

Ryan Jopp / Nicola Fish / Tony Nankervis

# Applications of technology in visitor attractions: Revisiting Stipanuk's perspective of the tourism/ technology interface

## Abstract

In the face of an increasingly sophisticated consumer base, attractions of all types are embracing technology as a means of 'creating' or enhancing the visitor experience (Neuhofer, Buhalis & Ladkin, 2014). Perhaps because they represent the most obvious example of technological application in attractions, theme parks have been the primary focus of contemporary literature as it relates to the tourism/technology nexus. However, it is suggested that this perspective is too narrow as it neglects the myriad of uses of technologies across the entire spectrum of attractions.

This paper revisits the seminal work of Stipanuk (1993) which called for a broader view, postulating applications ranging from technology as creator/enhancer, to technology as protector, focal point, and even, potentially, destroyer of attractions. A conceptual model is then advanced which depicts technology as having an eclectic set of applications across a broad spectrum of attractions.

**Key words:** tourism; technology; Stipanuk; attractions management

## Introduction

In what now seems a strikingly prophetic examination of technological applications in tourism, Schafer (1989, p. 2) observed that "science and technology [are] often the wild cards in the tourism strategic planning game – appearing unexpectedly, creating entirely new markets or causing further segmentation of current ones". Despite describing Schafer's work as "visionary and innovative", Stipanuk (1993, p. 267) bemoaned the narrowness of the literature relating to the interaction between technology and tourism and called for a view of technology that [goes] beyond considerations of simply "technology-as tool". In doing so Stipanuk called for a multi-dimensional perspective.

As such, this paper revisits Stipanuk's conceptual framework, and examines it in the more specific context of visitor attractions. Stipanuk's original paper established six major roles for technology within tourism: "creator, protector, enhancer, focal point, tool and destroyer" (Stipanuk, 1993, p. 267). This paper explores the evolving nature and importance of each of these roles, within the attraction sector, and provides number of contemporary examples to illustrate both modern applications and future implications. As with the original work, this paper highlights industry opportunities to leverage technology, but perhaps more importantly, the discussion incorporates a broader definition of tourism attractions, beyond the concept of theme parks, while highlighting growing concerns around sustainability. Based

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**Ryan Jopp**, PhD, Lecturer, Swinburne Business School, Swinburne University of Technology, Melbourne, Australia;  
E-mail: [rjopp@swin.edu.au](mailto:rjopp@swin.edu.au)

**Nicola Fish**, Lecturer, Office of PVC (Student Engagement), Swinburne University of Technology, Melbourne, Australia;  
E-mail: [nfish@swin.edu.au](mailto:nfish@swin.edu.au)

**Tony Nankervis**, PhD, Adjunct Teaching Fellow, Swinburne Business School, Swinburne University of Technology, Melbourne, Australia; E-mail: [anankervis@swin.edu.au](mailto:anankervis@swin.edu.au)

on this discussion, a conceptual model is advanced which depicts technology as having a diverse and eclectic set of applications across a broad spectrum of attractions.

## Applications of technology in attractions

Of the many changes confronting attractions at a site-specific level, arguably the most pervasive and pronounced are those of a technological nature. They assume particular importance because they frequently provide the means by which the management of attractions can respond to economic, social and political forces. Elements of both early and contemporary literature (Benckendorff, Moscardo & Murphy, 2005; Martin & Mason, 1993; Milman, 2001; Neuhofer, Buhalis & Ladkin, 2014; Oliver, 1989; Stipanuk, 1993) all allude to technology as a significant influence in the success of visitor attractions.

The almost intuitive tendency to view the interface between technology and attractions as being vested in the process of creating or enhancing the visitor experience is viewed as being too narrow, since it ignores other equally important applications. In an early, but valuable examination of the interactions between tourism and technology, Stipanuk (1993) advanced six major roles for technology in tourism. In an attempt to "broaden the discussion beyond that typically found in the [then] current literature" (Stipanuk, 1993, p. 267), a continuum was conceptualised between applications of technology as creator of the tourism experience [as might be demonstrated by such things as building and engineering technologies]; and technology as destroyer of the experience born of a potential over reliance on systems which may be prone to failure (Stipanuk, 1993, p. 275). Technology as protector, enhancer, focal point, and tool of the visitor experience completed Stipanuk's typology. In later work (Swarbrooke, 2002, pp. 89-90) offers a somewhat more focused perspective, viewing the roles of technology as being vested in applications to; the attractions product, the management of attractions, and as competition for attractions.

Perhaps the most significant distinction in Stipanuk's view is that of technology as creator and enhancer. Here the parallel distinction exists between a purely contrived attraction, where the scale of technological application is customarily high; and a natural attraction, where technology might be employed to provide access or ease of view, which would potentially enhance the visitor experience. These distinctions are explored throughout this paper and examples provided.

## The visitor experience

The tourism sector is an increasingly information rich industry, with technology and online connectivity reshaping the entire travel experience. From pre-trip research and bookings via online sites such as TripAdvisor and Airbnb, via your browser or an app on your phone. To the in-situ incorporation of virtual or augmented reality experiences on site, through the use of so-called 'wearables', such as smart watches and glasses (tom Dieck, Jung & Han, 2016). To post-travel experience sharing, whereby visitors post glamorous pictures on social media, and provide online reviews of their various experiences. The pervasiveness of technology throughout the entire tourism experience is enabled by the growth of internet capacity and availability of Wi-Fi globally, as well as the use of QR codes and augmented reality hot-spots to enhance the visitor experience (Lalicic & Weismayer, 2016).

The ubiquity of such technologies throughout the tourism experience enables active involvement through every stage of the travel experience, leading to the co-creation of tourism experiences (Bunincontri & Micera, 2016). Indeed, Sigala (2016, 2017) presents strong arguments that increased

social media engagement can transform the visitor experience, by providing tourists with a platform to create, share and promote various aspects of their visitor experience. As such, attraction managers must evaluate the current and potential challenges and opportunities offered by the adoption of emerging technologies. Indeed, recent literature on co-creation of the tourism experience, identifies a link between active participation in the tourism experience and satisfaction, and suggests destination competitiveness can be increased through leveraging co-creation opportunities (Buonincontri & Micera, 2016; Prebensen & Xie, 2017).

Perhaps the most obvious example of technological application, in the creation of the visitor experience, transpires in the theme park sector. Unlike natural attractions, which rely on the prevailing attributes of a location, the fact that theme parks are contrived in nature, predicates a necessity to reconstruct, replicate, or otherwise create elements of appeal. Of particular relevance are advances in engineering and construction, which are providing unprecedented opportunities in the design and presentation of attractions.

In addition, the emergence of a new generation of tourists seeking higher degrees of interactivity, access to otherwise inaccessible experiences of the past or the future, and an increased sophistication of delivery, suggests quite particular directions for this significant segment of the attractions sector. In particular, the use of technology which facilitates simulation of otherwise unavailable forms of activity or provides "manufactured adventure" born of "a social need for risk taking that is risk free" (Milman, 2001, p. 142), seems integral to the future design and operation of theme parks.

More recently, Augmented Reality (AR) has surfaced as a way to develop a competitive advantage in the sector. Indeed, the worldwide success of Pokémon Go demonstrated the capability of this form of technology to not only influence behaviour, but also create a point of difference for an attraction/destination. Pokémon GO, brought the combination of mobile gaming and augmented reality to the masses, and images of crowded landmarks received immense global publicity, all which relied on a smartphone's geolocation function to enable gameplay, as in-game movement is activated by physical travel (Zach & Tussyadiah, 2017)2017.

The use of AR allows for a more immersive tourism experience and has the potential to provide users with contextualised and personalised information (Anabel & Igor, 2017). For example, the theme park Futuroscope in Poitiers, France, presents a show called 'The Future is Wild33', which allows visitors to experience a virtual safari, set 200 million years from now, where their surroundings come to life and "the animals of the future are superimposed on reality" (van Krevelen & Poelman, 2010, p. 11). The potential of AR is also being explored in museums and art galleries, where the combination of AR and wearable devices provides visitors with a hands-free opportunity to experience content in a dynamic fashion, which brings art, history and knowledge to life (tom Dieck & Jung, 2015; tom Dieck et al., 2016). Overall, the application of AR provides visitors with the opportunity to get to know unknown components of an attraction in an enjoyable and interactive manner (tom Dieck & Jung, 2015).

Even the replication of climatic conditions, which eliminate the necessity to travel large distances, is now possible by means of highly efficient air conditioning, and engineering that can recreate the experience of a beach environment in a sub-arctic location. There are a number of well-documented examples that demonstrate this application, including West Edmonton Mall in Alberta Canada (home to the world's largest indoor wave pool), and Dubai's Ski Dome, which opened in 2005. The former, maintains a daily temperature of 30c, in a location with an average mean temperature of less than 12c (West Edmonton Mall, 2017). While the latter offers a range of "snow related pursuits in a 'winter wonder-land' of sub-zero temperatures (Henderson, 2006, p. 93) at a destination that is characterized

by its perpetually warm weather. Taken to its ultimate, if not logical extension, it might even be possible to conceptualise the almost complete elimination of locational constraints by means of technology

## Challenging traditional perspectives

These examples question traditional perspectives of attractions which, notionally at least, view them as existing in a particular time and place. If the notion of certain types of attractions being confined to areas with certain geographical or cultural attributes can be dispelled, then the corresponding notion of attractions being fixed in time and place is equally questionable. One has only to consider events of various kinds that are arguably not fixed in either dimension, but which are indisputably attractions, to partially validate such a contention. In the context of the current discussion, the reenactment of events that no longer exist, but enjoy historical significance is another example of the technology creating the visitor experience.

The use of emerging technologies present particular opportunities to heritage tourism attractions, as they can enable the replication of historical events, which are more engaging and accessible to a variety of audiences (Murphy, 2015). One example of the successful application of technology to heritage attractions is the "Battle Room", at the Battle for Bannockburn Visitor Centre in Scotland. This experience provides an authentic and historically accurate representation of the bloody war between the armies of Edward II and Robert Bruce ("The Battle of Bannockburn," 2017). The terrain map is 3D and animated, resembling a mix between a scale model of the landscape, and a computer game, with the events and emotions of combat supported by surround sound and immersive images (Murphy, 2015).

That such attractions rely almost entirely on a combination of technologies to recreate events that occurred long ago, suggests that virtually no event in history is beyond reenactment. Since it may be contended that even an idea, a revered ideology, or a deeply held social conviction can constitute an attraction, the scope to translate even the most obscure social mores or traditions into an attraction seems now within reach. Naturally, the realities of market appeal and viability serve as logical filters to any such concept.

By implication, these examples constitute creation in a literal sense since they essentially involve a synthetic process, yet there are examples of technology creating the experience by simply facilitating opportunity or access to existing attractions. Since means of access can frequently constitute an integral part of the appeal of an attraction, applications of this type of technology are arguably as important as their use in total replication. The simple realisation that ease of access and enhanced visitor amenity are directly instrumental to user satisfaction suggests that the application of this type of technology is, by definition, instrumental in the creation of the visitor experience.

For example, in the period of heightened expectation that instinctively characterises entry to a theme park, delays in access, although a seemingly inconsequential process, could create negative first impressions if not handled in a timely and efficient way. Since it is at this stage that organic and induced images are tested against actuality, ensuring ease of access should be a clear imperative. The use of sophisticated technologies, which simplify ticketing options, reduce queuing and minimise confusion and uncertainty, will assume increasing importance as a more demanding and technology savvy generation of visitors emerges.

It could further be argued that modifying elements of the natural environment by means of technology is more an act directed at enhancing the visitor experience rather than creating it. Although as Stipanuk (1993, p. 217) observes, "there is sometimes no distinction which can be made concerning technology creating versus technology enhancing the visitor experience," some clarity is afforded by distinguishing

between the act of facilitation and enhancement in a literal sense. Given the two outcomes most often happen simultaneously further blurs the distinction.

Any examination of the potential uses of technology in the enhancement of the visitor experience would be incomplete without acknowledging the vast range of applications not specifically directed at individual elements of the collective product. The use of technology in the enhancement process frequently involves applications that are not immediately obvious to the visitor yet are vital to visitor satisfaction. To think of enhancement in a cosmetic rather than mechanical sense is to ignore the improvements that can be effected in what are essentially 'backstage' functions as a means of optimising the quality of the visitor experience. Museums offer a blend of both 'front' and 'backstage' applications of technology to enhance the visitor experience (NMC Horizon Report 2015)

This may range from strictly utilitarian functions such as ensuring efficient access and egress, parking and internal mobility to more complex processes involved in increasing degrees of interactivity, improving the interpretive process, providing information that is accessible and easily understood, or ensuring that distractions, risks or annoyances are minimised or eliminated. More complex examples may include the use of aforementioned VR/AR technologies, which are directed at enhancing sensory experiences by improving the quality of sound effects or providing visual images, which inform, excite, and stimulate the visitor.

## Technology as preparation

Taking an even broader perspective, the value of technology in preparing the visitor for the experience is worthy of emphasis. Whether this is simply a matter of providing useful pre trip information as might be the case with a theme park, or a process of educating and empowering the visitor as a means of preparation for visits to sites of religious or historical significance, current applications in information technology present significant opportunities. Particularly given the recent proliferation of social media and mobile devices (Lai, 2015).

The internet and social media are increasingly being used by visitors to gather information and advice during the pre-trip stages of their travel experience (Hudson & Thal, 2013; Pabel & Prideaux, 2016; Roque & Raposo, 2016). However, research to date suggests that the majority of tourism organisations are not engaging consumers in a meaningful way using this platform (Hudson & Thal, 2013). Attraction managers need to understand the changing social media landscape, and be increasingly adaptable and agile, in order to meet the opportunities and challenges presented by social media communication in the tourism sector. Increasing smartphone ownership and growth in social media consumption, are clear indicators that attraction managers should pay greater attention to their utility in terms of pre-trip consumption and overall impact on the decision-making process (Guillaume, 2007; Pabel & Prideaux, 2016).

The suggestion that such preparation, regardless of substance, will influence the ultimate outcome in terms of visitor satisfaction suggests that it should be a priority for attractions management. The expansion of web based information dissemination, combined with a more technology savvy consumer, may even suggest that this will progressively become a consumer expectation rather than a simple marketing enhancement (Xiang, Magnini & Fesenmaier, 2015). The emerging trend towards tourism experiences that educate and enlighten rather than simply entertain may also increase the importance of this preparatory function.

## Are we there yet?

Instinctively, opportunities for the enhancement of the visitor experience reach their zenith once the choice has been made, the journey undertaken, and entry to the attraction or site is achieved. In a myriad of ways, technology can and may be used to enhance the experience. These may range from simple but effective signage by means of video monitors to highly sophisticated AR techniques that aid in interpretation, increase degrees of interactivity, or provide enhanced sensory opportunities to see, touch, smell or taste.

Given the cross-cultural nature of tourism, and attractions visitation in particular, the ability to provide variable signage, or deliver interpretive narrative in a number of languages, could arguably make the difference between a meaningful and superficial experience. Even when language or cultural differences are not a barrier the use of technology in interpretation can be integral to the visitor experience. As an increasingly important component of the attractions inventory, museums and art galleries provide possibly the best examples of the current and potential use of this feature. For some considerable time, recorded narrative along designated 'trails' have arguably elevated the enjoyment of historical exhibits, paintings, or other works of art to a completely new plain. Again, a potentially superficial experience based on a quest for social capital (Mowforth & Munt, 1998) may be transformed into a meaningful, educational, and perhaps even transformational experience. The difference between these two outcomes in terms of visitor enjoyment is not difficult to conceptualise, nor is the potential for positive word of mouth and repeat visitation.

Earlier discussion on the changing preferences of attraction visitors alluded to an increasing search for the experiential rather than the merely detached mental absorption of sights and sounds. The employment of this type of technology, regardless of how simple, should be an intuitive direction for attractions management.

## Technology as protector of the attraction

Earlier discussion centered on the application of building technologies, in the construction of walkways, viewing platforms and aerial railways, as a means of facilitating access and thereby hypothetically at least, creating the attraction. To some extent, it is here that the thin division between creation, enhancement, and protection comes into focus, since it could be argued that the construction of such facilities also enhances the experience by facilitating a better view, while at the same time protecting fragile environments.

In the context of technology as protector of the attraction, such examples almost intuitively confine considerations to those of the natural environment; yet similar technologies can also be applied in protecting the integrity of sensitive cultures, or in the preservation of sites of historical significance. Regardless, the connotation is one of creating either a tangible or a notional barrier between the visitor and key elements of the attraction. One could argue, that in protecting the natural and cultural environments in which the attraction is located, the quality of the visitor experience is maintained.

Even direct simulation, has a role to play in protecting the visitor attraction. The avoidance or amelioration of damage by either preparing the visitor for the experience in the case of a cultural attraction, or keeping the visitor 'at arm's length' from natural or heritage attractions under duress, presents significant opportunities. The employment of increasingly sophisticated multi-media presentations in visitor centres, either in situ or in the immediate surroundings, as a means of partial or even complete substitution for attractions is evidence of such techniques. Indeed, it may be possible to exclude visitors from attractions that have seen unacceptable levels of damage or deterioration by offering replication

with degrees of virtual or augmented reality that provide an acceptable alternative to a reasonable percentage of visitors. The Ancient Lascaux cave paintings in France present one such example, whereby a vast site cut into the rural landscape presents a replica of the cave system augmented with the latest digital technologies (Sinclair, 2016).

Although unclear in the context of any adjudication of what is 'enjoyable', the use of technology in ensuring an accident free environment for visitor and employee alike is also clearly technology dependent. From simple fire prevention and detection to the safe operation of rides, which by their nature involve risky mechanical maneuvers, the use of highly sophisticated electronics and mechanics are essential to successful and safe operation.

Despite this, the literature on the specific role technology plays in providing a safe visitor experience appears lacking. This is despite safety and security being recognised as a major concern, particularly in the modern era of terrorism. Indeed, Beirman (2003) claims that the perception of safety and security is a major determinant in travellers' decisions to visit a place. As such, the success or failure of a tourism destination, or indeed attraction, depends on the ability to provide a safe and secure environment for visitors (Abbas, Amir, Ismail & See, 2015). If indeed, the link between such protective measures and the sustainability of an attraction is deserving of any explanation, the obvious implications of a serious accident in terms of litigation and visitor appeal may provide further clarity.

## The sustainability imperative

The sustainability agenda is now prevalent across the globe (Carlsen, 2013), with the concept, as it relates to resource management and development, evident through all levels of tourism policy and practice (Edgell, 2016). As tourism attractions operate at the nexus between business and the environment, they can have both negative and positive impacts on natural and socio-cultural environments (Stefan, Comes, Nicolae & Sabina, 2012). Moreover, the responsibilities inherent in the 'stewardship' of rapidly depleting resources on almost every front, suggests that the role of protector in attractions management will assume increasing importance as they struggle to balance the quality of the visitor experience with the maintenance of socio-cultural and environmental integrity.

The use of technology for replication has profound implications in sustainable practice, providing the opportunity to restrict access to elements of the attractions as a means of site hardening. The use of elaborate multi-media presentations as a substitute to close contact with animal populations, or to minimise the physical use of threatened historical monuments are amongst the potential applications.

Furthermore, new technologies such as VR/AR provide the ability to not only enhance the overall experience, but preserve historic architecture or art, by reducing physical contact, and minimising signage requirements (tom Dieck & Jung, 2015). By overlaying digital content into the real-world environment, the original state of the attraction can be preserved and enhanced, while better enabling understanding and awareness of historic and cultural events (Kalay, Kvan & Affleck, 2007; tom Dieck & Jung, 2015; M Claudia tom Dieck et al., 2016).

Indeed, research and education in respect to sustainable tourism has increased dramatically over the past 25 years (Edgell, 2016). However, (Ali & Frew, 2014a, 2014b) suggest that a research gap exists which focuses on the role of technology in developing business capabilities for sustainable tourism development. This seems a critical oversight as new technologies can improve the efficiency of processes and systems at tourist attractions and improve relationships with relevant stakeholders (Stefan et al., 2012)

Despite Stipanuk (1993) essentially referring to technological applications and outcomes in terms of the overall visitor 'experience', rather than attractions per se, extending his observations to issues of a site specific nature (as is being done here) emphasises the need to consider those elements of an attractions visit which are not necessarily visible, or part of the process of enjoyment, yet may impact on the ultimate outcome.

In addition, applications of technology in the protection of the broader environment can ultimately 'protect' the attraction itself. The notion of good corporate citizenship, inherent in which, are the kind of environmental practices that display concern for global issues of pollution, air quality and climate change, are now a marketable feature. The consumer appeal of environmentally friendly products and services is gaining momentum, and attractions are certainly no exception.

Research indicates that tourists are becoming increasingly discerning, and will choose to visit an attraction that offers clean and green tourist products (Mensah & Mensah, 2013). Indeed, for certain tourism operations, environmentally conscious tourists will be a very useful segment to target and attract (Dolnicar & Matus, 2008) as awareness and intention to purchase such products increases (Eslaminosratabadi, 2014). Indeed, Jopp, Mair, DeLacy, and Fluker (2015, p. 304) suggest that "tourism destinations and/or organisations may be able to gain a competitive advantage by positioning themselves as being "green"".

From a site-specific perspective, the simplest of functions such as food service, waste disposal, and the use of environmentally 'friendly' packaging all rely on technology to some degree. Indeed, these aspects of sustainability are widely expected by the modern consumer, as is evident by the number of attractions and events that now incorporate sustainability initiatives, such as Universal Orlando Resort and a range of resorts and theme parks in California (Universal Orlando, 2017).

## Technology as the focal point of the attraction

Thus far, we have considered both the actual and potential roles of technology in the operation of attractions, with particular emphasis on the contribution of such processes to successful and sustainable operation. If not explicitly stated, the pervasive theme appears to be that advances in technology provide exciting opportunities in the development and management of attractions. By inference, at least there is a suggestion that technology is something with which one must keep pace in order to succeed. In short, the focus has been on the application of technology to attractions rather than the reverse proposition. Amongst the more interesting elements of Stipanuk's examination of the interaction between tourism and technology is his contention that technology can indeed be the central theme or "focal point" of an attraction (Stipanuk, 1993, p. 273).

The temptation to conclude that this implies only showcasing the latest or most 'cutting edge' technology is to ignore one of the interesting phenomena in the evolution of modern attractions, namely the restoration for visitor consumption of technological processes that may not, under any other circumstances, continue to exist. One has only to consider the difference between a railway museum that may feature working locomotives of a bygone era, and a space museum that displays a lunar landing module to conceptualise the distinction.

Thus, what is now termed 'industrial tourism' or 'work watching' crosses the divide between the realms of the new and exciting and the increasingly popular area of heritage tourism. In some ways, it highlights yet again the diversity of attractions types and the problematic nature of advancing any single management approach. The obvious differences between attractions where management is born of a compulsion to cater to visitors (such as might be the case in tours of an industrial plant), management



where the principal objective is profit, and management driven by a conservation ethos (as may be the case in a transportation museum), is illustrative of the point.

The single most important realisation is that featuring technology of whatever era in an attractions setting is conducive to the experiences sought by an increasing percentage of tourists. Benckendorff et al. (2005, p. 1) emphasise this in their statement, "some authors have argued that visitors to tourist attractions will increasingly seek and expect the use of technology to create and enhance their experiences". Earlier discussion of the emergence of the new tourist suggests that attractions with some degree of technological focus will attain an important position in the future portfolio of attractions. Formica and Kothari (2008, p. 364) go as far as to suggest that, "more technologically advanced destinations... will set the standards for every other destination".

## Technology as a management tool

Earlier discussions pointed to technological applications, which although not visible or apparent to the visitor, have a significant impact on visitor satisfaction. Mostly these centered on applications directed at the visitor experience, yet there are other applications, which although not directly involved in the process of delivery are instrumental in management processes and efficiencies. Since it could be satisfactorily argued that this ultimately translates into the organisation culture and thereby consumer perceptions of the attraction, it is held that this is no less important.

Stipanuk's (1993) perspective of technology being an integral 'tool' in the management of tourism, and the later observation by Swarbrooke (2002) that technology has direct applications in the management of tourism both add weight to this contention.

Key examples of the utilisation of technology in the management process are identified by Stipanuk (1993, p. 274) as information technology [most notably in the areas of budgeting, accounting and financial management, computerised reservation systems], those concerned with communication technology in the pursuit of market information; and the use of technology in energy management, security and fire protection. A contemporary examination may include intelligence as a means of anticipating and avoiding hostile intervention by outside forces, including terrorism.

By Stipanuk's own admission the role of 'technology as a tool' requires further research to "identify the true benefits, costs, decision process and factors involved..." (1993, p. 275). Swarbrooke (2002) and Milman (2001) similarly suggested that more contemporary studies in this field would be of value. Given Stipanuk's (1993, p. 275) further observation that "some firms have embraced technology without adequate study or cost/benefit analysis" the pursuit of such studies seems a priority. This observation has particular resonance in the context of this study, given the focus on management orientation and strategic activity.

## Technology as potential destroyer of the attraction

If indeed, as Stipanuk (1993) observes, technology was or is being embraced without due thought or analysis, the last element of his paper is worthy of only brief examination. If, as asserted in earlier sections of this paper, attractions have some degree of reliance on technology to create, enhance, or protect the tourism experience, there is potential that a breakdown in technology will have the opposite effect. Paradoxically the areas of greatest vulnerability appear to lie where dependence on technology is greatest, either in terms of the size and sophistication of the organisation, or in terms of attractions that are wholly or substantially contrived and thereby rely on simulation for their existence. Even in

the role of protector, sudden or catastrophic failure of technology can obviously render the attraction unusable or unappealing.

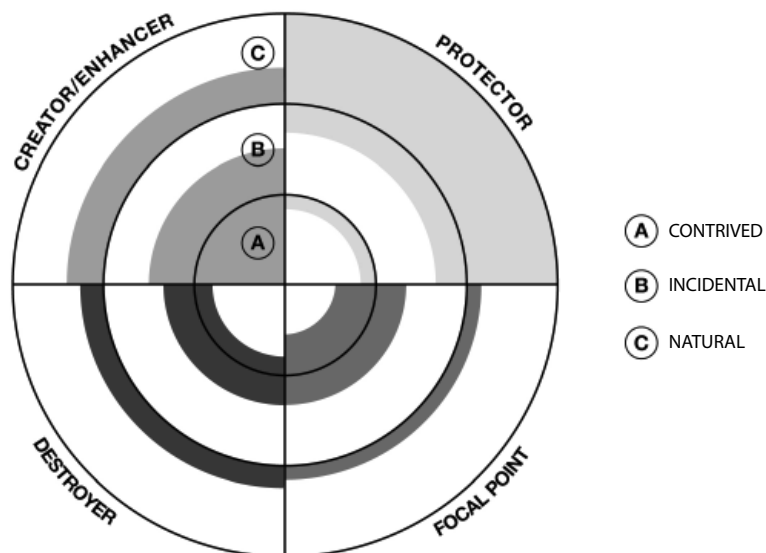
There is also emerging research that looks at the co-destruction of the tourist experience (Neuhofer, 2016; Sigala, 2016). In addition to the previously discussed opportunities that technology presents for co-creation of the visitor experience, Neuhofer (2016) suggests that technology may also co-destruct, or diminish, the visitor experience. This may occur when tourists wanting to immerse themselves in the on-site experience are not able to fully break free from technology and enjoy the moment. This is given particular credence, given the increase in visitor desire for escape and relaxation, whereby they wish to remove themselves from the hustle and bustle of modern life (Neuhofer, 2016; Sigala, 2016).

## Future directions

In summary, technological advancements in all of its manifestations, presents attractions developers and management with some significant challenges and some equally distinct opportunities. The ability to communicate with a steadily increasing pool of potential visitors, to facilitate their access, to maximise their satisfaction with the attractions product, and ultimately to contribute to sustainable practice, are amongst the key opportunities.

That realisation aside, the sheer diversity of attraction types, and the equally diverse range of technological applications, renders any generic application problematic. A clear and present need exists for research directed at examining the scope and scale of technological functions across a spectrum of attraction types. To that end, a conceptual model [see Fig 1] is advanced which juxtaposes the essential elements of Stipanuk's model with a fundamental taxonomy of attraction types. Shaded areas are intended to represent the degree to which, it is hypothesised, technology can be utilised to fulfill the respective functions of creator/enhancer, protector, focal point, and destroyer over a spectrum of attraction 'types'.

Figure 1  
Attraction/technology spectrum



Source: After Stipanuk (1993).

Although the authors would concede that the taxonomy used is somewhat broad, and that adopting an eclectic view of attraction types may yield different perspectives, the clear operational dichotomies

between natural, contrived, and incidental attractions in terms of their reliance on technology, provides a fundamental platform for further research.

For example, contrived attractions would typically include theme and fun parks where the emphasis is on technological utilisation directed at creating or enhancing the attraction. Conversely national parks where the reliance on, and utilisation of technology is principally driven by conservation, sees technology used more in protective mechanisms. Falling within these are a wide range of attractions which are not purpose built for tourism, yet attract significant numbers of visitors. The likes of cathedrals and stadia are representative of this category.

Towards validating these hypotheses, ongoing research will seek to elicit expert opinion on the scope and scale of technological application in the various operational settings included in the taxonomy. It is in this respect that the research is considered to offer greatest potential given the particularities of managing various types of attractions. It may be possible to demonstrate, for example, hitherto unexplored uses of technology in particular types of attractions, or to identify less obvious priorities.

## Conclusion

Given the contended view that technological applications in attractions are overly simplistic; this study seeks to broaden the understanding of both existing and potential uses of technology beyond that of creator/enhancer. Perhaps more importantly, it may also serve to shift the emphasis from contrived attractions to those where technology has less obvious potential. These discussions may have utility in almost every aspect of attraction management, from inception to marketing, and ultimately to issues of sustainability.

## Limitations

While this paper represents a comprehensive review of modern technological applications at attractions, it is acknowledged that this is not representative of the entirety of applicable technological advancements. Certainly, the emerging fields of Artificial Intelligence and Machine Learning present both significant opportunities and challenges for attractions managers. Furthermore, given the rapid rate of technological advancements globally, there will undoubtedly be exciting new developments in the juncture between technology and tourism.

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