by proposing to include emotional drivers as influences in the use of
18 digital channels in their study of passengers' airport experience. Therefore, TAM has been widely
19 extended with contextual factors to understand tourists' acceptance of social media for the choice of
20 destination (Di Pietro *et al.*, 2012), biometric systems (Morosan, 2012), consumer-generated media
21 (CGM) usage for travel planning (Ayeh *et al.*, 2013), and airline BC2 e-Commerce websites (Hong-
22 bumm Kim *et al.*, 2009)
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31 In some studies, TAM is combined with other theory (ies) to develop the theoretical framework. Jen-
32 Min Huang *et al.* (2015) used TAM and readiness model as the research structure to investigate the
33 user's intention golfers towards golf GPS. By examining the applicability of the TAM and Hedonic
34 Theory, (Yu-Chih Huang *et al.*, 2013) developed a research framework to identify the factors that
35 affect tourists' experience and behavioural intentions within a 3D tourism destination. From a
36 generational perspective, (Sox *et al.*, 2016) synthesised a theoretical model of technology use within
37 meetings by investigating how attendees' experiences and the basis of the Generational Cohort
38 Theory (GCT) influence the TAM. Integrated TAM with the theory of reasoned action, the theory of
39 planned behaviour, and the innovation diffusion theory, Amaro and Duarte (2015) proposed and test a
40 model of consumers' intentions to purchase travel online. Casaló *et al.* (2010) provided a framework
41 that integrates TAM with the Theory of Planned Behaviour and Social Identity Theory to explain the
42 intention to participate in firm-hosted online travel communities.
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52 The Unified Theory of Acceptance and Use of Technology (UTAUT) is another widely used theory in
53 tourism technology research. UTAUT was developed by Venkatesh *et al.* (2003) to predict user
54 adoption of an information technology. Venkatesh *et al.* (2003) found that performance expectancy,
55 effort expectancy, social influence and facilitating conditions are the main factors determining user
56 adoption. Escobar-Rodríguez and Carvajal-Trujillo (2014) applied an extended UTAUT model to
57 examine key determinants of purchasing flights from low-cost carrier websites. San Martín and
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Herrero (2012) established a theoretical model that includes psychological factors that influence tourists' online purchase intention in rural tourism. Based on the UTAUT-2 framework, Gupta *et al.* (2018) found that performance expectancy, social influence, price saving, perceived risk, perceived trust and prior usage habits are significant predictors that affect tourists' intention of using travel apps.

Some studies synthesise new framework or theory to understand tourist behaviours of technology use. Dan Wang *et al.* (2014) proposed a new framework to understand the holistic understanding of smartphone use for travel that integrates the mechanism shaping the adoption, use and impact of smartphones. Tingting Zhang *et al.* (2015) proposed a conceptual model that suggest brand equity, sense of community and monetary incentive are three main motivations for customer engagement in online co-innovation communities (OCCs). In Dinhopl and Gretzel (2016)'s conceptual study, the theory of tourist videography was proposed to establish a foundation of various social practices in relation to tourists' video taking on holiday. Synthesising previous research, Bendegul Okumus and Bilgihan (2014) developed a conceptual model to test users' intention of using mobile applications as a tool to promote healthy eating in the restaurant.

6. Discussion and Conclusion

6.1 Concluding thoughts

In this paper, we adopt Barki *et al.* (1993)'s keyword classification scheme to provide a rigorous and comprehensive understanding of the progress on technology use in tourism. Around the theme of use, we found that research has been widely conducted in both organisational and individual levels with focuses in certain areas. In tourism and hospitality organisations, innovative technologies are used by managers as a strategic tool to maintain a competitive advantage, develop marketing strategies, or support their decision makings. In addition, the recent development of technology such as the interactive feature of the information technology, virtual world, and wearable AR applications also enable tourism and hospitality providers to design a wide range of experiences. One key goal of adopting new technologies is to achieve high levels of user satisfaction. A large amount of research focuses on the consumers, ranging from their expectation, attitudes and behaviours towards various forms of technologies in different tourism and hospitality settings. Among these, eWoM and mobile technologies have been largely explored (Munar and Jacobsen, 2014, Young Im and Hancer, 2014), given the increasing confidence of consumers as well as the development of ICT and e-platforms. Our findings are illustrated in figure 1. The figure is organised by major keyword themes. Bolded keywords above the line were found in our analysis, while un-bolded items below the line were missing from the literature. Based on the focus of the papers, we reclassified [User Support] and [Corporate or Management] research into different categories. Additionally, we found no research from the 'Type of Access' category.

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3 <<Figure 1 to appear about here>>
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5 *6.2 Theoretical Implications*

7 In terms of theories, information system theories such as UTAUT, TAM, Hedonic Theory, and
8 Innovation Diffusions Theory are widely adopted or extended in various tourism and hospitality
9 context to understand technology use. In addition to IS theories, these articles also widely adopt
10 concepts from other fields and disciplines such as Cognitive Absorption, postcolonial theory and
11 theory of tourist motivation, the theory of affordances and the theory of planned behaviour.
12 Furthermore, there are several conceptual papers developing new frameworks and/or theories to
13 understand technology use.
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19 Future research can broaden the choice of IS theories. Two particular theories that could be borrowed
20 from the information systems field is that of adaptive structuration theory (DeSanctis and Poole,
21 1994) and task-technology fit theory (Goodhue and Thompson, 1995). The basic reasoning of
22 adaptive structuration theory is that of how information systems work. System designers embed their
23 own intentions (spirit) into the functioning of the systems, but that users “adapt” these to their own
24 needs (appropriations) and thus use the system in unintended ways (Straub, 2012). These kinds of
25 workarounds result in new ways to use systems which designers respond to in subsequent redesigns.
26 From a tourism information technology design point of view, this could be an interesting theory to
27 apply in terms of how technology evolves over time according to use. On the other hand, the task-
28 technology fit theory asserts that users, depending on the relevant tasks at hand, make conscious
29 choices of best-fitting technologies before they use systems (Straub, 2012). Again this could be
30 applied to the tourism field in terms of how and why users choose information systems for their
31 specific purposes.
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40 Studies of technology use can be further explored by exploring various critical turns of theories, such
41 as mobilities turns, performance turn, late modernity and queer theory in order to contribute to critical
42 tourism and hospitality studies. Issues such as the critics of ubiquitous connectivity during the
43 holiday, ICT roles in the social inclusion in the holiday space, and ethical concerns the robotic use in
44 the hospitality sector are worthy of further investigation.
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49 *6.3 Practical Implications*

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51 Our paper has delineated the research in this area into three main categories: type of processing,
52 organisational use, and users. This is a useful way of categorising the main uses of technology in
53 tourism. That is, managers for example, can and should deal with future IT-related issues by
54 integrating the innovative uses of IT into their strategic business plans. One way to do this is to
55 simultaneously be aware of changing IT technology that could benefit the bottom line of tourist
56 organisations, and being aware of changing tourist perceptions, expectations and increasing digital
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savviness. The way data is collected, stored and analysed is also important to consider due to changes in data protection laws in Europe for example, and future research could explore more ways to make this interactive, online, and to provide information processing in real-time.

6.4 Limitations and Future Research

This literature review article focuses on four high impact tourism journals and two specialised tourism and technology journals. Although the selection criteria ensures the quality and impact of reviewed papers, some relevant research published in other journals or proceedings could be potentially excluded. Future research can review a wider scope of journals and books in order to achieve a comprehensive understanding. This article applied Barki *et al.* (1993)'s keyword classification scheme of IS use. In figure 1, we illustrate that tourism and technology studies only focus on certain use themes, and there are a wide range of themes in IS use which are under-researched. Tourism and IS academics can look for potential topics to research in these areas.

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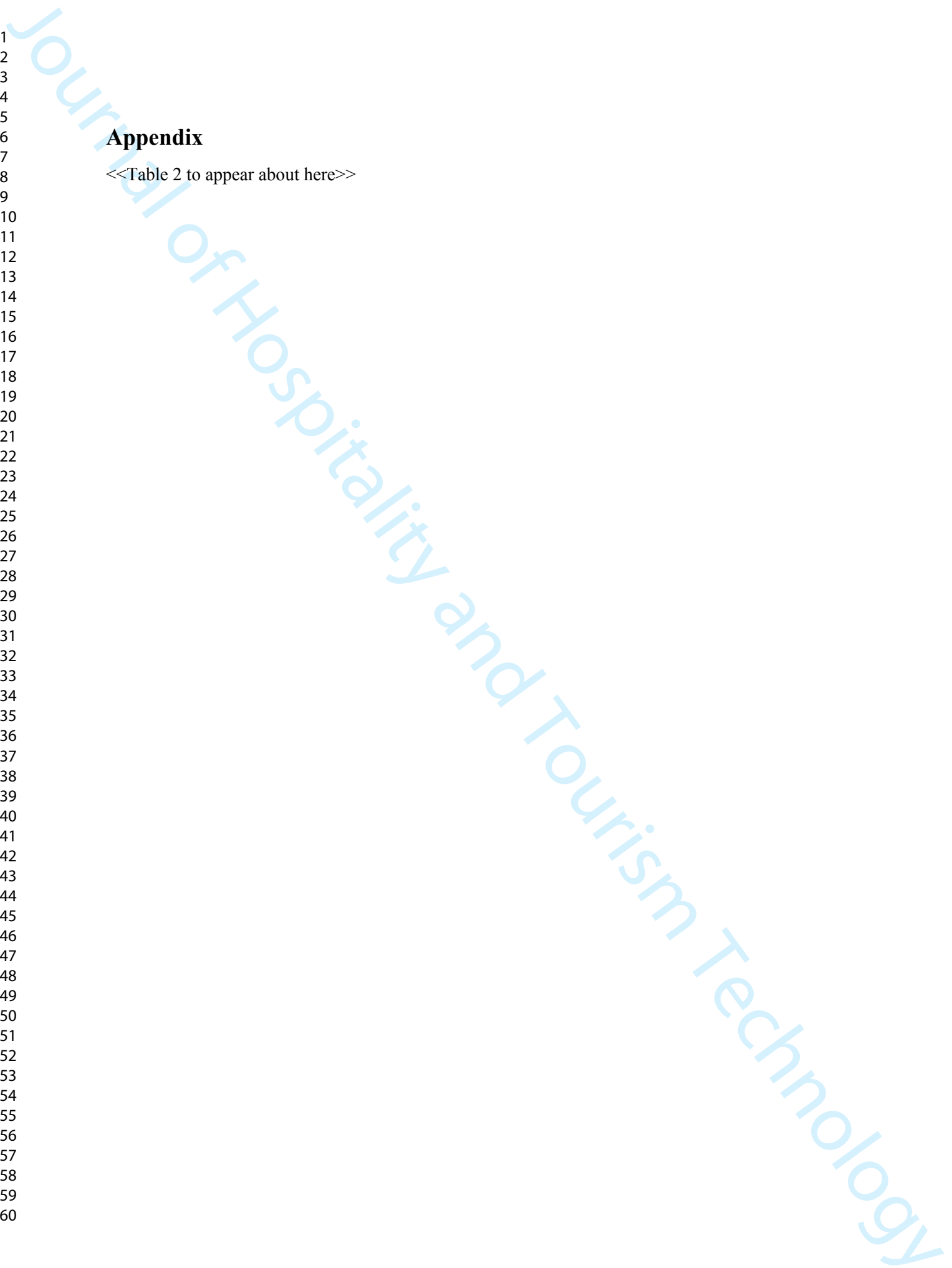
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Appendix

<<Table 2 to appear about here>>



Journal	Downloaded
JTR	52
TM	98
ATR	26
JST	31
JHTT	76
ITT	31
Total	314

Table 1: number of papers downloaded

Keyword	No	Keyword	No
From Barki et al. (1993)			
Competitive use of IS	67	Executive requirements for decision support	1
Strategic IS	39	User expectations	15
Competitive IS	24	User job titles	0
Office automation	1	CEO	0
Word processing	0	Executive	0
Satellite work center	0	Middle manager	0
End-user computing	1	Senior management	0
End-user programming	0	Entry-level personnel	0
Operational computing	1	Type of IS support	13
Telecommuting	0	Corporate support	2
Distributed work arrangements	0	Departmental support	0
Users	122	Personal support	2
Individual characteristics	9	User support	5
User attitudes	15	Interpersonal support	0
User behaviour	56	Management support	3
User types	12	Type of is access	0
Direct users	3	Direct access	0
Indirect users	0	Chauffeured access	0
Intermediate users	0	Type of processing	55
End users	1	Online IS	37
Expert users	2	Batch IS	0
Novice users	0	Real-time IS	6
User requirements	5	Interactive IS	12
From Burton-Jones et al. (2017)			
Use	0	Routinization	0
Utilize	0	Implementation	6
Usage	6	Adoption	28
Utilization	2	Diffusion	2
Appropriation	1	Acceptance	16
Adapt	0	Continuance	0
Assimilation	0	Addiction	0
Infusion	0	Trying	0

Table 2: keywords used, and the number of papers coded

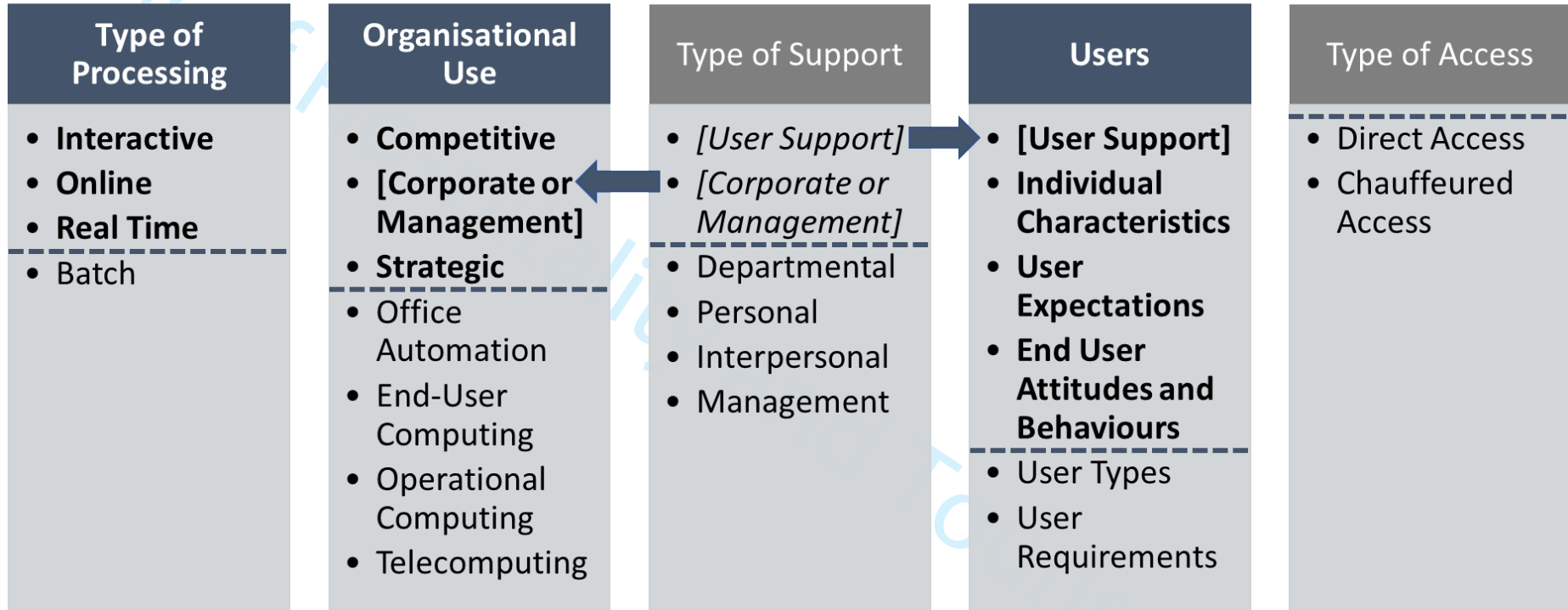


Figure 1: Findings