

Park Visitors and Web 2.0 – Crowdsourcing in Park Management?

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Abstract

The concept of crowdsourcing sounds like a potentially useful method to gather information collectively contributed by a group of individuals. However, how willing would individuals actually be in contributing information in reality? This paper primarily presents the findings from a visitor survey conducted at a prominent National Park in Victoria, Australia, as part of a research project. The survey's aim was to assess if park visitors would be likely to participate and contribute location-based information. The results show that around two thirds of visitors may contribute information through crowdsourcing projects or by using participatory tools if the park organisation were to organise or provide these. The task and purpose of the activity must be clear, and organised appropriately bearing in mind age and gender preferences. Issues such as data quality aside, aggregated data contributed by park visitors, if analysed appropriately, could potentially assist park management and benefit decision-making.

Keywords: Web 2.0; crowdsourcing; park visitor survey; user contributed information; volunteered geographic information.

Author biographies

Monique Elsley commenced her PhD in the Geospatial Sciences department at RMIT in March 2009. She graduated in Multimedia Cartography at RMIT in 2007, followed by an Honours Degree in Geospatial Sciences. Monique has presented stages of her PhD to various conferences including GeoCart'2010, 25th ICC 2011 and SSSC2011. Her paper *Contemporary and Collaborative Web Concepts as part of a Geo-Knowledge Tool to Assist Park Management* has been published in the Springer publication *Advances in Cartography and GIScience*.

William Cartwright is Professor of Cartography in the School of Mathematical and Geospatial Sciences at RMIT University, Australia. He is Chair of the Joint Board of Geospatial Information Societies and Immediate Past President of the International Cartographic Association. His major research interest is the application of integrated media to cartography and the exploration of different metaphorical approaches to the depiction of geographical information.

Jim Whelan has over 40 years experience in park management, much of that as Ranger in Charge at Wilsons Promontory National Park. In recent years he has headed up Parks Victoria's 'Centre for Excellence in Park Management'. Knowledge management is a key focus for the Centre and Jim has established links with research institutions such as RMIT to collaborate on developing tools and techniques to resolve complex knowledge management issues relevant to park management.

Colin Arrowsmith is Associate Professor in the School of Mathematical and Geospatial Sciences at RMIT University. He holds a Doctor of Philosophy from RMIT as well as two masters' degrees and a bachelor's degree from the University of Melbourne, and a Graduate Diploma of Education from Hawthorn Institute of Education. Colin has authored more than 40 refereed publications and 6 book chapters in the fields of GIS, tourism analysis and in film studies. Colin's research interests include the application of geospatial information systems, including geographic information systems (GIS), geospatial science education, investigating the impact of tourism on nature-based tourist destinations, tourist behaviour, as well as investigating the issue of managing micro-historical data within GIS utilising cinema data.

1. Introduction

Recent Web developments have seen the arrival of collaborative and participatory tools and applications collectively known as *Web 2.0*. Web 2.0, also referred to as the Social Web or New Web (Tapscott & Williams, 2008), encourages users to participate and share information with other users in a collaborative manner. This is achieved through applications such as blogs, wikis, pod- and vodcasts, and social media sharing sites like *Facebook* (www.facebook.com), *YouTube* (www.youtube.com) and *Flickr* (www.flickr.com). As a result of this interaction, users generate information that is regarded as being potentially valuable (O'Reilly, 2005) with potential user, economic, organisational and other benefits (Surowiecki, 2005). It is the collaborative aspect in particular that is regarded to play a role (Tapscott & Williams, 2008), resulting in a collective intelligence where individual bits of information are aggregated to create a bigger picture or solve a problem. Crowdsourcing (Howe, 2009) draws on these notions and refers to a group of individuals collectively contributing information to complete a project.

The notions of collaboration, collective intelligence and crowdsourcing have been utilised in various projects and for different reasons, but all recognise the potentially valuable information individuals may possess and can contribute. For example, the Library of Congress in the United States released over 3000 photographs on the photo-sharing site *Flickr*, encouraging viewers to attach information to the photographs in the form of tags with the ultimate aim of finding previously unknown details (Raymond, 2008). In the natural environment realm, the *eBird* project, by the American Cornell Lab of Ornithology and National Audubon Society and launched in 2002, asks both amateur and professional bird enthusiasts to record their bird sightings onto a central database, resulting in a worldwide, vast data resource on birds and biodiversity that is continually growing (eBird, n.d.). In Australia, the *RabbitScan* project involves the public to map occurrences and impacts of rabbits on their property on in their area (FeralScan, 2011). The combined individual contributions produced a nationwide picture of the location of rabbits and their impact on the environment.

The eBird and RabbitScan projects show that the collaborative and participatory aspect is present in the geospatial realm. The term *Where 2.0* (Turner & Forrest, 2008) defines the geographic or locational aspect inherent in many Web 2.0 applications and user contributed information – so called *volunteered geographic information* (Goodchild, 2007), *collaboratively contributed geographic information* (Bishr & Mantelas, 2008) and *user generated geo-content* (Das & Kraak, 2011). The emergence of mapping tools and technologies including geospatial platforms like *Google Earth* and *Google Maps* that are freely available via the Web means that people can easily visualise and create georeferenced information. Similarly, GPS enabled mobile devices like mobile phones and cameras increasingly generate user information that is instantly georeferenced.

This paper primarily presents key findings of a visitor survey conducted at Wilsons Promontory National Park, Victoria, Australia in September 2010. The aim of the survey was to assess the potential willingness of park visitors to participate and contribute location-based information to benefit park management. The visitor survey forms part of a larger research project designed to develop a methodology for enhancing access to an existing data archive using the concept of a *geo-knowledge tool* (Elsley & Cartwright, 2011a) - a digital information or knowledge system that provides access to georeferenced data based, in part on data's geographic attributes. Parks Victoria, the organisation that manages parks on behalf of the Victorian State Government (Parks Victoria, 2010), is a collaborator on the project, and Wilsons Promontory National Park – *Wilsons Promontory* or *The Prom* in short - is the pilot study area.

The following section discusses the role of Parks Victoria in managing national parks within the state of Victoria, Australia. Subsequent sections describe the rationale for combining traditional and non-traditional data and subsequent visitor survey, and the methodology applied including an overview of Wilsons Promontory. This is followed by the survey questions and results, and ensuing analysis. A discussion and conclusion section completes the paper.

2. Parks Victoria and park management

Parks Victoria manages a diverse estate that includes close to 130 national parks, state parks, marine national parks and sanctuaries, over 2,700 other parks, natural features and conservation reserves and over 13,500 Aboriginal and non-Indigenous cultural heritage sites. These parks encompass over 4 million hectares, or about 17 percent of the State of Victoria (Parks Victoria, 2010), and over 5% of marine waters (Parks Victoria, 2007). Representatives of all different types of natural habitats present in Victoria are included in these protected areas (Department of Sustainability and Environment, 2009). The primary role of national parks is to preserve and protect the states flora, fauna and natural features. They play a key role in protecting Victoria's water supply and catchment areas and preserve cultural and historic sites and landscapes. Another key function is to provide for outdoor recreation of all types, thus playing an important role in community and individual wellbeing – encapsulated in the Healthy Parks Healthy People slogan (Parks Victoria, 2011) – and simultaneously benefit Victoria economically (Parks Victoria, 2007). Tourism Victoria (2008) reports that Victorian national parks attract the highest number of park visitors in Australia.

Park Victoria has various core management areas, one of which is fire and emergency management. The importance of the role of fire management has increased (Parks Victoria, 2010), partly due to bushfires that have occurred in recent years. The Victorian Bushfires Royal Commission, in response to the 2009 Victorian fires, made the recommendation for a long term program for prescribed burning (Victorian Bushfires Royal Commission, 2009).

The pilot study component of the research project focuses on information requirements to enable park managers to apply fire in a controlled environment to improve ecological and biodiversity outcomes. A vast amount of background information is required for such burns and strict decision-making processes are followed. Key data sources can be accessed through available systems and tools are in place to assist the process. Nonetheless, it is acknowledged that some data relied upon may have shortcomings for various reasons – for example, anecdotal fire history records may be the only available records (Stoner, 2007), or flora and fauna records based on sightings cannot be maintained or enhanced as required due to lack of resources. The question being asked - and the rationale for the visitor survey - is if park visitors or the general public could potentially assist in improving these data when visiting the park.

3. Rationale: alternative data and traditional data

The primary objective of the research project is to enhance access to the existing park management data archive. The project will also investigate if alternative, non-traditional data sources can be utilised to complement or benefit the existing archive. What are some of these non-traditional data sources? In the current Social Web era, information can be sourced via the Web through digital data archives created and made available by organisations and media outlets and through participatory Web tools like blogs, wikis, and media sharing sites. The alternative data sources could also comprise staff members who are not generally consulted, as it is not part of their job, but who are now able to participate and contribute information using collaborative communication tools. Or they can be park visitors, the general public and other interested parties in parks, all of whom can generate information about their park experience through images or comments uploaded onto the Web. If these are analysed, they may give insight into visitor activities, where they go when visiting a park, their views or uncover other data relevant to park management. This could for example be specific flora or fauna knowledge that amateur enthusiasts possess and are willing to share via a Web enabled collaborative forum, or it may be the reporting of current fishing conditions by fishermen in the park using a mobile phone. All this information can potentially be generated and captured through the application of collaborative Web tools and crowdsourcing projects. If appropriately assessed, analysed and applied, it has the potential to assist with park planning and decision-making, and improve park management including visitor services and fire management.

4. Methodology

The research project uses a pilot study to manage the activities to be completed to achieve the primary aim of developing a methodology for a geo-knowledge tool. One such activity was conducting a visitor survey at Wilsons Promontory, the pilot location. The survey's objective was to assess the willingness of park visitors to assist with the collection of location based information whilst visiting the park, or their willingness to contribute information related to their trip or the natural environment in general whilst at home.

4.1 About Wilsons Promontory National Park

Wilsons Promontory is located about 200 km southeast of Melbourne (see Figure 1) and its borders comprise 130 km of scenic coastline that is surrounded by a number of marine and coastal parks (Parks Victoria, 2009). With a land area of 50,460 hectares (Parks Victoria, 2009) it is the tenth largest national park in Victoria (Parks Victoria, 2003).

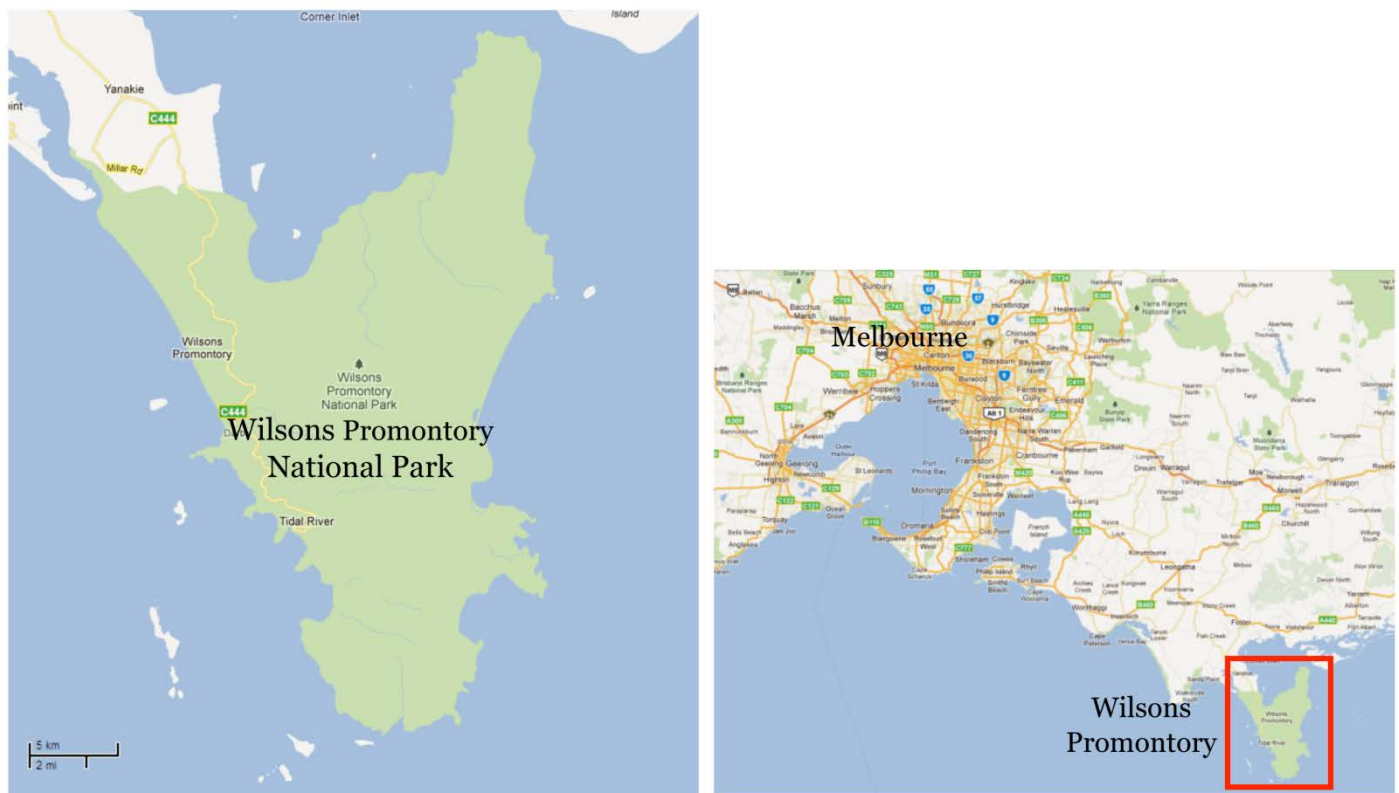


Figure 1. Maps of Wilsons Promontory National Park and its relative location to Melbourne (Source: Google Maps <http://maps.google.com.au>)

The area that is now The Prom has a long history of Aboriginal occupation. European settlers first sighted the park in 1798. Its natural resources have been exploited with commercial undertakings including timber milling and cattle grazing (Parks Victoria, 2003). Some of these have left an ecological impact on the park through a changed landscape, a change in natural vegetation and a resulting diminished biodiversity.

Wilson's Promontory is an important tourist destination in Victoria, and both Victorian and overseas visitors are attracted by the natural and cultural attractions the park provides. The annual number of visitor days are about 398,000 (Tourism Victoria, 2008), with day and overnight activities including camping and bushwalking. A vast number of flora and fauna species are located within The Prom. Some of these are rare and vulnerable, and the park plays a prominent role in protecting the State's biodiversity (Parks Victoria, 2003) with ecological fire management practices observed to protect the numerous flora species that require fire regimes (Stoner, 2007). The park has a fire history dating back to pre-European times, and the changed landscape as a result of European settlement has made some of the later fires very severe. In 2009, a fire ignited by lightning burnt over 50% of the park over a five week period (Department of Sustainability and Environment, 2010). Controlled burning has subsequently taking a more prominent role in park management activities (Parks Victoria, 2010).

Park managers globally face the challenge of gaining access to appropriate information and data, when and where they are needed. This is compounded due to loss of tacit knowledge through ageing workforces and an increasing number of qualified staff with expert knowledge nearing retirement age (Gettler, 2010). Those working at Wilson's Promontory are no exception.

Wilson's Promontory contains large areas of remote and natural country that is difficult to access on a regular basis, however, they are visited on a semi-regular basis by park users. For park managers to monitor these areas at a frequency that would enable sound management decisions is problematic. If managers were able to involve visitors to collect and contribute information through active or passive means (Turner & Forrest, 2008) instead, these contributions could potentially assist in addressing some of the knowledge gaps.

5. The visitor survey

Park visitors are one group of people interested in parks who can potentially contribute useful information. A visitor survey was therefore conducted to gain an insight into their perceived willingness to participate and assess what the opportunities are for involving park visitors in crowdsourcing projects or obtain information from them through participatory tools (Elsley & Cartwright, 2011a). Would they be prepared to provide specific location based data using appropriate tools for the benefit of the park or to assist park managers?

The visitor survey took place during the Victorian school spring break over a three-day period in late September 2010. A total of 83 people completed the questionnaire, which considering the season and weather as well as type of questionnaire that required people to sit down in order to complete it, was regarded as a positive outcome. The participants were recruited using a direct approach – as they were passing a central area of the park that comprises a café, supermarket and seating, they were approached and invited to complete the survey on the spot. Because visitor numbers are limited during that time of year, all adults that passed the area were approached, and bar two or three, all people agreed to participate.

There were 17 main questions categorised as 'General' (questions 1 - 5), 'About Web 2.0' (questions 6 - 13) and 'User experience/information needs' (questions 14 - 17), with four open questions under the header 'About your stay at Wilson's Promontory' to complete the questionnaire.

Following are the results for the four sets of questions. Please note that although there were 83 participants, not all participants answered all questions. The number of responses to each question is listed and it can generally be inferred that the remaining respondents did not answer that question. A summary of the results and preliminary analysis for three questions – 9, 10 and 13 – has already been described in Elsley and Cartwright (2011a)

5.1 Responses to 'General' questions 1 - 5

The first two questions asked about age group and gender. There were 49 female and 34 male participants who were divided into four age groups as shown in Table 1.

	Total # of participants	Gender division
18 – 30 years old	10	5 females / 5 males
31 – 45 years old	30	19 females / 11 males
46 – 60 years old	25	15 females / 10 males
61 years old and over	18	10 females / 8 males

Table 1. Division of survey respondents by age and gender.

The fact that the youngest and oldest age group are slightly underrepresented is somewhat linked to the period chosen to conduct the survey: a primary and secondary school holiday for Victoria. People who do not have school age children may be more likely to choose another time to visit the park to avoid busy accommodation and higher prices.

The next question asked if people used the Internet, and if they did, if they were familiar with Web 2.0 tools that were described in an accompanying explanatory letter. Of the 83 respondents, 78 used the Internet, with 76% of these 78 aware of or familiar with Web 2.0 tools. 90% of the participants from the 18-30 age group knew about Web 2.0 as well as 77% of 31-45 year olds and 71% of 46-60 year olds. Only about 50% of people aged over 60 were aware of the social Web developments.

For people who were familiar with Web 2.0, the remainder of the question asked which, if any, of a list of social media tools or applications they used. The choice of applications represented well-known and arguably popular sites with an 'Other' option for those tools not on the list. The 65 responses received showed that *YouTube* and *Facebook* had the highest number of users (45 and 40 respectively), followed by wikis (25). The supposedly popular micro-blogging application *Twitter* only had seven users, outscored by feedback forums (10) and blogs in general (9). *Flickr* and four other applications were mentioned through the 'Other' option, with minimal users each (see Figure 2). Ten of the 65 respondents answered that they did not use any Web 2.0 tools or applications.

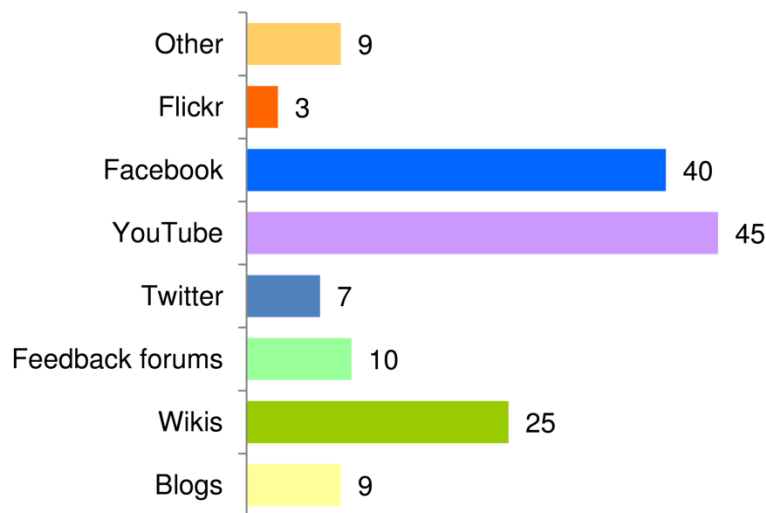


Figure 2. Number of users for selected key social media tools and applications.

The majority of the 55 respondents who did use social media applications used either two (19) or three (14) applications, whereas 10 indicated they only use one application (the remaining people used between four to seven different applications). The most common combination was *YouTube* and *Facebook* with wikis added for the people who used three applications. The youngest age group, 18-30, used the most applications per person. Each member of this age group who had responded to the question and did use the tools uses 3.9 applications on average. This drops to 2.3 for the 31-45 age group, two for the 46-60 age group and 1.87 for the 61+ age group.

A slight variation can also be observed for each age category and the actual tools they use. Blogs, for example, were mostly used by people under 46. Only one person in the 61+ age group used blogs and no one in the 46-60 age group did. Wikis and feedback forums however were more used by the 46-60 year olds, with the number of people using wikis matching the number of people using *Facebook* (10 each), while five used feedback forums, which is half of all feedback forum users. Finally, the respondents in the oldest age group, 61+, were the only group that used *Facebook* (7) more than they did *YouTube* (3). In the three other age groups, *YouTube* beat *Facebook*.

The next question asked if people used the Internet on mobile devices, and if 'yes', on which device and if it was wireless enabled. Thirty-six out of 83 people responded that they did use the Internet on a mobile device with 31 of these 36 wireless enabled, but only half (18) replied which device that was. The *iPhone* was the most popular (6), followed by a mobile phone in general (5), a laptop (3) and a *Blackberry* (2). Two others mentioned an *iPad* and a smartphone.

The final question in the 'General' category asked what type of park related information people were generally interested in. Nine options were available through tick boxes. The vast majority of the 82 people that answered ticked multiple boxes. The responses in order of most ticked are shown in Table 2.

# of responses	Park information of interest
72	Bushwalking/short walks (one day or less)
66	Natural/geographic features such as waterfalls, lookouts etc.
66	Nature (flora/fauna)
53	Cultural features, such as historic sites, aboriginal sites, art etc.
48	Camping
46	Hiking/trails (more than one day)
23	Water sports such as surfing, fishing, kayaking, diving etc.
9	Other, please specify

Table 2. Number of responses for nine park related information types that people are interested in.

Although the question asked about general interest, it is feasible that the season in which the survey was conducted (early spring and generally cold) may have influenced some of the responses. For example, the water sports option may well get a bigger response in the height of summer. The responses to the camping and overnight hiking options may be similarly affected. Nonetheless, it is interesting to observe the relative low interest in camping, although this is a key aspect of a trip to Wilsons Promontory with fixed accommodation options limited in numbers compared to the available camping space. However, some people may regard this as a necessity; just part of it or something you do rather than a particular area of interest. The additional comments noted by the nine people who ticked the ‘Other’ box include running, children’s activities and safety.

5.2 Responses to ‘About Web 2.0’ questions 6 - 13

The first question in the category ‘About Web 2.0’, question 6, asked what the person’s opinion was on the concept of Web 2.0. There were nine possible answers provided. Three of these were clearly positive and the remainder negative or neutral, with multiple ticks allowed. Sixty-four out of 79 respondents chose at least one positive answer, with 45 of these 64 giving only positive answers and 19 a combination of positive and negative answers. Fifteen people only ticked negative or neutral (‘I have no opinion’ and ‘Perhaps more for the younger generation, but at least not for me’) options.

The two most popular answers were ‘Interesting’ and ‘Useful’ (53 each). ‘Fun’, the third positive answer, was ticked 20 times. The most dominant negative response was that it was intrusive (16), whereas nine people thought it was more for the younger generation, seven considered it just the latest trend that would pass, six thought it was all a bit exaggerated and three thought it was a waste of time (see Figure 3).

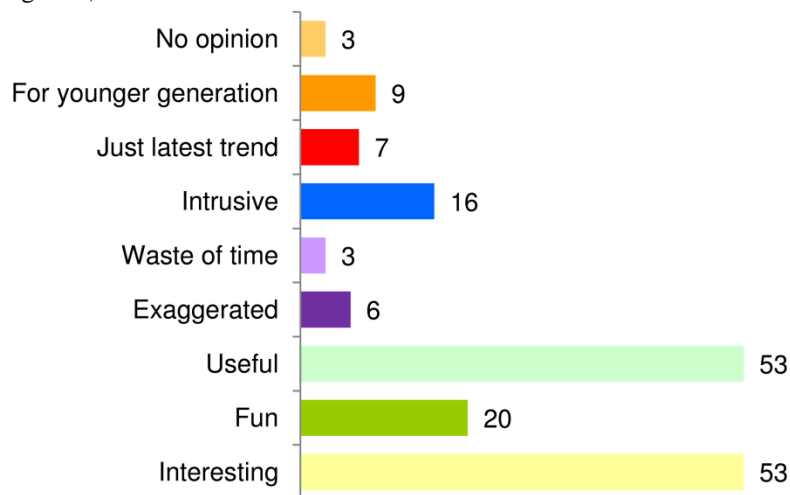


Figure 3. Varying views on Web 2.0 by number of people.

Not one person ticked the ‘Other’ box apart from using it as an opportunity to add the comment that Parks Victoria “should use/take advantage of new communication technologies”.

Of the 15 people that only had negative views of Web 2.0, 12 were female and three male, representing 25% and 9% of the total number of female and male participants respectively. Thirteen of these 15 did use the Internet and seven were not familiar with the Web 2.0 concept and its technologies. The biggest group with only negative views were females aged 31-45 (6), representing almost a third of all females in this age group. These six represent 20% of all people in this age group, while 16% of all people aged 45-60 and 28% of all people aged 61+ also had negative views only. None of the 18-30 year olds did.

The next two questions required people to indicate how strongly they agreed or disagreed with a statement (the Likert scale of five ranged from 'strongly agree' to 'strongly disagree'). The first of these two questions asked whether they thought that participating on the Web could potentially be dangerous. There was no distinct division with 21 people either disagreeing (18) or strongly disagreeing (3), whereas 34 either agreed (28) or strongly agreed (6) - 26 had no opinion (two did not answer). The 34 that saw some danger comprised just under 50% of all female participants whereas less than a third of all male survey participants thought this.

The second question asked whether people would only contribute *safe* information, with the results more clear cut. Almost two thirds of people either agreed (41) or strongly agreed (13) that they would only contribute information that they did not mind being passed on or being used by others, whereas less than 10% disagreed (4) or strongly disagreed (4) with this. Eighteen neither agreed nor disagreed and three did not answer.

One of the key outcomes of the survey was finding out if people would be willing to participate in any project Parks Victoria, or managers at Wilsons Promontory, would hypothetically organise. The following question 9 and well as ensuing questions 10 and 13 asked this more or less directly.

Question 9 asked if people would be happy to share their photographs or videos from their stay at the park through a Web based photo- or video-sharing site. About 66% (51 out of 77 usable responses¹) would do so in principle, 18 respondents ticked the no box whereas another eight had to think about it / needed more information (Elsley & Cartwright, 2011a). The 18 who would not participate were roughly evenly divided over the four age categories and represented both female and male participants equally evenly.

Incorporated into the question were options if they would be willing to upload onto any photo-sharing site or onto a dedicated Parks Victoria/Wilsons Promontory site only. The division in responses was close to 50/50. Males however were more inclined to choose any photo-sharing site (76%) whereas 70% of females opted for a dedicated site. The other choice participants were given was uploading photographs at home versus doing so at a designated computer at the park's visitor centre. This favoured the former, with 25 out of 30 people indicating their choice would be to upload photographs from home. All in all a total of 51 people indicated that they would participate in principle, whether this was any photo-sharing site, a special site set up by Parks Victoria or Wilsons Promontory, from home or during their stay using a dedicated computer in a park's visitor centre. Figure 4 shows the percentages of females and males for each age category that would potentially participate, as well as the percentage of the total number of people for each age group. With the exception of the youngest group aged 18-30, males were overall more likely to participate than females were, with the least likely people to participate women in the age group 61+ (30%) followed by their counterparts aged 31-45 (47%).

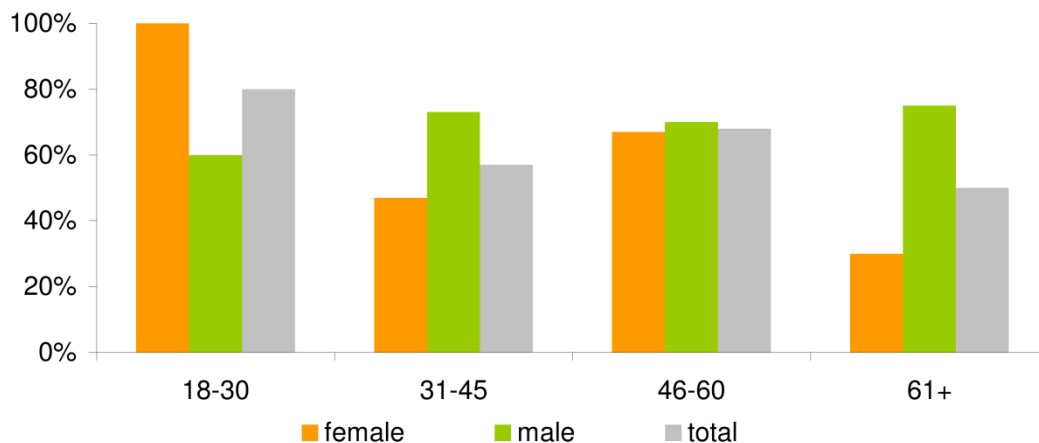


Figure 4. Contributing photographs - percentage of female, male and total respondents for each age category who would potentially do so.

Question 10 asked if people would be likely to use Web based communication tools like a blog, feedback forum, *Twitter* etcetera if Wilsons Promontory were to use these. Thirty-four out of 80 people responded that they would, however only 10 of these 34 indicated they would actively participate themselves. The remaining 24 would only look at or read contributions by other people.

¹ Four participants ticked multiple boxes that were contradictory, for example 'yes, I would upload photos from home' as well as 'I need more information'. For the sake of clarity these four answers have been discarded and have been regarded as non-answers instead.

Twenty-eight out of 80 gave a straight no and 18 required more information (Elsley & Cartwright, 2011a). Similar to the previous question, the age group 61+ again had the highest non-participants (50%). None of the youngest age group 18-30 said they would not participate (although two did answer maybe rather than a straight yes), while 33% of all 31-45 year olds and 36% of all 46-60 year olds would not use such tools. Figure 5 shows the percentage of females and males in each age category who responded that they would potentially use Web 2.0 tools provided by Wilsons Promontory or Parks Victoria.

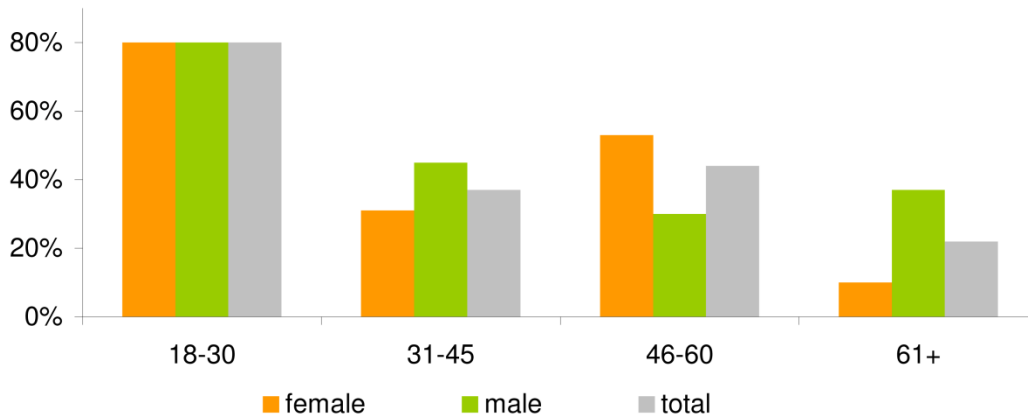


Figure 5. Using Web 2.0 tools provided by Parks Victoria/Wilsons Promontory - percentage of female, male and total respondents for each age category that would potentially use such tools.

The 34 people who would potentially use the tools comprised 18 females and 15 males. Only three out of the 18 females would contribute themselves whereas seven out of the 15 males would, again showing a tendency for males to be more inclined to participate than females. The remaining 15 females and eight males would only look at other people's contributions. Figure 6 represents just the 34 people who would potentially use the tool, and what percentage of each age group and gender of those would contribute themselves or only read other people's contributions.

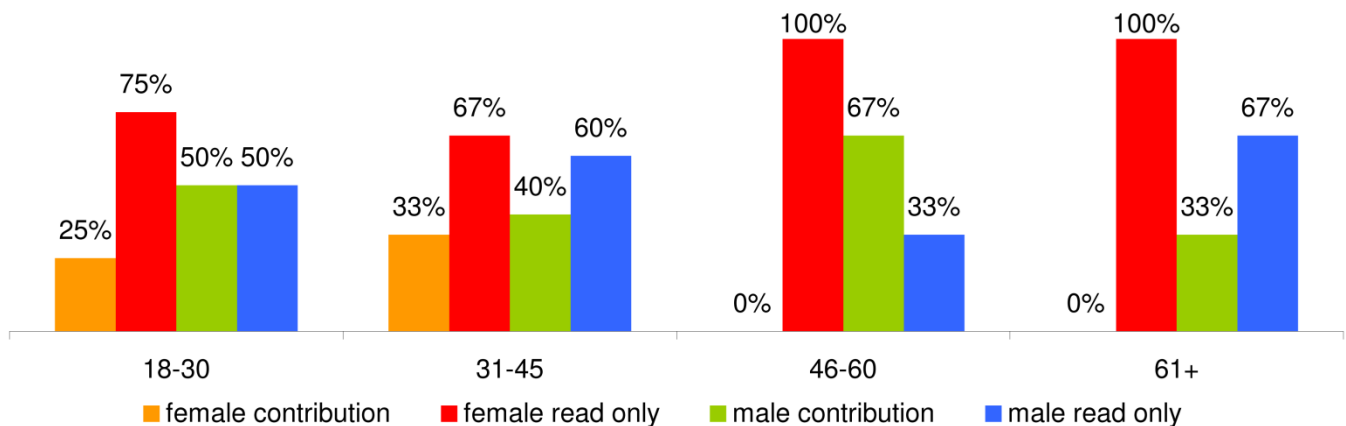


Figure 6. Percentages of each age group and gender category who would contribute to organisational Web 2.0 tools and those who would only look at other people's contributions.

Although Figure 6 shows that females in the two highest age groups are more willing to use the tools than any other group, none of these women would contribute information themselves (although one added the comment that she might).

Briefly comparing the non-participants in question 9 with those in question 10; 12 of the 18 people who would not upload photographs would also not use the tools in question 10. Of the remaining six, three would use the tools (the other three needed more information). So 12 of the 28 people who would not use the tools in question 10 would also not upload photographs, however, another 12 would potentially do so (the remaining four needed more information).

When asked in the next question how often they might participate, only seven would do so on a semi regular basis – perhaps weekly or a few times a month at least (Elsley & Cartwright, 2011a). The majority would only use these tools before or after a trip to Wilsons Promontory (28 out of 55 respondents), or otherwise a couple of times a year (12) or perhaps only a few times and then

no more (8). Looking at the responses of the 34 people who would use the tools in the previous question 10, only six of the 34 would participate semi regularly (weekly or monthly). Only three of the 10 people that would contribute themselves would do so on a semi regular basis and over 50% would participate after a trip to Wilsons Promontory. Of the 24 people that would only look at other people's contributions however, only three would do so semi regularly and only nine would do so before or after a trip (the remaining respondents would use them only a few times).

In preparation for the third question (question 13) that directly asked about people's willingness to participate, question 12 firstly asked if people had a GPS enabled mobile device such as a phone or PDA. Out of 81 responses, 29 ticked yes and 52 ticked no. Question 13 then asked if they would be willing to carry a mobile GPS enabled device during their stay to assist park management. Fifty-two out of 80 respondents stated that they would, with 26 answering 'no' and two 'perhaps' (Elsley & Cartwright, 2011a). Twenty-one of the 52 potential participants did not want to do anything specific for it except carry the device, whereas 27 of the 52 would be willing to put in some (minor) effort to complete the task. All 18-30 year olds would participate, but it was the 31-45 year olds that were less willing to do so this time (only 50%). 64% of 46-60 year olds and 67% of all people aged over 60 would also be willing to participate.

Twenty-seven of the 52 people who would be willing to carry a GPS device were female, representing 55% of all female survey participants. Again, the males were more inclined to participate, with 74% of the 34 male participants willing to do so. Figure 7 shows the gender division as a percentage of the total number of female and male participants as well as the percentage of all people in each age category who would potentially be willing to carry a GPS enabled device to assist park management during their stay at Wilsons Promontory.

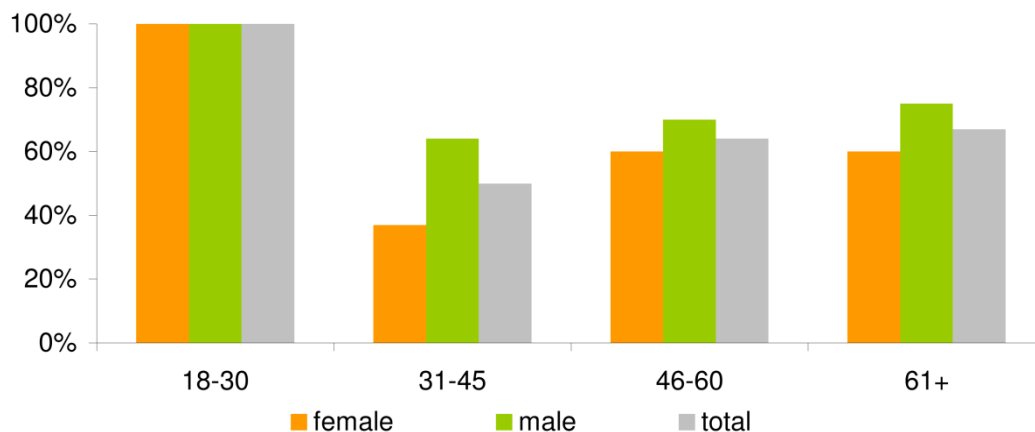


Figure 7. Percentage of female, male and total respondents for each age category who would potentially be willing to carry a GPS device during their trip.

Additional comments received as to the perceived willingness include that they would do so as a once off and that the exercise should not require much effort. Furthermore, judging by the low number of people with GPS enabled mobile devices, Parks Victoria or Wilsons Promontory would have to provide participants with such devices in the event this was to take place. This would most likely aid and streamline any such project anyhow, as all devices could be prepared in advance and be ready for use with appropriate applications and instructions in place.

5.3 Responses to 'User experience/information needs' questions 14 - 17

The next four questions were aimed at gaining some insight into what kind of information park visitors use and where or how they obtain that information. Because georeferenced information can now be readily visualised using Web based mapping tools that include collaborative and participatory elements, and the use of maps as a result of these developments is growing, park visitors' views on maps was also sought. The results of these questions could particularly assist the development of the conceptual geoknowledge tool.

Question 14 asked if people usually obtain information about a place they intend to visit, and if 'yes', how they usually obtained this information. Of the 81 responses, only two people answered that they did not find information whereas 79 said they did. The six possible answers provided for where they obtained their information, apart from 'Other', were:

- Guidebooks or other books;
- Beforehand, from the Internet;
- Beforehand, through brochures and/or information from a tourist centre;

- d) At destination, through brochures and/or information from the visitor centre; and
- e) At destination, by accessing Internet on a mobile device.

The responses received mainly comprised a combination of answers. Answer b) - obtain information before hand from the Internet - was the most popular and ticked 64 times, followed by answer d) (49), answer a) (43) and answer c) (34). Of the 14 people who did not use the Internet beforehand to obtain information, one did tick e) and thus uses the Internet on a mobile device at destination. The remaining 13 people included the five people who did not use the Internet at all, asked previously in question 3.

A perhaps somewhat surprising outcome is that almost 37% or 29 people do not use the park's Visitor Centre to obtain information. Although this overall may be more an issue for Parks Victoria to consider with regards to providing appropriate information services for example, it may also be something to bear in mind if the geo-knowledge tool were ever to become available at a park for visitors to use and gather information.

The next question asked if people were likely to use a Web based tool that let them choose the information they were interested in and put it together as a map or other document to take along, instead of, for example, an existing guidebook or brochure. Of the 80 responses, 20 indicated they would definitely use such a tool and 32 stated they were very likely to.

Only four answered a straight 'no' whereas six said 'probably not', and 17 people indicated 'perhaps' (the final respondent ticked both perhaps and very likely). Looking at total numbers, this means that almost 66% of people were very like or definitely to use such a Web based information tool while only 12% would probably not use the tool.

Male respondents were more likely to use the tool (70% of all males versus 59% of all females). The age groups 18-30, 31-45 and 46-60 have close to even percentages of possible users (ranging from 70% to 68%). Only 44% of people aged 61+ however was likely to use the tool. Figure 8 shows the percentages of the 'yes', 'no' and 'perhaps' answers for each age group.

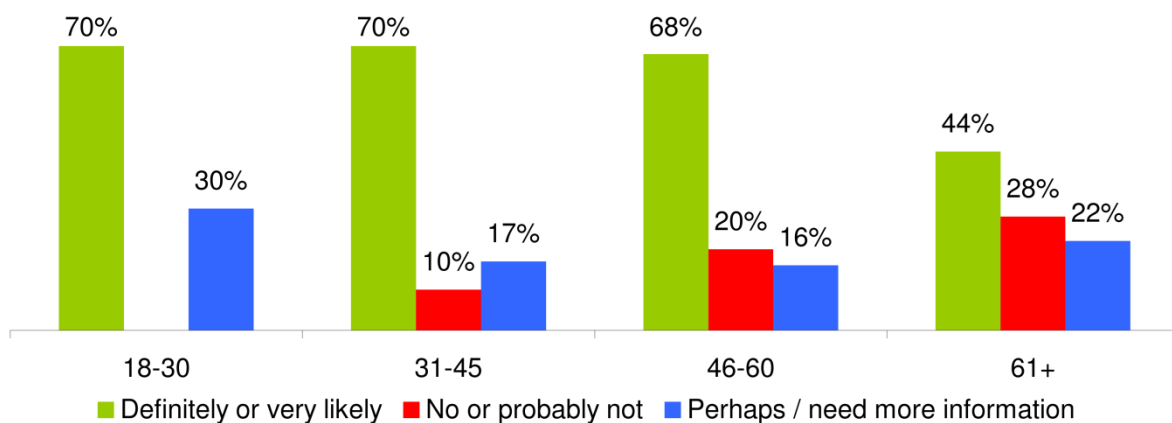


Figure 8. Using a Web based mapping / information tool - percentages of yes, no and perhaps responses for each age category.

The final two questions in this set focused on maps. Question 16 firstly asked if the person used maps, with 82 out of 83 responding that they did and only one male aged 61+ stating that he did not use maps. By the way, apart from the first three questions about gender, age group and using the Internet, this is the only other question that was answered by all 83 survey participants.

Question 17 asked people's general views in relation to maps and the information on them, with a choice of eight possible answers. Fifty-five people ticked a single answer only, which in order of most popular are shown in Table 3.

# of responses	General view on maps
28	Maps normally show a variety of information, most of it useful (answer a);
13	Maps are better if they are combined with other information, for example, with a brochure that explains things in writing (answer e);
7	Maps normally show a variety of information, but only some of it is what I am after (answer b);
3	I wish I could take a map that would only show information that is important to me (answer c);
2	Maps are useful on their own; the symbols used help me understand what things are (answer d);
2	I have no particular opinion (answer g).

Table 3. Number of responses for six options regarding participants' general view on maps, where the respondent chose a single answer only.

Not one respondent chose answer f, 'I don't think that maps are that useful; brochures or information sheets are much more useful', or the eighth possible answer 'Other'.

The remaining 26 people ticked multiple answers, with the top two answers a and e above also the most popular in combination, followed by answers a and d in combination. Overall, the two most popular answers were answer a (48) and answer e (31).

It appears that although maps generally are regarded as useful, a significant number of people would like to use them in combination with other information rather than a standalone map. Provided the design was right and appropriate to user needs, the conceptual participatory Web tool described in question 15 could be useful if it let people choose their own information and put it together as a map or other document chosen by the user to take along on their trip. As aforementioned, the potential use of this tool is around 70% for people aged 18-60.

5.4 Responses to 'About your stay at Wilsons Promontory' open questions

The final set of questions was partly related to the participants' current trip to Wilsons Promontory and also gave the opportunity to provide extra feedback or comments. Some of this information would be useful for the development of the conceptual geo-knowledge tool, as it provides some insight into people's interests that in turn gives an idea of potentially valuable information people may not just be interested in receiving but may actually possess themselves to share with others. Most of the comments and feedback however will be more pertinent for managers at Parks Victoria or Wilsons Promontory to consider.

The first of this group of open questions asked what main activity or activities they had undertaken during their stay. The 81 responses generally included multiple activities and, being open questions, resulted in a wide range of answers that were often were similar in meaning. Table 4 shows the answers in order of popularity, including the variations used deemed similar.

# of responses	Activity undertaken
40	Walking; this includes short walks, day walks, walks, walking trails etc.
18	Camping
16	Bushwalking
16	Hiking; this includes hiking, overnight hike, and 4 day bushwalk
11	Sightseeing
10	Beach
9	Wildlife / bird
7	Photography
6	Swim / paddle
5	Flora
5	Relaxing, resting or lounging
4	Eating / Lunch
3	Day visit
3	Fishing
2	Surfing
1	Running

Table 4. Various activities undertaken by respondents during their trip, and the number of respondents that undertook these.

The ensuing question as to how they enjoyed the activities only elicited positive responses. The 61 answers included comments like "loved it", "fabulous", "beautiful", "have been here in the past" and many more.

To the question whether people wished they had additional information during their stay, 46 out of 74 respondents said 'no', whereas 29 indicated that they had wanted additional information and subsequently listed what that was. The free format comments are difficult to summarise, but, very broadly, include a need for more detailed maps, and more information about natural and cultural features as well as visitor services and park conditions. Following are a selection of additional information that was regarded as missing according to survey respondents:

- "Better access to info about flora/birds to assist with identification";
- "Better signposts for walkers - kept getting lost at Tidal River";
- "Geological information / cultural information";
- "Historical notes, e.g. who was Norman!" (Author's note: this is a reference to Norman Beach, the main beach at Tidal River);
- "More detailed park map and hiking map right at the entrance";

- “More fishing information (places to fish - type of bait required etc.)”; and
- “The history of the park, and how it is recovering from the bushfire”.

The final question simply asked for any other suggestions or comments, to which 20 people responded. Instead of giving general feedback, some respondents linked their comments to the research and survey they had just completed. Again, as these remarks are free format they are somewhat difficult to sum up and categorise. Listed below therefore are firstly the apparent survey related comments, followed by examples of other feedback provided by the participants:

- “I think the personalised maps and brochures is a great idea! Also people sharing favourite spots on trails and their idea of its difficulty and why”;
- “Many of us are interested in such technology, and would use it but may not have the time to be the actual participants giving the information”;
- “More technology to help people plan trips to the Prom is a good thing”;
- “Walking trails maps available on mobile would be good (via Web/downloadable) e.g. as applications”;
- “An information/natural history exhibition/centre with detailed info where visitors can choose the info and talk to others is VERY good value”;
- “Could be useful to have self-booking software, showing vacancies and allowing clients to reserve/choose, securing bookings via credit card online”;
- “Do not develop the Prom any further - with resorts etc. It is beautiful in its "primitiveness". It is my favourite place on Earth!!!”.

6. Analysis of park visitor survey results

One of the key outcomes of the survey was to gain insight into the perceived willingness of park visitors to participate and contribute information. This could be through a hypothetical crowdsourcing project organised by managers at Wilsons Promontory or through collaborative Web based tools that the organisation would employ. Three questions, 9, 10 and 13, asked this more or less directly. Other questions were aimed at determining people’s usage and views of aspects of Web 2.0, in turn assisting in learning whether they would be more or less likely to participate and what kind of information they could potentially contribute using which tools. The analysis of the survey results will focus primarily on the questions relating to Web 2.0. Observations and minor analyses and observations for some questions were already added to results in the previous section. The initial focus of the analysis will be on questions 9, 10 and 13 before other Web 2.0 related questions are included, after which observed variations in age and gender are discussed.

6.1 Analysis of key Web 2.0 related questions

Considering the responses to questions 9, 10 and 13, participation in a crowdsourcing project or using collaborative tools by park visitors may depend on whether the activity is a once off, and whether it has a specific purpose (Elsley & Cartwright, 2011a). Questions 9 and 13 ask that people upload photographs after their trip or carry a GPS device during their trip – more or less one off events with a specific task to undertake. In both cases, around 65% of people responded they would probably participate. Question 10 however is more general in nature – would they use Web based communication tools if Wilsons Prom provided these - without stating a specific purpose, why or what needs to be done. This time only 42% said ‘yes’, with a further 22% saying ‘perhaps’ pending more information. Figure 9 shows the number of people who responded ‘yes’, ‘no’ and ‘perhaps’ to questions 9, 10 and 13.

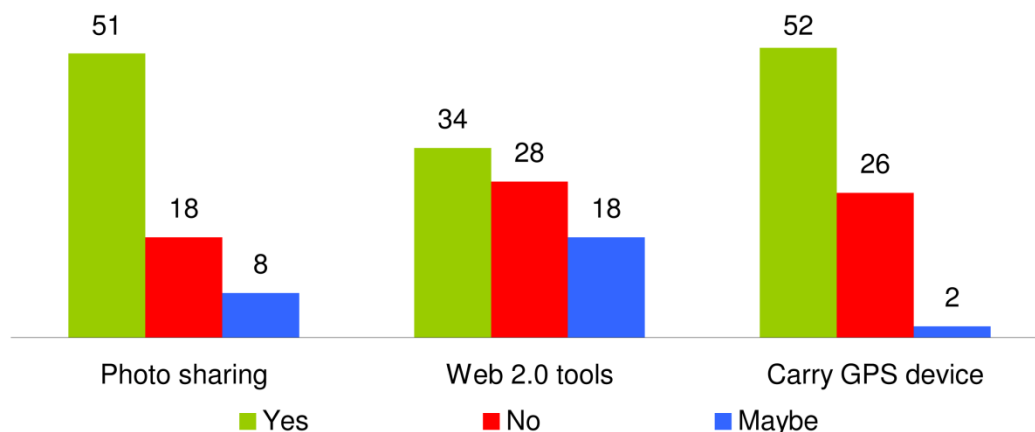


Figure 9. The number of yes, no and maybe responses for questions 10, 11 and 13.

Question 13 arguably stated the task and purpose most clearly: carry a GPS device around during your trip to assist park research. With the exception of two, all participants indicated either 'yes' or 'no'. The photo-sharing question 9 had 10 respondents demanding more information before they could commit, as the purpose of the task was arguably less clear than that of question 13 (share photographs with park visitors versus assist park research). Question 10 was more general again (would they use tools). The 18 'maybes' could become potential participants once the task or purpose is clearer. This is perhaps backed up by the fact that the majority of participants indicated they would use the tools only around a trip to Wilsons Promontory (responses to question 11). Half of the people that would use the tools from question 10 and well as 75% of the people that may use them pending more information would most likely do so after a particular trip to the park. So if question 10 was asked in a less general fashion, but instead included information along the lines of "could you please visit our website and add feedback or observations from your trip to our blog or feedback forum after you return home to help us..." people may be more likely to do so. A more direct, more purposeful request may further change the number of users versus contributors. The results of question 10 indicated that people were less likely to contribute information themselves, and instead would use tools to merely read or look at other people's contributions. If question 10 was turned into a more purposeful, task specific exercise, these non-contributors may change into actual participants and contributors of information too now that they are being asked for specific information and know the purpose and task required (Elsley & Cartwright, 2011a).

The trigger therefore appears to be a purpose - whether this is a trip to the park or a specific task. Not only do people need to be attracted to participate while they are visiting a park, they also appear more willing to participate if asked to complete a specific task for a specific purpose. Attracting people during their visit - other than asking them to participate during that particular stay - could involve signing visitors up to an email list so detailed information can be sent out when visitor participation is sought. This is because it seems that the vast majority may not visit Parks Victoria's website or use social media tools unless they are about to undertake a visit to a park.

This should not matter as such, as it would supposedly be the time when visitors possess potential valuable information from their trip such as animals or flora they may have spotted, feedback on the condition of walking tracks or any other visitor experiences. Although the result to question 11, that most people would not participate often and would only use Web based tools before or after a trip to Wilsons Promontory, may not inspire optimism, at least they would be participating when going to the park and confirms the importance to attract people's participation during their stay.

6.2 Adding other questions

Less than half of people use the Internet on mobile devices based on the results for question 4. However, communicating using mobile devices would seem a useful way to exchange information and knowledge between park staff and visitors during the latter's stay. Additionally, the *Twitter* application that uses messages of maximum 140 characters to communicate is regarded as a potentially useful mobile application for communication between and amongst park staff and visitors, but had a low number of users amongst the park visitors (question 3). There are a few things that could be taken into consideration here. Firstly, question 4 did not ask if people had a mobile device as such and considering the high volume of mobile phones in Australia, it is highly likely that the vast majority of people would possess and carry a mobile device during their trip - GPS enabled or not. Secondly, the *Twitter* application is accessible through SMS technology as well as the Internet, and the latter would therefore not be necessary for people to use *Twitter*. However, if free Wi-Fi enabled Internet access was available at Wilsons Promontory, specifically to enable people to communicate in this way, visitors may well use the Internet on their mobile device (of course provided the device had Internet access capabilities). Lastly, although *Twitter* was not popular with visitors according to the survey, recent social media statistics suggest that *Twitter* has grown to be the second most used application on a mobile device after *Facebook* (Susan, 2011). *Facebook* was already popular with visitors, but if people became aware of a *Twitter* application to instantly communicate with park rangers or keep up to date with activities while visiting the park, about 65% of people could potentially use the tool.

The results of question 8, if people would only upload safe information, showed that almost two thirds of people at least agreed that they would, and only contribute information that they did not mind being passed on or used by others. When comparing the results of question 8 with the potential photo-sharing participants of question 9, of the 51 people that would potentially upload photographs, 41 agreed or strongly agreed that they would only upload safe info. Similarly, comparing the results of question 7 with question 9, of the 21 people who answered that they do not think the Web is dangerous, 20 would potentially upload photographs. This suggests that people are generally aware that information on the Web is there for everyone to see and use, but how these two results affect the theory behind the geo-knowledge tool is unsure. Would half the people not participate because they deem it unsafe, or would they know to just upload safe information and therefore be inclined to participate? In addition, the fact that they would only upload safe information, does that hinder the ability to analysis it and find potential useful information, simply because not everything is uploaded, just selected items?

6.3 Variations in age and gender

There are some differences between participants of different age groups as well as a slight gender variation that can be observed. The results of question 3 of the general question show that people in the age group 61+ are the least aware of Web 2.0, with only 50% of the participants in this age group knowing about it. Ten of the 18 respondents in this age group still had positive ideas about the concept of participation and collaboration however, choosing 'Interesting', 'Fun', and 'Useful' as part of their answer in the later question 6. Another four had neutral answers. Four people of this age group who were not aware of Web 2.0 also had positive or neutral views, with only one having a clear negative answer (a combination of 'Exaggerated', 'Waste of time', 'Latest trend', and 'For younger generation'). In view of this, although they may not be as aware of the phenomenon as people in younger age groups, this does not mean that people over 60 are necessarily not willing to participate and contribute. Although the results of question 9 and 10 show that people in this age category are the least likely to participate, for question 9 (sharing photographs) this is still 50%. Their potential participation rate for carrying a GPS around is even higher with 67%, being topped by only the 18-30 year olds. People in the oldest age group may therefore conform to the general trend observed, and are more willing to participate the clearer defined the purpose and task is, as their participation rate for questions 13, 9 and 10 is 67%, 50 and 22% respectively.

The youngest age group, people aged 18-30, was overall the most willing to participate with 80% potentially willing to upload photographs and using Web 2.0 tools provided by park management, whilst all would potentially carry a GPS device. What is perhaps somewhat interesting is that it is the people aged 46-60 who are the second most likely participants, beating the 31-45 year olds for questions 9, 10 and 13 (refer to total columns in Figures 4, 5 and 7). The females in this age group in particular were more willing to participate than females in the 31-45 and 61+ age groups. In question 10, they even outnumbered their male counterparts when it came to using park management provided Web 2.0 tools (unfortunately, despite their high potential to use the tools, they would not contribute any information themselves). Having a higher number of female participants was rare as overall males were more inclined to participate than females. This was the case for three of the four age categories with the exception of the 18-30 age group. For this youngest group of people it was equal twice and a higher percentage of female participation for question 9 (sharing photographs). The male participants in the age groups 31-45 and 61+ in all three instances (questions 9, 10 and 13) were more willing to participate. They were also more likely to use the Web based mapping tool introduced in question 15 (70% of all males versus 59% of all females).

Other differences that can be observed between different age groups were the number of social media tools used per person (people aged 18-30 use 3.9 on average whereas people aged 61 and use 1.87), and the actual applications used. The responses to the final part of question 3 show that *YouTube* and *Facebook* are overall the most popular social media tools used, with wikis third most popular, although a slight variation can be observed between the tools used by the different age groups (refer to the results of question 3 described previously).

7. Discussion and Conclusions

What do the results of the visitor survey mean? Can park visitors be considered as a potential alternative information source? And can the *volunteered geographic information* they can produce be incorporated into Parks Victoria's decision-making? The outcome of the survey suggests that people are more willing to participate and contribute information if there is a specific task or purpose involved - around two thirds of people may in effect do so. This would mean that if managers at Parks Victoria or Wilsons Promontory require certain information and park visitors (or the general public with an interest in park related matters) can assist in collecting or contributing this information, a special crowdsourcing project could potentially be successful. This project should be task and purpose specific so its participants know what they are required to do and why they are doing it. Such a crowdsourcing project could be conducted at Wilsons Promontory requiring people's participation during their stay with all relevant (technical) equipment supplied, but, pending the type of information sought, it could also be organised as a Web based project that allows people to participate and contribute from home. Because there are some observable differences between people from different age groups and gender with regards to their potential willingness to participate, it is possible that a crowdsourcing project at a park is more likely to attract a broader range of participants than a Web based project.

In order to attract the broadest range of participants possible, the variations observed in age and gender should be taken into account when considering which Web 2.0 applications to utilise for crowdsourcing opportunities. Picking tools that people already use will allow them to link with the project through their personal social Web activities. However, there would have to be a variety of options available to appeal to different age groups to draw the broadest group of participants possible. It may also require targeting or marketing certain age groups or gender more specifically in order to ensure they are less likely to be underrepresented as participants. Apart from the project or activity requiring a clear focus and set task, there should also be assistance available for those requiring further information. This would be to minimise the number of people who are not participating because they are unclear about objectives or what tasks they are required to complete (the people with maybe answers that comprised participants in all age groups and genders).

The idea behind crowdsourcing is that bits of information contributed by individuals combined create a big picture or contribute to solving or completing a bigger project. Although there is a higher chance of people participating if asked to complete a specific task or contribute specific information, there is also potentially valuable information not specifically requested. To try and capture

this passive information people contribute, it could be useful to have a dedicated Parks Victoria (or Wilsons Promontory) website that allows people to upload specific information in what can be regarded as a safe environment to minimise any reservations people may have about participating, as well as having a presence on the wider Web. This latter could be for example a presence on social media sharing applications like *YouTube*, *Facebook* or *Flickr* that do not ask for specific information, but merely encourage people to share any information they wish (albeit restricted to the media format permitted on those sites). A combination of both specific information requests and the opportunity to capture any information could potentially enhance or complement Parks Victoria's existing data archive and thus assist decision-making. Although the former arguably has a higher potential to improve known information gaps, particularly from a practical perspective, the latter may also unearth additional information that some people possess but that could be more difficult to ask for specifically, because it is rare or too precise or perhaps because it was previously unknown.

It should be noted that since this research began, Parks Victoria has joined four key Web 2.0 applications - *Facebook*, *Twitter*, *Flickr* and *YouTube*. These tools enable the organisation to communicate with the general public in a collaborative and participatory manner. Additionally, the organisation's website (<http://parkweb.vic.gov.au/>) was updated to a more Web 2.0 oriented site in the second half of 2011. The site's Terms of use and Privacy sections cover issues such as use licences, Parks Victoria's rights on how it will use information contributed by people to the site and its use of personal information but it is unclear how the organisation plans to deal with any data and information contributed by members of the general public in future. To ensure the information that can be harvested in this way is being used effectively and appropriately, the organisation would need to adjust or develop relevant policies and procedures.

A number of other issues not discussed in this paper would also need to be addressed by Parks Victoria, particularly when considering the data's potential use in decision-making. Considerations include the quality of the information generated by users, especially if not obtained through crowdsourcing with Parks Victoria control, and how this quality could be assessed (Elsley & Cartwright, 2011b). There is also an obvious need to find methods to analyse the user contributed data beyond collecting them in order to find patterns and potentially useful information to assist park management decision making. And lastly, some sort of mechanism should be developed to provide participants with quality feedback about how their contributions are being valued, utilised and applied by park managers. This should inspire further participating and contributing when their assistance is sought.

In conclusion, the results of the visitor survey suggest that crowdsourcing could be a viable option for park managers at Wilsons Promontory. Provided a crowdsourcing project was organised appropriately with a clear task and purpose, and considering the requirements of people of different ages and gender, around two thirds of visitors to the park might contribute potentially valuable information.

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