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Progress in Tourism Management

Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research

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Abstract

This paper reviews the published articles on eTourism in the past 20 years. Using a wide variety of sources, mainly in the tourism literature, this paper comprehensively reviews and analyses prior studies in the context of Internet applications to tourism. The paper also projects future developments in eTourism and demonstrates critical changes that will influence the tourism industry structure. A major contribution of this paper is its overview of the research and development efforts that have been endeavoured in the field, and the challenges that tourism researchers are, and will be, facing.
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1. Introduction

Technological progress and tourism have been going hand in hand for years (Poon, 1993; Sheldon, 1997). Since the 1980s, Information Communication Technologies (ICTs) have been transforming tourism globally. Developments in ICTs have undoubtedly changed both business practices and strategies as well as industry structures (Porter, 2001). The establishment of the Computer Reservation Systems (CRSs) in the 1970s and Global Distribution Systems (GDSs) in the late 1980s, followed by the development of the Internet in the late 1990s, have transformed the best operational and strategic practices in the industry dramatically (Buhalis, 2003; eBusiness W@tch, 2006; Emmer, Tauck, Wilkinson, & Moore, 1993; O'Connor, 1999). If the past 20 years have seen an emphasis on technology per se, then since the year 2000 we have been witnessing the truly transformational effect of the communications technologies. This has given scope for the development of a wide range of new tools and services that facilitate global interaction between players around the world.

Tourism as an international industry and as the biggest provider of jobs on the planet boasts a greater array of heterogeneous stakeholders than many other industries. The energetic growth and development of the industry are perhaps only mirrored by the growth of ICTs. The accelerating and synergistic interaction between technology and tourism in recent times has brought fundamental changes in the industry and on our perceptions of its nature. The significance of crossing the new information threshold of universal, ubiquitous communications access has brought the entire tourism industry to the new levels of interactivity, propelling management by wire. Increasingly, ICTs play a critical role for the competitiveness of tourism organisations and destinations as well as for the entire industry as a whole (UNWTO, 2001). Developments in search engines, carrying capacity and speed of networks have influenced the number of travellers around the world that use technologies for planning and experiencing their travels. ICTs have also changed radically the efficiency and effectiveness of tourism organisations, the way that

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businesses are conducted in the marketplace, as well as how consumers interact with organisations (Buhalis, 2003). There have been many new entrants among the players on the tourism stage, shifts in market share and balance of power, changes in political perceptions of tourism, and a growing recognition of the importance of tourism to an ever-increasing number of national and regional economies.

The ICT driven business processes re-engineering observed in the industry gradually generates a new paradigm-shift. This alters the structure of the entire industry and develops a whole range of opportunities and threats for all stakeholders. Not only ICTs empower consumers to identify, customise and purchase tourism products but they also support the globalisation of the industry by providing effective tools for suppliers to develop, manage, and distribute their offerings worldwide (Buhalis, 1998). As a result, a major research field is emerging from this interface, as the researchers increasingly seek to understand and communicate the significance of the new technologies, investigate and interpret contemporary activity, and attempt to forecast the way ahead for both industry and technological developments.

To a certain degree, this has been reflected in the literature. Very few publications on tourism and technology appeared up to 1990. The research community came together initially at a conference at the University of Perugia in Assisi, in 1991. Perhaps what really built the research community and made eTourism a key area of research was the annual ENTER conference that emerged in 1994 in Innsbruck Austria. A few years later, the *Journal of Information Technology & Tourism* (JITT) followed in 1998 establishing a multidisciplinary interest group of researchers that published regularly on tourism and technology. Most participants of this group constituted the core membership of the International Federation of Information Technology for Travel and Tourism (IFITT) which was developed under the leadership of Professor Hannes Werthner.

As a result of this, activity research in the area flourished. Frew (2000) estimated that 665 refereed articles were published in the 20 years period 1980–1999. The rapid development in telecommunication technologies, collaborations at the national and international levels had substantially increased publications 154% and 275%, respectively, between the first and second decades during the study period. Leung and Law (2007) report that out of 4140 papers published in the six leading research journals in hospitality and tourism in the period of 1986–2005 (*Annals of Tourism Research* [*ATR*], *Journal of Travel Research* [*JTR*], *Tourism Management* [*TM*], *International Journal of Hospitality Management* [*IJHM*], *Cornell Hotel and Restaurant Administration Quarterly* [*CQ*], and *Journal of Hospitality & Tourism Research* [*JHTR*]), 195 papers focused on ICTs, 66 of which appeared in the *CQ* and only 5 in the *ATR*. Among the 195 papers analysed in that study, 137 papers (70.26%) had at least one author who was affiliated with North American institutes. O'Connor and Murphy (2004) reviewed recent research on information technology in the hospitality industry and revealed three broad research areas: the Internet's effects on distribution; on pricing; and on consumer interactions. These are consistently examined in most of the publications on the subject.

This paper provides a comprehensive review to the key ICTs in Tourism (or eTourism in short) themes and aims to illustrate the principle dimensions of the research enquiry. The paper provides the historical evolution of the theme in the literature, particularly in leading publication channels in tourism, and to bring together the most influential publications in the last 5 years. Three main themes are identified as the main axes of eTourism research, namely: consumers and demand dimensions; technological innovation; and industry functions. These three themes represent the stakeholders in the demand, supply, and technologies. The paper demonstrates the contribution to knowledge, theory, and professional practice resulting from these publications as well as exploring future prospects for the research area and the interdisciplinary contributions. It also provides managerial implications and dimensions while suggesting strategic and operational solutions for the industry. In April 2007 to January 2008, online databases of ScienceDirect and EBSCOHost's tourism and hospitality index, as well as the Google Scholar search engine were used to search for related articles, mainly in the tourism literature, using different combinations of keywords that are related to eTourism. Key references from mainstream journals were also included in the analysis. Besides, published articles in ENTER proceedings and the JITT were thoroughly read through by the authors to identify the relevant articles. At the end of the database search, more than 149 published articles were determined to be relevant to this study as they had made a critical contribution to this area and they are analysed in this paper.

2. Consumers and demand dimensions

Increasingly, ICTs enable travellers to access reliable and accurate information as well as to undertake reservations in a fraction of time, cost and inconvenience required by conventional methods (O'Connor, 1999). ICTs can assist in the improvement of the service quality and contribute to higher guest/traveller satisfaction. ICTs place users in the middle of its functionality and product delivery. Every tourist is different, carrying a unique blend of experiences, motivations, and desires. To an extent the new sophisticated traveller has emerged as a result of experience. Tourists from the major generating regions of the world have become frequent travellers, are linguistically and technologically skilled and can function in multicultural and demanding environments overseas. The development of ICTs and particularly the Internet empowered the "new" tourist who is becoming knowledgeable and is

seeking exceptional value for money and time. They are less interested in following the crowds in packaged tours and much more keen to pursue their own preferences and schedules. Increasingly, package tours are loosing market share in favour of independently organised tourism facilitated by dynamic packaging. The contemporary/connected consumer is far less willing to wait or put up with delays, to the point where patience is a disappearing virtue. The key to success lies in the quick identification of consumer needs and in reaching potential clients with comprehensive, personalised and up-to-date products and services that satisfy those needs. Gradually new, experienced, sophisticated, and demanding travellers require interacting with suppliers to satisfy their own specific needs and wishes. Living in a hectic life, consumers in the developed world often have short periods of time to relax their batteries and also to engage in their favourite activities. Leisure time will increasingly be used for "edutainment", i.e. the exploration of personal interests for both their personal and professional development.

Travel and holidays are one of the most expensive items purchased regularly by households around the world, and it represents a significant proportion of individual's annual budget. The Internet has changed tourism consumer behaviour dramatically (Mills & Law, 2004). Prospective travellers have direct access to a much greater wealth of information provided by tourism organisations, private enterprises and increasingly by other users/consumers. From information search, to destination/product consumption and post experience engagement, ICTs offer a range of tools to facilitate and improve the process. Customers search for travel-related information, make online air-ticket bookings, online room reservations, and other online purchases themselves instead of relying on travel agencies to undertake this process for them (Morrison, Jing, O'Leary, & Lipping, 2001). Due to the popularity of Internet applications, most tourism organisations such as hotels, airlines, and travel agencies have embraced Internet technologies as part of their marketing and communication strategies.

Information Search is a significant part of the purchase decision process and was revolutionised as a result of the Internet. ICTs not only reduce uncertainty and perceived risks but also enhance the quality of trips (Fodness & Murray, 1997). The more research undertaken on a trip and the more information found, the better customer needs can be met and served. A well-informed consumer is able to interact better with local resources and cultures, to find products and services that meet his/her requirements and to take advantage of special offers and reduced prices. According to Snepenger, Meged, Snelling, and Worrall (1990), the four major factors that influence information search in the tourism context are (i) the composition of vacation groups, (ii) the presence of families and friends at the destination, (iii) prior visits to the destination, and (iv) the degree of novelty associated with the destination. Gursoy and McCleary (2004) developed a comprehensive theoretical model that integrated all psychological/motivational, economics, and processing approaches into a cohesive whole for understanding tourists' information seeking behaviour.

Moreover, Jang (2004) proposed that future research should explore potential travellers' concerns and difficulties when planning and purchasing trips online, which can be achieved through in-depth analysis of relationships regarding information search and cross-cultural impacts on tourists' online information search behaviours. Buhalis (1998) stated that potential tourists have become more independent and sophisticated on using a wide range of tools to arrange for their trips. These include reservation systems and online travel agencies (such as Expedia), search engines and meta-search engines (such as Google and Kayak, respectively), destination management systems (such as visitbritain.com), social networking and web 2.0 portals (such as wayn and tripadvisor), price comparison sites (such as kelkoo) as well as individual suppliers and intermediaries sites. Pricing is also a major issue in eTourism as many organisations use ICTs to communicate directly to consumers on web-only fares and rates, passing on discounts that are generated from saved commissions and distribution charges made in a short value chain. Research found substantial price dispersion for domestic airline tickets offered by online travel agents in the US where the average price was lower than traditional travel agents (Brynjolfsson & Smith, 2000; Clemons, Hann, & Hitt, 2002). Also, customers have spent increasingly more time on price comparisons on different travel websites such as Kayak and Kelkoo searching for alternative products that can reduce the cost of their travels. Prior research shows that search costs decrease in electronic markets due to diminishing cost of data exchange. This, in turn, enables consumers to find offers that meet their needs and tastes (Bakos, 1997, 1998).

The Internet is one of the most influential technologies that have changed travellers' *behaviour*. Previous research showed that tourists who searched on the Internet tended to spend more at their destinations as compared to those who consult other information sources (Bonn, Furr, & Susskind, 1998; Luo, Feng, & Cai, 2004). The Internet enabled consumers to engage directly with suppliers and challenging the role of intermediaries. It also allowed consumers to interact dynamically with suppliers and destinations and often make requests that will enable them to customise their products. At present, there is a large increase in the number of customers who make reservations directly from hotel websites (Jeong, Oh, & Gregoire, 2003). With rapid data transmission on the Internet, the expected response time from organisations to customers has been greatly reduced. The reaction to online inquiries can thus influence customer satisfactions and booking behaviour. As a result, response behaviour becomes an essential factor for the success of small and medium-sized tourism enterprises (Main, 2001; Pechlaner, Rienzner, Matzler, & Osti, 2002). In addition, satisfaction online

has a positive impact on loyalty both to the organisational programmes and their website (Anderson & Srinivansan, 2003). According to Wolfe, Hsu, and Kang's (2004) research, the reasons of consumers not purchasing travel products online are the lack of personal service, security issues, lack of experience, and time consuming. Weber and Roehl (1999) found that people purchasing travel products online are more likely to have been online for 4 years or more and trust can be built between customers and online businesses through positive experience of past transactions (Bai, Hu, Elsworth, & Countryman, 2004; Bieger, Beritelli, Weinert, & Wittmer, 2005). The Internet is already influencing the consumer behaviour in developing countries such as China enabling consumers to have much more choice (Li & Buhalis, 2005).

Although plenty of choices are available on the Internet for customers to choose from, psychological barriers often prevent consumers from completing transactions online, resulting to "lookers" purchasing products off-line. With less time spent on waiting and planning, and more time on enjoyment, consumers would surely like to make reservations and received tickets at home via travel websites (O'Connor & Frew, 2001). Moreover, e-shopping provides a large geographic coverage which consumers can choose from a great product assortment when they shop at home (Peterson, Balasubramanian, & Bronnenberg, 1997). Werthner and Ricci (2004) have thus found that the tourism industry is leading eCommerce applications. However, since payment is the most important item in eCommerce, consumers are always concerned on payment security. Such concerns are a possible outcome of computer crimes, which are one of the primary factors that prevent consumers from providing credit card information. Mills, Ismail, Werner, and Hackshaw (2002) listed several cybercrimes such as auction fraud, vacation fraud, gaming fraud, spamming, and identity theft. Business organisations must therefore pay more attention to protect themselves and their customers from losses due to cybercrimes. These crimes, however, are not likely to be completely prevented or easily detected by law enforcement alone (Mills et al., 2002). Additionally, privacy issues are found to be of major concern to many consumers. This leads to the situation that many travellers use the Internet to search for information but still purchase offline. Research findings have shown privacy issues also play a significant role in inhibiting purchase of travel-related products online (Kolsaker, Lee-Kelley, & Choy, 2004). Website owners should, therefore, pay more attention on making customers feel comfortable and secure to complete their reservations and to increase trust in the online environment (Bauernfeind & Zins, 2006; Chen, 2006).

Virtual communities are gradually becoming incredibly influential in tourism as consumers increasingly trust better their peers, rather than marketing messages. The most cited definition of a virtual community was firstly given by Rheingold (1993, p. 58) as "a virtual community is a group of people who may or may not meet one another face-to-face, and who exchange words and ideas through the mediation of computer bulletin boards and networks". A Virtual Travel Community (VTC) makes it easier for people to obtain information, maintain connections, develop relationships, and eventually make travel-related decisions (Stepchenkova, Mills, & Jiang, 2007). Vogt and Fesenmaier (1998) stated that participation and attitude are the primary dimensions of consumer behaviour in the virtual communities. Since many travellers like to share their travel experiences and recommendations with others, VTCs have become one of their favourite areas to post their travel diary. Additionally, online travellers are enthusiastic to meet other travellers who have similar attitudes, interests, and way of life (Wang, Yu, & Fesenmaier, 2002). As such, better understanding VTC users' behaviour and motivation can assist tourism practitioners and policy makers to establish, operate, and maintain VTCs in a more efficient way. This, in turn, facilitates consumer centric marketing or relationship marketing (Niininen, March, & Buhalis, 2006). VTCs, however, may be at risk of losing members if their members are not satisfied with the content, design, security policies, and repercussions for non-compliance with community rules (Allison, Currall, Moss, & Stuart, 2005; Wang et al., 2002). The emergence of *Web 2.0 or Travel 2.0* brings together the concept of social networking/virtual communities and applies it to the tourism industry. TripAdvisor (www.tripadvisor.com) is amongst the most successful social networking/virtual community in tourism that facilitates the reviewing of all hotels around the world and brings together individuals in discussion forums. The system provides users with independent travel reviews and comments written from TripAdvisor members and expert advisors and provides a powerful platform for interaction between peers (Wang & Fesenmaier, 2004b). User satisfaction is a major factor for evaluating a travel organisation. By analysing VTCs' content, travel organisations can understand their customers' satisfactions and behaviour, and undertake corrective actions to improve their offering. They can also increase brand awareness and strengthen brand association through the assistance of VTCs. Despite VTCs' large potential impact on the tourism industry, Preece (2000) stated that research on the topic is still at an infancy stage when compared to other geographical and physical communities.

ICTs and the Internet have dramatically increased the number of *choices* for consumers. Until the emergence of the Internet, consumers could only access major brand names and also those organisations in their immediate vicinity. Consumers can now have much more choice for searching and subsequently purchasing on the Internet. The choice is availed from single products to dynamically packaging holidays. For example, with the fast expansion of no-frills airlines such as easyJet and Ryanair, as well as with holiday packages and hotel rooms discounted at the last-minute, travellers can enjoy low-cost travel. Oorni and Klein (2003), however, found that low-cost airlines have

high online booking ratios because they offer simple products and are pursuing a direct sales strategy. Other airlines with complicated yield management strategies simply obstruct consumers to search for flights efficiently without expert assistance. Leading global online travel agents, such as Expedia, Orbitz, Lastminute.com, Opodo, and Travelocity, are mainly successful for their provision of a platform for one-stop shopping with significant improvement in usability and interaction design (Klein, 2002). Comparing with traditional travel organisations, making websites more user-friendly and with simple pricing could help attract customers to complete the online transactions.

One of the problems that the Internet has a brought around was that of too many choices. When novice web users search for travel information, they tend to browse through multiple websites. This is often the result of starting seeking information in a generic search engine such as Google. A *recommender system* is to provide assistance in the social process of indicating or receiving indications about what options are better suited in a specific case for specific individuals (Gretzel, Mitsche, Hwang, & Fesenmaier, 2004; Resnick & Varian, 1997). Ricci (2002) further stated that a recommender system can provide valuable information to assist consumers' decision-making process. A recommender system can support travellers in a complex decision-making process by identifying better customer requirements and by correlating those to other consumers and their preferences (Fesenmaier, Werthner, & Wöber, 2003; Ricci & Werthner, 2002, 2006). Personality has been related to the selection of vacation destinations, the choice of leisure activities throughout the vacation, and other travel-related decisions. When implementing tourism recommender systems, textual summary is used to classify the database item (tourism options) in themes or categories of the ontology (Loh, Lorenzi, Saldana, & Licthnow, 2004). Although different recommendation technologies have been applied to eTourism, Rabanser and Ricci (2005) argued that the existence of different business models present application challenges.

ICTs also provide a very effective mechanism for consumers to air *complaints*. In the past, less than 5% of customers who were dissatisfied had actually voiced out their complaints (Albrecht & Zemke, 1985). In order to provide a channel for customers to have feedback and complaints, tourism organisations should have an e-complaint handling section on their websites so that there is a proper channel of communication between management and unsatisfied customers. However, with the rapid development of the Internet, users at present can easily spread their complaints which, in turn, can significantly affect a company's image. Electronic Word-Of-Mouth (WOM) is a useful tool to disseminate complaints about brands via websites, chat rooms, and consumer forums (Gelb & Sundaram, 2002). Untied.com is probably one of the most famous examples of an individual who not only used his website to complain against United Airlines himself but also to accumulate thousands of complaints from fellow travellers. In the Internet era, even individuals have sufficient power to take on powerful organisations such as airlines (Buhalis, 2004). Many consumers rely on WOM to reduce the perceived risks and uncertainty before they make any purchases (Walker, 2001). Shea, Enghagen, and Khullar (2004) have illustrated a real case "Yours is a very bad Hotel" that made at least seven newspapers and magazines report the unpleasant experience. The influential power of the Internet, "complaint forum" and chat room were clearly shown in this study. At present, many tourism practitioners do not know which VTCs exist and how to handle e-complaints in virtual communities, resulting in losing customers and negative WOM (Mattila & Mount, 2003). To prevent the wide spread of e-complaints, tourism managers should locate these complaint forums and try to handle them professionally.

It is interesting to observe the many different ways in which the web is used by different market segments. Cotte, Chowdhury, Ratneshwar, and Ricci's (2006) study finds that utilitarian-consumption highly correlates with information search and online shopping behaviour. Utilitarian consumer behaviour is rationally task-directed rather than directed by the nature of the experience itself. Instead, pleasure-oriented consumers typically enjoy interacting with the Web to play Web-based games, e-mail, or chat. That is, interactive communication behaviour can be viewed as a sort of entertainment. Increasingly *profiling* will lead to better personalisation, customisation, and interaction between consumers and tourism organisations. Pouloudi, Vassilopoulou, and Ziouvelou (2002) summarised the Internet users' profile into seven e-social factors, namely: region/geography, culture, legal/regulation/policy, economic, ethical/professional, social capital/social networks, and social structure. In particular, information search behaviour has a significant relationship with demographic and lifestyle characteristics. Enabling consumers to develop their online profile and to include personal data that indicate their preference can support tourism organisations to provide better service. Also, understanding how different market segments appreciate different tourism products and services also enhances the possibilities to put suitable products forward. For instance, Lastminute.com collects suitable information to personalise the weekly newsletter sent to consumers and also identifies what parts of the newsletter are accessed by consumers in order to personalise their offerings even further. Demographics and life cycle information is critical for profiling. For example, where to go for holidays has long been considered as a joint decision-making process between husbands and wives. In recent years, children, however, also play a key role in the decision-making process (Wang, Hsieh, Yeh, & Tsai, 2004). Children often seek fun, games, and chat rooms on the Internet. As such, for the children-target tourism attractions, managers should provide more children-friendly content, such as interactive games in order to attract children to visit and

engage with their websites (Tufte & Rasmussen, 2003). With the growing popularity of the Internet, not only teenagers browse information online, but also senior members of the society (e.g. age 50 and above) are also becoming active Internet users. According to Graeupl (2006), flight information and accommodation are the most searched topics for the consumers aged between 50 and 60 years olds, and most of them were not interested in package holidays. As a result, consumers have expressed their increasing interests for more convenience, choice, and in online travel shopping.

Increasingly consumers are willing to provide significant personal information in exchange for recognition and better services. Tourism organisations should also collect customer information at each stage of service, before, during, and after a visit in order to understand behaviour choices, concerns, and determinants. Customer satisfaction depends highly on the accuracy and comprehensiveness of specific tourism information and the ability of organisations to react instantly to consumer requests. Consumers not only require value for money, but also value for time for the entire range of their dealings with organisations. This reflects people's shortage of time, which is already evident in Western societies. Therefore, the value proposition offered to consumers needs to be revised accordingly (Minghetti, 2003). Personalised services driven by advanced Customer Relationship Management systems should record customer preferences and requirements for present and future usage (Picolli, O'Connor, Capaccioli, & Alvarez, 2003). Systems need to be location, context, and mood aware in order to provide sensible advice.

2.1. Implications

Tourism organisations therefore need to recognise these changes and to develop personalised services to address individual needs. Proactive services may be offered based on the anticipated needs resulting from known/declared or previously experienced customer profiles. Reactive services should be designed to meet the needs of customers following incidents or external environment factors. In order to achieve customer centricity, organisations need to integrate all their systems and develop mechanisms for both recording customer reaction to stimulus and also for providing suggestions to both employees and the customers themselves. An off the cuff complaint at the pool bar of a hotel, for example, can be channelled through the system and resolved on the spot. Equally requests and concerns during the reservation process should be passed on to the personnel that are developed for product delivery.

3. Technological innovation

Constant innovation in applications of hardware, software, and network developments means that only dynamic organisations, which can assess the requirements of their stakeholders and respond efficiently and effectively, will be able to outperform their competitors and maintain their long-term prosperity. Rapid technological development paradoxically means that the more powerful and complex the ICTs become, the more affordable, user-friendly they become, enabling more people and organisations to take advantage. Technological innovations in hardware, software, and netware have been propelling a wide range of changes in Information Systems (IS). ICTs convergence effectively integrates the entire range of hardware, software, groupware, netware, and humanware and blurs the boundaries between equipment and software (Werthner & Klein, 1999). Wireless and mobile networks are extensively used for communications, networking of equipment, and interoperability between both organisations and functions. As a result, IS have evolved from simply interrelated components working together to collect, process, store and disseminate information to support decision-making, coordination, control, analysis and visualisation in an organisation, to dynamic, interoperable mechanisms of collecting, processing and disseminating intelligence within organisations and in their extensive environment (Laudon & Laudon, 2007; Turban & Aronson, 2001). Technology therefore emerges as an "info-structure" of an organisation that supports the entire range of internal and external communications and processes (Buhalis, 2003). ICTs are becoming a holistic integrated system of networked equipment and software, which enables effective data processing and communication for organisational benefit. In the last few years, a number of technologies have been identified as critical for further innovation in the tourism industry. These technologies primarily provide innovative software and network that support organisations to improve their communications with partners and consumers.

Interoperability and Ontology building is one of these technologies. Werthner and Klein (1999) defined interoperability as the provision of a well-defined and end-to-end service which is in a consistent and predictable way. This generally covers not merely technical features but also in the case of electronic market environments, contractual features and a set of institutional rules. Stabb and Werthner (2002) stated that interoperability is a major technical issue. Interoperability offers a realistic alternative to standardisation, as many of the initiatives to establish global standards in tourism have failed to be widely accepted. This is due to the lack of flexibility of the standardisation process which requires every detail of the exchanged messages, including all the technical details depending on the communication mechanism being committed among all the communication partners, resulting to a high effort for defining and maintaining such standards (Fodor & Werthner, 2005). Interoperability enables partners to interact electronically with each other by the most convenient method and to deliver the right information at the right time to the right user at the right cost. Using an ontology that represents a set of concepts within a domain and the relationships between those concepts a mediator

software system (such as Harmonise) effectively "translates" partners' data and allows them to communicate electronically. Jakkilinki, Georgievski, and Sharda (2007) proposed an ontology-based eTourism Planner-AuSTO that enables users to create itinerary in one single application by this intelligent tool that builds on semantic web technologies. Similarly, Maedche and Staab (2002, 2003) showed that semantic web technologies can be used for tourism IS to provide useful information on text and graphics, as well as generating a semantic description that is interpretable by machines. The OntoMat-Service, introduced by Agarwal, Handschuh, and Staab (2003), can embed the process of web service discovery. Travellers thus no longer need to search information among millions of websites to grab the desire information. To the degree that tourism organisations need to interact dynamically with partners to develop and deliver tourism products, interoperability will be critical for their ability to work efficiently with others.

Multimedia is also becoming one of key areas of development that influences tourism. Tourism information needs an extensive representation of photos and graphics in order to provide a tangible image or experience to travel planners. Using animations or video clips can enhance information richness and interaction. Unlike offline information, which is unilaterally exposed to travellers, the Web allows people from around the world to virtually interact with a destination through three-dimensional (3D) virtual tours (Cho & Fesenmaier, 2001). The experience within a computer-mediated environment can simulate real visits and virtual experience can provide almost real-life experiences. This can lead to the creation and communication of destination image (Cho, Wang, & Fesenmaier, 2002). The 3D interactive websites have been adopted by online marketers to attract online consumers, encourage online purchases, and to create loyalty (Fiore, Kim, & Lee, 2005). Tourists can get visualised tourism information from digital maps with aerial and satellite images in both two dimensions and even three dimensions (Raggam & Almer, 2005). Interactivity can be further enhanced using multimedia. Abad, Sorzabal, and Linaza (2005) demonstrate how tourist attractions can be presented dynamically by virtual characters in real time, which is enhanced by the multimedia information about the items stored in a database. Using the system, visitors can ask for available attractions that correspond to the selection criteria with ranking based on travellers' preferences. Interacting with multimedia-enhanced websites can produce telepresence and allow people to "experience" products and destinations without actually visiting a place. Telepresence uses a range of technologies to make users feel as if they were present at a location or situation which in reality they are not (Steuer, 1992). Telepresence relies on how closely the computer-mediated experience simulates real-world interaction with a product and is determined by the extent to which interactivity is achieved (Fiore et al., 2005; Shih, 1998).

Perhaps one of the most interesting areas is *mobile and wireless technologies*. Wireless is a term used widely to describe telecommunications in which electromagnetic waves (as opposed to wire) carry a signal. ICT developments have proliferated the use of wireless applications and devices, including: cellular phones and pagers; global positioning system; cordless computer peripherals and telephones; home-remote control and monitor systems. The development of mobile telephony over the Global System for Mobile Communication (GSM) and the Wireless Application Protocol (WAP) allowed the communication of voice and data over mobile phones. General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS) as well as I-Mode in Japan gradually introduce third generation (3G) mobile phones and services, empowering the communication of multimedia information on interactive mobile devices. Mobile phones now have a greater penetration even to digitally excluded communities. The proliferation of different mobile devices, such as Personal Digital Assistants (PDAs) and 3G mobile phones with Global Position Systems (GPSs) enable travellers to retrieve travel-related information without any time and geographic constraints. In addition, mobile services now enable travellers to book hotel rooms and air-tickets, car rentals, retrieve information about transportation schedules, travel guides for destinations, and dining guides (Berger, Lehmann, & Lehner, 2003). Flouri and Buhalis (2004) stated several potential mobile applications such as SMS and MMS. Solon, McKevitt, and Curran (2004) developed TeleMorph that can determine the mobile network bandwidth to output presentations, and receive and interpret voice questions from tourists to show destination information. This technology can prevent information delay when travellers retrieve information from low bandwidth networks. Alfaro, Nardon, Pianesi, Stock, and Zancanaro (2005) implemented a multimedia guide on PDA with each destination installed infra-red emitters. When tourists approach, their PDAs will automatically display a multimedia presentation of the destination. A major challenge for their wide adoption, however, is the language barriers (Chen & Hsu, 2000) that make the mobile information not providing the latest information due to delay in translation.

In addition to mobile networks, Wireless Local Area Networks (WLANs) allow users to connect devices to the Internet through a wireless-radio connection (WiFi), while Bluetooth connects PDAs, cell phones, computer mice, and other peripherals over short distances. WLANs have limited area coverage and they are offered at a range of about 100 m away from stationary hot-spots. WiFi is now extensively used in hotels, airports, and cafes allowing people to connect to the Internet. It is not expected to offer wide and omnipresent coverage like mobile networks do. The next technological evolution emerging is WiMAX, defined as Worldwide Interoperability for Microwave Access. WiMAX promotes conformance and interoperability of the IEEE 802.16 standard and provides wireless

data over a long distance (Patton, Aukerman, & Shorter, 2005). This enables users to browse the Internet without physically connecting the computer to a wall jack. WiMAX supports the delivery of last mile wireless broadband access as an alternative to cable and DSL. WiMAX is expected to offer the highest possible coverage, up to 30 miles (Odinma, Oborkhale, & Kah, 2007) providing Internet broadband wireless access to entire destinations. This will support users to have Internet access while at the destination without having to pay expensive data-roaming charges. WiMAX is also predicted to have its largest impact in developed countries or rural, remote locations characterised by low population density in which an adequate wired infrastructure was never developed, or cannot be developed for economical reasons (WiMAX Forum, 2004). This narrows the digital divide, favouring the transition to a new stage of information and service providers (Ohrtman, 2005). Always-on (when users are connected to the Internet constantly) connectivity creates great opportunities for interactivity at the destination and the provision of personalised, contextualised, and location based services (LBS). The four primary functions of LBS for the traveller are: (1) localisation of persons, objects, and places, (2) routing between them, (3) search for objects in proximity such as restaurants, shops, hotels, or sights, and (4) information about travelling conditions, such as traffic-related data (Berger et al., 2003).

Web design in both functionality and usability senses is also becoming of critical importance. Travellers expect websites to be informative, interactive, and attractive (Chu, 2001). Kim and Lee (2004) classified web service quality into six dimensions, namely: ease of use, usefulness, information content, security, responsiveness, and personalisation. In Law and Cheung's (2005) study on customers' weighting factors on hotel website contents, they found that reservation information was the most important dimension. A successful website should therefore take customers' interest and participation into consideration, to capture information about their preference, and to subsequently use the information to provide personalised communications and services (Chung & Law, 2003; Doolin, Burgess, & Cooper, 2002). Hashim, Murphy, and Law (2007) consolidated 25 tourism and hospitality website studies from 1996 to 2006 on website quality and features analysis and generated 74 website features. Hoteliers must therefore routinely evaluate their websites in order to ensure that the sites are efficient, appropriate, and useful to customers (Baloglu & Pekcan, 2006). Lastly, Cunliffe (2000) emphasised a poor web design resulted in a loss of 50% of potential sales and the negative experience lead to a loss of 40% of potential repeated visits.

Related to usability is *accessibility* which addresses the fact that web surfing is still a barrier for people with disabilities (Michopoulou, Buhalis, Michailidis, & Ambrose, 2007). Examples of the physical barriers include: low vision users will need large text or spatial adjustment, blind people will require screen readers, colour-blindness users will need adequate contrast of text and background colours, and deaf people should have visual displays rather than pure audio presentations. Han and Mills (2006) stated that the current website design have nine themes that will affect the screen readers for the visually impaired users. In response, the World Wide Web Consortium has illustrated requirements for using websites and Web-based applications, and has provided supporting information for guidelines and technical work (W3C, 2005). Hence, by exploiting this knowledge and following the Web Content Accessibility Guidelines (Chrisholm, Vanderheiden, & Jacobs, 1999) from the W3C Web Accessibility Initiative (WAI), content can be presented in an accessible and customisable way, accommodating users' needs and preferences. The hospitality and tourism industries should be aware of the fact that people with disabilities and the elderly represent a growing market segment. Assistive technologies such as voice browsers can provide certain assistance for these customers to access web information (Pühretmair, 2004). Waldhor, Freidl, Fessler, and Starha (2007) for example implemented an automated call centre agent (RESA) for a low-budget hotel, which enables customers to use their phones and voice to reserve hotel rooms via RESA without the need to go through any human agents. RESA can automatically select a desired room on the basis of customer's voiced criteria. Rumetshofer and Wöß (2004) introduced intelligent accessibility add-on that allows users to create their personal profiles with their special needs, and the update depends on the user's input and action over time. System environments and navigation styles can also be automatically managed. Nevertheless, these technologies need further customisation before they can totally match with users' needs. To attract business and provide convenience to the physically challenged customers, tourism web designer should consider the needs from every group of users and to design websites to address inclusion.

Perhaps the next major revolution will emerge in the form of *Ambient Intelligence* (*AI*) defined by ISTAG (2003) as a set of properties of an environment in which people are in the process of creating. AI represents a new paradigm for how people can work and live together. According to the ISTAG vision statement, in an Ambient Intelligent Environment humans will be surrounded by intelligent interfaces supported by computing and networking technology that is embedded in everyday objects, such as furniture, clothes, vehicles, roads and smart materials—even particles of decorative substances like paint (Manes, 2003). Humans will live in an AI space in which there will be seamless interoperation between different environments—home, vehicle, public space, work, leisure space, tourism destination, etc. This implies a seamless environment of computing, advanced networking technology and specific interfaces which should be aware of the specific characteristics of human presence and personalities; adapt to the needs of users; be capable of responding intelligently to spoken or gestured indications of desire; and even result in systems that are capable of engaging in intelligent

dialogue. Pursuit of the AI vision will require contributions from many streams of research to realise both "ambience" and "intelligence". The development of the AI space will depend not simply on finding solutions to the research challenges for ambience and intelligence, but on the extent to which mechanisms can be found to ensure the successful, seamless, integration of components and their convergence into AI systems. There are a number of research domains or components in which significant progress must be made in order to further develop and realise the AI vision (Buhalis & O'Connor, 2005).

3.1. Implications

The technical complexity of modern systems based on ICTs demands that all aspects of the innovation chain integrate their efforts. The concentration and coherence required to achieve both significant technological development and market impact necessitate engagement of both the research and business communities to integrate the rapid co-evolution of technology, the market, social, and administrative requirements.

4. Industry and business functions

Although the literature has been dominated by applications which explain how to automate rather than how to assist organisation to evolve to the new era, gradually the importance and necessity of ICTs' usage for both the strategic and operational tourism management is emerging in the literature (Inkpen, 1998; O'Connor, 1999; Marcussen, 1999a, 1999b). Increasingly ICTs are used to re-engineer all business functions and processes towards supporting the organisation on its entirety rather than automating.

The *strategic* and *operational* dimensions of ICTs for tourism strategy are emerging in the literature. Law and Jogaratnam (2005) advocated that technologies can become part of the strategic planning process of a business only when managers make full use of it. Furthermore, effective ICT applications require the knowledge of managers and operating staff. ICTs should be used for both operational and strategic management. ICT developments have direct impacts on the *competitiveness* of enterprises, they determine the two fundamental roots to competitive advantage, i.e. differentiation and cost advantage (Porter, 2001). Moreover, it is crucial for tourism practitioners to proactively incorporate ICTs into their efforts to improve service quality as ICTs enable organisations to dynamically differentiate and specialise their products and services. This almost leads to the market segment of one, where consumers can build their tourism experience by bundling their products dynamically (Buhalis & O'Connor, 2005). Recently, Mazanec, Wöber, and Zins (2007) argued that it is necessary to develop an Internet website when the competitiveness of a tourism destination is evaluated. ICTs also become instrumental to cost management in the industry and particularly for the distribution and promotion costs (Connolly, Olsen, & Moore, 1998). Redesigning processes and eliminating repetitive tasks reduced labour costs and increased efficiency (Buhalis, 1998). This has empowered the development of no-frills organisations that use technology heavily for operations and distribution and at the same time it has put incredible pressure on traditional organisations to re-engineer their operations. On several occasions, this has led to outsourcing functions and process to external organisations (Paraskevas & Buhalis, 2002).

The emergence of the Internet affected all Five Forces in Porter's (1979, 1980) model, as it changed the conditions of competition in the marketplace. The Internet is changing the industry structure by altering barriers to entry, minimising switching costs, revolutionising distribution channels, facilitating price transparency and competition, while enhancing production efficiency (Kim, Nam, & Stimpert, 2004). Rivalry among existing competitors was also revolutionised, as technology and the Internet affected differentiation and cost structures as well as switching costs. The Internet had a major effect on entry barriers as it altered market scope, economies of scale and the amount of capital required for competing. Porter (2001) demonstrates how the Internet has changed industry forces. The Internet has also enhanced the bargaining power of suppliers as it enabled them to monitor competitors and offer tailored and differentiated products. By being able to adjust to changes in demand and by being efficient, suppliers gain important cost savings. Overall, suppliers of travel products enhanced their position within the industry due to the increased possibility of interconnectivity and interactivity with consumers and partners. From a customer perspective, the Internet affected the bargaining power of buyers. Buyers gained bargaining power as they now have instant access to information, understand market offers and conditions better and are constantly exposed to special offers. They have more choice and are able to make direct comparisons that are rising from their expectations and demands. As Porter (2001, p. 70) states "buyers back away from open marketplaces. They may once again focus on building close, proprietary relationships with fewer suppliers, using Internet technologies to gain efficiency improvements in various aspects of those relationships". The increase in buyers' bargaining power is also related to the increased convenience, transparency, flexibility, direct communication with suppliers, and depth of the available information. The Internet also enabled them to dynamically package their individualised products by combining different travel products (i.e. accommodation, transportation, etc.) (Daniele & Frew, 2005). Access to a greater range of available suppliers also increased their power. The threat of substitution may also be affected by technological advancements (Porter, 1980). The intensified rivalry led to increased difficulty to create and sustain competitive advantages through differentiation strategies (Go, Govers, & van den Heuvel, 1999). Wöber (2001) suggested that the

identification of tourism destinations competing for the same market can be assisted by a Group Decision Support System (GDSS). In this way, decision-makers can include their subjective and objective views for analysis like the traditional forms of competitive analysis. Similarly, there was a shift in the bargaining power of suppliers, as the Internet provided alternative procurement opportunities. The bargaining power of suppliers was also enhanced by allowing direct contact with consumers and decreasing distribution costs while creating the opportunity for partnerships with countless affiliates and other distributors. Consequently, tourism enterprises for the first time ever did not have to rely exclusively on powerful intermediaries, such as Tour Operators or Global Distribution Systems. As a result, the Internet forces tourism organisations around the world to change their strategies dramatically (Buhalis & Zoge, 2007). Constant innovations of both product and process supported by proactive and reactive strategies are some of the few sources of competitive advantage in the Internet era (Buhalis, 2003).

Perhaps *marketing and distribution* are the most affected business functions from the technological revolution (Go & Williams, 1993; O'Connor, 2000; O'Connor & Frew, 2002; Yu & Law, 2000). Technology supported organisations to develop their knowledge base to improve their management and marketing functions (Fesenmaier, Leppers, & O'Leary, 1999; Schertler & Berger-Koch, 1999). By using the Web and the Internet as marketing tools, tourism organisations also gained some distinct advantages in cost reduction, revenue growth, marketing research and database development, and customer retention (Morrison, Taylor, Morrison, & Morrison, 1999). Reaching worldwide customers in a cost-effective way allows organisations to engage in a direct dialogue with consumers (Buhalis, 1998, 2003). The Internet has assisted tourism organisations to use a wide range of promotional activities to supplement, if not replace, offline promotions. This change is important as the Internet is generally considered as a multi-promotion tool and distribution channel (Gretzel, Yuan, & Fesenmaier, 2000; O'Connor & Frew, 2004). Web marketing is therefore gradually becoming mainstream (Buhalis, 2003; Fesenmaier, Gretzel, Hwang, & Wang, 2003). The flexibility of the Internet and the ability to address different target markets support tourism organisations to develop a marketing proposition for each target market and to create themes or routes through the destination to address the needs of each market. Thus, customers are dynamic targets at which marketers can aim promotional messages.

ICTs also transformed the distribution function to an electronic marketplace, where access to information and ubiquity is achieved, while interactivity between principals and consumers provides major opportunities. The Internet promotes the mass-customisation of tourism products as it supports the industry to target niche markets of significant size in different geographical locations. Hence, the Internet propels the re-engineering of the entire process of producing and delivering tourism products, as well as it boosts interactivity between partners that can design specialised products and promotion in order to maximise the value-added provided to individual consumers. Ultimately, ICT tools reinvent the packaging of tourism to a much more individual-focused activity, offering great opportunities for principals and intermediaries and enhancing the total quality of the final product (fitness to purpose). Electronic tourism distribution channels dictate the choice of product as the difference between products becomes secondary to the easiness of getting an entire transaction completed (Buhalis, 1998). Therefore, ICTs gradually change the function of distribution from facilitation of information exchange and reservations to a much more sophisticated mechanism of adding value and providing service Buhalis and Licata (2002). In addition, to the degree that a great number of new players provide tourism and regional information, there is a rapid expansion of intermediaries in the marketplace.

In the pre-Internet era tourism suppliers had no other choice but to use intermediaries, such as travel agents and tour operators, for their distribution functions. CRS and GDSs facilitated the intermediation process (Kärcher, 1997; O'Connor, 2003; Sheldon, 1997). Both intermediaries and end-consumers are dependant on comprehensive, accurate, and timely information to aid in their travel choice as a result of the intangible nature of the tourism products (Poon, 1993). The Web enabled organisations to be able to distribute their products not only through direct distribution but also through a very wide range of channels (O'Connor & Frew, 2002). Third party intermediaries included online travel agencies as well as meta search engines, all of which could distribute both static and dynamic information such as availability and pricing. Electronic intermediaries are also emerging dynamically and increasingly challenge traditional distributors. For example, Expedia and Lastminute.com are now challenging the business models of Thomson and Thomas Cook, forcing them to rethink their operations and strategies. Auctions sites such as eBay.com, price comparison sites such as Kelkoo and Kayak.com; price reversing sites such as Priceline.com and price prediction sites such as farecast.com also provide a great challenge for pricing of both suppliers and intermediaries. In addition, Web 2.0 or Travel 2.0 providers such as Tripadvisor.com, IGOUGO.com and Wayn.com also enable consumers to interact and to offer peer to peer advice. These changes force all tourism players to rethink their business models and to take drastic actions in re-developing their value chains. Tourism organisations aim to disintermediate all intermediaries that add cost to their production and distribution. For example, tour operators aim to sell their packages direct, bypassing travel agencies. They also disbundle their packages and sell individual components. On the other hand, travel agencies dynamically package tour products and support the development of customised packages, disintermediating tour operators. The web therefore introduced utter transparency in the marketplace

(Buhalis, 2003). This trend commoditised the tourism product and challenged differentiation strategies and branding. Consumers who search the Internet for accommodation or airlines for example would be offered listing of products based on price or commercial arrangements with intermediaries, rather than product attributes or brands. This had great implications, especially for branded products and services that could observe their customers switching products or channel if another product was cheaper by few dollars. Pricing became utterly transparent and hence the price that appeared in different distribution channels had to be coordinated to ensure price parity (O'Connor, 2003). Therefore, organisations had to reinforce their brands online and offline and to justify their positioning and pricing strategies. At the time of a very volatile environment in the marketplace, tourism intermediaries are forced to readdress both their revenue and costs bases as well as to re-evaluate all partnerships and value chains.

eLearning includes all technology-enabled learning. The Internet provided innovative tools and techniques to facilitate eLearning for both students and professionals (Baum & Sigala, 2001; Cheng & Piccoli, 2002; Piccoli, Ahmad, & Ives, 2001). eLearning is used by the entire range of the educational experience from distant leaning to mixed delivery and a wide range of research has been undertaken on the benefits and the challenges emerging. Tourism educators around the world use Virtual Learning Environments (VLEs) to support their class teaching, distribute notes and link to resources, stimulate discussion and facilitating marking and course administration. The Internet and computer simulations have also been used to simulate classroom discussions in order to enhance students' understanding and retention of taught theories (Fawcett & Lockwood, 2000). However, Sigala and Christou (2002) found that most educators mainly exploit the Internet in order to automate rather than to transform their instructions and foster pedagogical innovation. Naturally the educators' perceptions and abilities towards technology were found to significantly affect the type and degree of Internet use. Sigala (2002) explores Internet learning environments by reviewing and evaluating the evolution of practices in Internet pedagogy in order to identify effective e-learning models for tourism and hospitality education. Her three-era model of eLearning includes: automational era models that use the Internet for publishing and disseminating learning materials as a depository centre. The mass learning era employs networking and interactive capabilities of the Internet for developing virtual eLearning applications based on collaborative and constructivist instructions. Finally the mass-customisation era empowers customised learning to the needs of individual learners. She concludes that that e-learning models should aim at the personalisation of online instructions that simultaneously aim at exploiting the benefits of collaborative and constructivism practices.

eLearning is also widely utilised as an essential feature of training delivery, but the levels of its adoption in companies differ. eLearning has been accepted as a means of increasing skills and knowledge, and is being integrated into their training strategy along with other methods of delivering training. eLearning is particularly important for smaller companies that do not have sufficient resources to send their employees to expensive courses and those that require flexibility in working arrangements (Collins, Buhalis, & Peters, 2003). The time constraints and workload of managers of SMTEs frequently prevent them from attending training sessions during their working hours. Therefore, the prospect of flexible-location, cost-effective and time-independent learning environments may encourage them to participate more in training sessions via online learning systems. However, Braun (2002) suggests that SMTEs are still not committed to online training because they do not consider it a priority at present.

4.1. Implications

Despite the aforementioned benefits, hitherto the eTourism virtuality is still primitive. This jeopardises the opportunities for tourism corporations to develop credible interfaces with other members of the value-chain, and thus, it prevents them from developing their virtuality further. A number of organisations fail to appreciate the benefits of co-opetition and co-destiny, when organisations collaborate with players that they would normally regard as competitors. A wide range of issues must be therefore resolved before the tourism industry can take full advantage of the ICTs and maximise its virtuality.

5. Conclusions and future research

The technological revolution experienced through the development of the Internet has changed dramatically the market conditions for tourism organisations. ICTs evolve rapidly providing new tools for tourism marketing and management. They support the interactivity between tourism enterprises and consumers and as a result they re-engineer the entire process of developing, managing and marketing tourism products and destinations. Increasingly the impacts of ICTs are becoming clearer, as networking, dynamic interfaces with consumers and partners and the ability to re-develop the tourism product proactively and reactively are critical for the competitiveness of tourism organisations. The literature review undertaken demonstrates that eTourism research is in its infancy and that a number of issues have only now started being addressed in the literature.

Increasingly ICTs will provide the "info-structure" for the entire industry and will overtake all mechanistic aspects of tourism transactions. It is evident, however, that the future of eTourism will be focused on consumer-centric technologies that will support organisations to interact with their customers dynamically. Consumers are

becoming incredibly powerful and are increasingly able to determine elements of their tourism products. They are also much more sophisticated and experienced and therefore are much more difficult to please. Innovative tourism enterprises will have the ability to divert resources and expertise to servicing consumers and provide a higher value added transactions. The development of new and more powerful ICT applications empowers both suppliers and destinations to enhance their efficiency and re-engineer their communication strategies. Innovative technologies will support interoperability, personalisation, and constant networking. Agile strategies are therefore required at both strategic and tactical management levels to ensure that the ICT-driven opportunities and challenges are turned to the advantage of tourism organisations towards enhancing their innovation and competitiveness.

Like all studies, this paper is not without limitations. A major limitation of this study is the predominant inclusion of publications from publication channels in tourism. A natural extension of this study is, therefore, to include more publications from mainstream journals. It would be interesting to compare and contrast prior research endeavours between tourism researchers and other researchers in the context of eTourism. Other limitations of this study are the adoption of an unsophisticated method for grouping the published articles, and the absence of empirical data from industrial practitioners and academic researchers to comment on the applicability and implications of the published articles. Thus, we advocate the importance of performing future studies to address these issues. In spite of these limitations, this paper should be of value to readers to better understand the research that has recently been conducted by tourism researchers. Lastly, the paper presents the included publications in a comprehensive approach. A future attempt can extend the time period of publications, and critically analyses the findings in a progressive way.

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