























Using Information Technology to Enhance Community Engagement

Invasive Animals CRC Program 4 "Facilitating Effective Community Action". Prepared by Dr. Theodore R. Alter, Dr. Jeffrey C. Bridger, Paloma Z. Frumento, Madison S. Miller, and Eleanor S. Polley











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Prepared by Dr. Theodore R. Alter, Dr. Jeffrey C. Bridger, Paloma Z. Frumento, Madison S. Miller, and Eleanor S. Polley **Disclaimer:** The views and opinions expressed in this report reflect those of the author and do not necessarily reflect those of the Australian Government and Invasive Animals Ltd. The material presented in this report is based on sources that are believed to be reliable. Whilst every care has been taken in the preparation of the report, it is "as is", without warranty of any kind, to the extent permitted by law.

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Front cover photo: European Rabbit-Kevin Soloman



Abstract

Program 4 of the Invasive Animals Cooperative Research Centre (IACRC) focused on the institutional, policy, and adoption processes for community engagement. As part of this program, 4E1 - "Facilitation of Collective Action" - had two primary objectives: (1) catalysing an effective and sustainable support system for on-going communityled action at the landscape level and (2) developing a cohort of community engagement professionals working in the field. Central to achieving these objectives was the need to strengthen the knowledge base for both professionals and community members seeking to collaborate in controlling invasive species. There is a currently a significant gap in theory and empirical research relating to the effective use of online, web-based delivery platforms for engagement.

This document was developed in 2014 and reviews the literature on this issue, describes internet access and use patterns in Australia, summarizes current IACRC online and web-based tools and provides observations regarding potential modifications and improvements, and concludes with recommendations for further research. Although some of the data is now out-of-date, the document provides a useful platform for the goal of designing an integrated engagement strategy which includes online tools.



Photo: Feral goats by Daryl Panther



Note: most council reserves and conservation areas are Crown Land.



Photo: Wild dog by Leo Berzins



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Information Technology for Community Engagement

Introduction

There are a rapidly increasing number of online tools that may be used to facilitate engagement on the part of stakeholders - including landholders, land managers, agencies, government, non-profit organisations and the general public - in dealing with issue of invasive animal management. Many scholars and practitioners are optimistic about the potential for facilitating knowledge-sharing, dialogue, and action across such diverse groups. For example, Dozier et al. (2011) recommend one subset of online tools, social media, as "a newly emerging mechanism for engaging a large and diverse group of participants, including individuals or groups that might otherwise be hard to reach or to bring together" (155). However, as Bittle et al. (2009) note, such patterns of interaction are not necessarily inherent to the medium. To the contrary, they write, "the Internet, especially the blogosphere and social networking platforms, is primarily enabling people in partisan silos to network within their own group" (1). Such "communities of affinity" tend to develop organically, while bridging interest groups requires a concerted effort (2) or a key individual, or individuals who are knowledge brokers spanning networks. Black (2011) uses the term "echo chambers" to describe the phenomenon in which "even apparently apolitical sources, such as popular social-networking sites and search engines, have the potential to solely provide citizens with information that confirms, rather than challenges, their views" (7-8) as occurs in closed networks or 'communities of affinity'. Information flows using social media are established through the choice of whom to follow on Twitter, what to "like" on Facebook, and even search histories on Google, which are used to target future search results to particular individuals. Despite these challenges, there are many successful examples of the use of online tools such as social

media for distributing information, collecting information, conducting assessments or conducting polls, and creating and strengthening personal and communication networks, among other functions.

A number of these engagement projects are occurring outside of traditional engagement frameworks and are led by actors other than engagement professionals. There are a variety of innovative and productive 'citizen science' initiatives around the globe that take creative and ground-breaking approaches to knowledge production and collective action (Williams, 2014). For example, Sweden-based game developer Mojang uses their popular game, Minecraft, to facilitate public participation in neighborhood reconstruction. Early successes in Sweden led to a partnership with UN Habitat called "Block by Block." Minecraft is well-suited to this project because players develop and carry out their own goals in the context of creating virtual worlds. For the Mojang blog Manneh (2012) writes: "It has proven a great way to visualize urban planning ideas without necessarily having architectural training. The ideas presented by the citizens lay as a ground for political decisions." While a full discussion of the capacity of such virtual world exercises to foster substantive and meaningful deliberation is beyond the scope of this document, this example suggests that a more in-depth consideration of the online engagement strategies will necessarily extend beyond the academic and professional realms to span a wide range of expert and citizen knowledge.

Contemporary engagement efforts also have a recursive relationship to new technologies; as technologies shape people's patterns of socialization and forms of learning, engagement strategies must continually adapt as well. For example, traditional community engagement focused heavily on face-toface interaction in well-defined locales. However, an emerging literature shows that, particularly for young people whose formative years have been shaped by rapid technological change, conceptualizations of 'community' are increasingly unbounded in time and space. For example, based on ethnographic research in Sydney, New South Wales, Yerbury (2012, p. 96) concludes: "Community is no longer seen as an entity into which an individual can be absorbed, but rather something that grows out from the individual and that is endlessly created and re-created." It is unclear what the impact of such conceptualizations might be for a highly localized problem such as invasive animal management, which is very strongly tied to specific places and geographic communities. As we will consider below, changing technologies predispose younger - but also some older - populations to new methods of communication and learning styles that can't fully be predicted.

The following scoping document is broken into four thematic sections. In Section 1, we begin by reviewing the literature about online tools for engagement. We then suggest several key metalevel questions and considerations necessary for designing an engagement strategy which includes online components. In Section 2, we review the Australian context, with regard to both individual and organisational internet access and use patterns, as well as the regulatory framework for the internet. As part of this discussion, we describe the potential impacts of access and use to the effectiveness of online engagement. In Section 3, we summarise the suite of online tools employed by the IACRC, with comparative examples from organisations addressing similar issues. We offer observations regarding the overarching engagement strategy and integration of online tools. Finally, we conclude with a set of opportunities for further research.

Classification Schema for Online Engagement Tools

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Online engagement is very much a moving target. For this reason, any set of classification schema applied to tools for online engagement must be broad enough to encompass both existing and emerging technologies if it is to have heuristic value. At the same time, scholars have struggled to label and understanding meaningful differences within these broader subgroups. Pasek et al. (2009) write:

In order to investigate the need for greater differentiation within established categories, the authors carried out a cross-sectional study which provides evidence that levels of social capital vary

"The need to distinguish between informational, communicative, recreational, social, product consumption, and financial management uses of information technology is quickly becoming a rallying cry in the literature" ?? (p.198)

among users of two similar but distinctive social media sites, Facebook and MySpace. They conclude: "If the Internet is indeed having an effect, that effect must be measured within the confines of a particular site-specific culture" (210). Although their analysis focused on general Internet use, the insight is also useful for developing issue-specific online engagement strategies.

Most schema for online engagement tools employ technical functions as a starting point for organisation, and then differentiate according to engagement functions. An example comes from the Urban Sustainability Directors Network (2012), which analyses the utility of the following online engagement tools through the lens of the International Association of Public Participation's (IAP2) (n.d.) Spectrum of Public Participation, discussed further below (9-11):

Low capacity digital engagement tools

o Communities of practice (LinkedIn groups, Quora, forums)



- o E-Newsletter (Constant Contact, MailChimp)
- o Event Registration (EventBrite and Meetup. com)
- o Facebook page
- o Listservs and email notification systems (Majordomo, Google Groups, Yahoo Groups)
- o Microblogging (Twitter, Tumblr)
- o Online advertising (Facebook ads, Google AdWords)
- o RSS (automatic syndication of online content)
- o Social bookmarking and link sharing (Reddit, Delicious, Digg, AddThis, StumbleUpon)
- o Website
- Medium capacity digital engagement tools
- o Blogging, photo blogging (Wordpress, Blogger)
- o Crowd sourcing (Open 311, SeeClickFix, CitySourced)
- o Crowd funding (CivicSponsor, KickStarter)
- o Discussion forum, online message board (BB Press, PHP BB)
- o Document commenting (Google Docs, SharePoint)
- o Document tracking and hosting (CivicWeb FilePro, Scribd)
- o Ideation (Give A Minute, UserVoice, IdeaScale, Icanmakeitbetter, AllOurIdeas, Google Moderator)
- o Online-offline community creation (ChangeByUS)
- o Media Sharing for photos (Flickr, Picasa, Pinterest)
- o Structured online deliberation (ConsiderIt, Open Town Hall, Civic Evolution, Delib, Debate Graph)
- o Survey (SurveyMonkey, SurveyGizmo, Wufoo, Google Forms)
- o Bulk text messaging (SMS, Poll, SayZu, Twitter)
- High capacity digital engagement tools
- o Collaborative writing & wikis (Google Docs, PB works, Wikispaces, Writeboard)
- o Live Streaming (Justin.tv, Qik, Ustream, CoverltLive)
- o Mapping (Google Maps, Ushahidi, Yelp, Zonability)
- o Online chat (Jabber, Skype, Facebook chat)
- o Prediction market (Spigit)
- o Scenario planning and calculators (CommunityViz, MetroQuest)
- o Serious games
- o Media sharing for video (YouTube, Vimeo)
- o Virtual worlds (Second Life)

o Webcast and discussion (Google+ Hangout, LiveMeeting, GoToMeeting)

In another example, Leighninger (2011) more seamlessly integrates technical function and engagement in his conceptualization of ten key tactics:

- develop documents collaboratively via wikis;
- create shared work space for citizens;
- facilitate large-scale deliberation online; use 'serious games' to generate interest, understanding, and input;
- survey citizens;
- aggregate opinions expressed on social media networks; gather and rank ideas and solutions;
- work with citizens to identify and prioritize problems that government can fix;
- help citizens to visualize geographic data; and
- help citizens to balance budget and revenue options.

The nexus of technical function and engagement function is a critical one. Bittle et al. (2009) caution: "Too often, online engagement is driven by technologies rather than technologies being selected that fit into the overall process" (16). They note that online strategies must be well-integrated into the broader engagement context, in those areas in which it may be used to gain advantage. Black (2011) provides an example in AmericaSpeaks' Networked House Parties, which incorporate webcast, face-to-face discussion, and text message voting. According to Black, each of these tools contributes to a distinct stage of the engagement process: "it is interesting to note that the blended format of the networked house parties uses faceto-face meetings for the deliberative discussion and the online tools for the naming and framing of issues" (35).

Online strategies must also be well-coordinated with one another, given that different tools and functions may appeal to different subsets of the target population. Bittle et al. (2009) explain:

"A Web site to provide information about the project is a different channel than online dialogue hosted on the same Web site. [...] And if we expect different demographic groups will use different channels to participate, how can we assure that they consider each other's opinions and deliberate across channels?" (18) Black (2011) similarly emphasizes the need for integration and coordination: "The real question becomes not which features to use, but how to best combine these different features to help participants articulate values and describe and weigh trade-offs for different options" (42). In the below graphic (see page 6), she links broad technology categories (blogs, wikis, social media, budgeting tools, discussion forms, virtual worlds, chat, web conferencing, and texting/SMS) to the Kettering Foundation's framework for democratic practices. This graphic is particularly helpful in highlighting the interdependent relationship between tools and desired outcomes.

Within classification schema for online engagement tools, social media is sometimes identified as a single broad category which includes social networking sites such as Facebook (see Black for an example). However, Kaplan and Haenlein (2010) argue that social media may also be seen as another broader lens for considering online engagement tools. They define social media as

"a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content" (61).

"Web 2.0" describes a platform whereby content and applications are no longer created and published



by individuals, but are continuously modified by all users in a participatory and collaborative fashion and "User Generated Content" describes the various forms of media content that are publicly available and created by end-users. seven functional building blocks: identity, sharing, presence, relationships, reputation, and groups. As noted above, the proliferation of models and schema for this research area obscures clear conclusions.



The Right Tool for the Job

This definition encompasses collaborative projects, blogs, content communities, social networking sites, virtual game worlds, and virtual social worlds. Their definition and categorization system, while particularly relevant to engagement functions, is not the only model. For example, Keitzmann et al. (2011) define social media according to

Designing a Strategy

While the schema identified above use technical function as a primary differentiating mechanism and engagement function as a secondary consideration, we would suggest the opposite approach. The most effective social media, and more broadly,

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information technology strategy will be determined by the level of public participation sought. Drawing on IAP2 (n.d.) and Shuffstall, et al. (unpublished, 2013) public participation can be conceptualized as a spectrum, represented below.



Spectrum of Public Participation

Photo: European rabbit by C Cameron



The terms can be defined as follows:

- Inform Provides the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities, and/or solutions. An underlying implication is that information will continue to be forthcoming.
- Listen Solicits public feedback on analysis, alternatives, and/or decisions. This builds on informing, and includes listening to and acknowledging concerns and objectives, and often provides feedback on how public input impacted decision-making processes.
- Involve Engages stakeholders as active participants to ensure that public concerns

and objectives are not only understood and considered, but directly incorporated in decision-making processes. A key feature of this level of public participation is that public concerns and objectives are used in all stages of decision-making, from conceptualizing problems to developing solutions, to the maximum extent possible.

- **Partner** Engages stakeholders as partners in all stages of decision-making processes. The public contributes not only feedback and advice, but also innovative ideas. In comparison to involvement, public input is given the same weight as technical and other advice.
- **Mobilize/Empower** Places stakeholders in charge of the decision-making process. The final decisions of the public are implemented.



The appropriate level of public participation will vary on the basis of the issues being addressed and the stakeholders/interest groups involved. For instance, informing may be most appropriate for issues of public concern which lack a wide range of opinion or do not generate significant conflict between stakeholder groups. At the same time, more intensive forms of public participation can be very difficult to achieve and may result in deadlock in highly conflictual settings, which can often be the case with regard to natural resource management. There are no simple rules for determining an appropriate tool or set of tools for engagement as described by this spectrum; this is always contextspecific and the level of public participation may vary throughout a decision-making process.

Efforts to include stakeholders and the broader public in environmental protection and natural resource management are relatively new (Fischer, 2000; Peters et al., 2010; Thompson, 2014). Contemporary efforts in these fields tend to employ an expert-driven model of public participation and community engagement. Typical modes of outreach and research include citizen surveys, focus groups, facilitated meetings, and key informant interviews; while this information is often incorporated into management plans, the plans are not co-produced by experts and citizens together. According to our schema above, these efforts are limited to listening, or involvement, at best.

Without broad, robust plans in place for partnering and mobilizing/empowering, it is unreasonable to expect that social media tools can achieve these goals. There is a temptation to assume that social media tools, because they are by nature interactive, can act as a substitute for welldeveloped engagement strategies. However the effectiveness of these tools, as is true with other technologies (e.g., baiting, trapping, vaccines, biocontrol agents), is highly dependent upon social and environmental context. In terms of invasive species management, it would not make sense to uncritically employ the same social media tool or suite of tools across a range of communities, geographies, species types, and specific control strategies (again, baiting, trapping, and others). It is important to recognize that the tools, like the forms of public participation they support, are multifaceted. As Thompson (2014, p. 11) points out, there are "a range of processes, practices, knowledge that can be employed to work with and for communities from a practitioner, research or institutional position." Similarly, there are a range of processes, practices, and knowledge that social media tools can facilitate, and the same tool may be relevant to activities across several levels of public participation.

The Australian Context

Key considerations for the adoption of online technologies for facilitating community engagement in the Australian context are access and use patterns. This is of particular relevance when many of the intended participants of internet-based engagement strategies live in regional, rural, and even remote Australia, where access to fast internet is less widespread. In this section we explore the penetration of Internet access and use in Australia, and identify potential constraints and opportunities. We review the internet-based options that are likely to be the most appropriate.

Internet Availability and Individual Use Patterns

Internet access throughout Australia has grown rapidly in the past decade. In 2001, only 35% of Australians had access to the internet in their homes (ABS, 2006). By 2011, 79% of Australians had internet access in their homes. Of these users, 92% had a broadband internet connection (ABS, 2011). The Australian Bureau of Statistics (ABS, 2013) reported that, as of June 2013, there were 77 Internet Service Providers (ISPs) in Australia with more than 1,000 subscribers. Overall, there were 12,408,000 internet subscribers accounted for in Australia in June 2013. Most internet subscribers use either digital subscriber lines (DSL) or mobile wireless connections, as indicated in the table below¹ :

	Jun 2012	Dec 2012	Jun 2013
Dial-up connections Broadband connections	439	282	227
DSL	4 632	4 727	4 787
Cable	917	918	934
Fibre	52	91	115
Satellite	94	92	93
Fixed wireless	30	49	49
Mobile wireless	5 862	5 995	6 150
Other	10	7	3
All broadband connections	11 597	11 879	12 131
Total number of subscribers	12 036	12 161	12 358

Internet subscribers by type of access connection(a)(b), for ISPs with more than 1,000 subscribers

¹(a) Dial-up and broadband figures reported by type of access connection may not equal figures collected by advertised download speeds, due to some broadband connections being reported as less than 256kbps.

(b) Data reported by type of access connection may be influenced by cyclical factors, such as educational semesters. This could impact on the data reported at each reference period of the IAS, namely 30 June and 31 December, particularly for types of access connection where relatively small numbers are reported.

The ABS (2013) found that the type of internet access growing most rapidly is fibre. Between December 2012 and June 2013 the number of fibre internet access connections increased by 26% (ABS, 2013). However, mobile wireless broadband accounted for the greatest amount of internet access connections, representing more than half of all connections (ABS, 2013). These different types of connection may have implications for the functions of online engagement tools, particularly relating to data transfer speeds and capacity and management.

Internet access patterns vary based on geographic

and social characteristics. According to the Australian Bureau of Statistics (ABS, 2007), rural areas are less likely to have internet access (42%) than major urban areas (66%), especially with regard to broadband service (24% in rural areas and 46% in urban areas). The Australian Capital Territory has the greatest number of homes (75%) connected to the Internet. The regional areas of New South Wales, Victoria, Queensland and Western Australia have slightly lower levels of internet connectivity, ranging from 63% to 65%. The lowest levels are found in South Australia, Tasmania, and the Northern Territory, and range from 55% to 58%. Broadband connection data exhibit similar characteristics, with the Australian Capital Territory leading the way at 53% saturation. New South Wales, Victoria, Queensland, and Western Australia followed with 41% to 42% of homes having broadband connections. Lastly, broadband connectivity in South Australia, Tasmania and the Northern Territory ranged from only 28% to 32%.



It is important to note that while the lowest levels of connectivity are generally found in Tasmania, these are not an adequate proxy for social media usage. A report by the Sensis group found that Tasmania to be the region with the highest percentage of social media users. Sensis (2011) reported that social media users in South Australia and West Australia frequent social media sites roughly 11 times a week while users in Tasmania frequent sites 14.8 times in a week. It is possible to break these statistics down even further, and note that while Tasmania leads in frequency of social networking site usage overall, it has one of the lowest average usages per week of Facebook among the states. With respect to specific social networking sites like Facebook, MySpace, Twitter and LinkedIn, Sensis found that almost one third of all Australian Internet users access those social networking sites daily. Across Australia, Facebook is the most popular social networking site, used by 97% of social networking participants or 6 out of 10 internet users. However, the popularity of other social networking sites, such as LinkedIn and Twitter, varies more widely by region. For instance, LinkedIn is more popular in New South Wales and the Australian Capital Territory than other states, while Twitter is more popular in Queensland, Tasmania and the Australian Capital Territory than other states. And while Facebook has achieved almost total saturation among social network users in both metro and non-metro areas, other social networking sites among those considered in the Sensis report reveal substantial differences between metro and non-metro users, particularly LinkedIn. Among social network users, 12% of those in metro areas report using LinkedIn, compared to only 2% of those in nonmetro areas. Time spent on social networking also differs across sites. Facebook users spend roughly 20 minutes on the site every time they view the site. In comparison, sites like LinkedIn and Twitter are generally accessed for about 12 minutes at a time. These findings should be interpreted cautiously, because it can be difficult to trace IP addresses and pinpoint exact individual user locations (Wirth Consulting, 2012). Nevertheless, data such as these

suggest that internet access and usage are two very different metrics, which may have significantly different implications for outreach and engagement campaigns using social media.

Usage patterns within the agricultural sector also vary geographically. The ABS (2009) notes: "A higher proportion of farms in remote areas use the Internet for business operations. This highlights the strong relationship between farm size, as measured by EVAO, and the use of the Internet for business operations." Additionally, it was noted that 48% of farms used a broadband connection rather than dialup. The range of internet use among farmers across the Australia territories varied from a high of 74% in the Australian Capital Territory to a low of 59% in Tasmania. The map below illustrates the percentage of Australian farmers that did not use the internet for business operations between 2007 and 2008, with dark red representing those territories in which more than 40% of farmers did not use the internet as part of their farming operation, and light red and pink representing regions in which a small percentage, only 0-10%, of the farmers did not use the internet as part of their business. According to the ABS, a total of 66% of farms were using the Internet for business operations between 2007 and 2008.



Photo: European fox by Danny McCreadie



Farms not using the Internet for business operations by Statistical Division 2007-08

© Commonwealth of Australia, 2009



Photo: European fox by Lee Allen



Photo: Feral pig by Michelle Drew



Despite this difference it is worth noting that, across all regions, more than half of farms use the internet for business operations, as indicated by the table below (ABS, 2009)

	All farms	Farms	No internet use			
	no.	using the Internet no.	%	no.	%	
States and Territories						
New South Wales	44 500	28 417	64	16 083	36	
Victoria	34 257	21 258	62	12 998	38	
Queensland	29 192	19 637	67	9 555	33	
South Australia	15 044	10 567	70	4 477	30	
Western Australia	13 135	9 524	73	3 611	27	
Tasmania	4 211	2 483	59	1 729	41	
Northern Territory	605	435	72	^169	28	
Australian Capital Territory	82	61	74	^21	26	
Industry						
Agriculture						
Nursery and Floriculture Production	1 947	1 448	74	499	26	
Mushroom and Vegetable Growing	4 562	2 390	52	2 172	48	
Fruit and Tree Nut Growing	13 814	9 765	71	4 050	29	
Sheep, Beef Cattle and Grain Farming	87 001	56 245	65	30 757	35	
Other Crop Growing	4 915	3 490	71	1 425	29	
Dairy Cattle Farming	8 793	5 814	66	2 979	34	
Poultry Farming	1 284	890	69	394	31	
Deer Farming	*138	*117	85	21	15	
Other Livestock Farming	3 444	2 503	73	941	27	
Agriculture	125 898	82 661	66	43 237	34	
All other industries	15 128	9 721	64	5 407	36	
EVAO						
\$0-\$49,999	58 907	33 475	57	25 432	43	
\$50,000-\$149,999	35 056	21 823	62	13 233	38	
\$150,000-\$249,999	15 930	11 354	71	4 577	29	
\$250,000-\$499,999	16 882	13 296	79	3 585	21	
\$500,000-\$999,999	9 313	7 985	86	1 328	14	
\$1m or more	4 938	4 450	90	489	10	
Total	141 026	92 383	66	48 644	34	

Use	of th	e Internet	on f	farms	for	business	operations(a).	bv	v selected	indicators:	2007-08
								~ ,			

 $^{\rm A}$ estimate has a relative standard error of 10% to less than 25% and should be used with caution

 * estimate has a relative standard error of 25% to 50% and should be used with caution

(a) Percentages are of all farms.

While farmers living in remote areas have fairly good access to internet, indigenous people do not fare as well. According to McCallum and Papandrea (2009, p. 1233), "Indigenous Australians in remote and isolated communities have access to a poorer level of technological facilities, slower internet connections, and less access to maintenance of facilities and training in internet use than those in urban Australia." McCallum and Papandrea note ABS data from 2002 indicated that 56% of indigenous Australians had used a computer and 41% had accessed a computer during the prior year, however in 2001 only 3% of the indigenous people actually had a computer at home. The authors also found that nearly 60% of indigenous Australian internet users reported that if they had more Internet training, they would utilise the internet more frequently. To further investigate this issue, they compared a town in which there were few to no administrative and technical staff to assist with internet use and maintenance with a town in which local government officers offered community and individual training and support. They found that this government-funded community development project increased demand for internet services in the region, and more generally boosted community leadership and engagement.

Based on their findings, McCallum and Papandrea (2009) suggest that successful internet adoption programs should focus on community internet facilities rather than home internet use, because computer centres provide a space for people to gather and learn together about the technology. Similarly, the Institute for a Broadband-Enabled Society (IBES) (2013) provides evidence that access alone does not correspond to digital literacy. In some instances non-users of broadband services simply refused to use or were reluctant to use the technology. Analysing users and non-users of broadband services is complicated because it involves such a variety of factors (such as the userfriendliness and functionality of various platforms and tools and learning preferences of internet users) however the IBES suggests that use of the services often occurs in clusters (not individuals.) The

implications for outreach and engagement are clear: delivery mechanisms must be adapted to meet local preferences and social structures.

There are a number of other demographic characteristics that influence internet access across Australia, in both rural and urban settings. Income in particular play a significant role; individuals living in families earning AUD\$2,000 or more per week were three times more likely to have broadband access than individuals earning less than \$600 per week (ABS, 2007). The Household Use of Information Technology (HUIT) found that between 2005 to 2006, 22% of households in the lowest two income quintiles stated that the main reason they did not have any type of internet access was due to high costs. As opposed to access in a public library or educational centre, only 34% of people in the bottom income quintile have internet access in their home, compared to the top income quintile, in which 77% people have home access. Those who are unemployed are 12% less likely to have broadband access than those with jobs. Moreover, people who are not in the labour force are 18% less likely to have broadband service and those who are employed in low skill occupations are 27% less likely to have broadband service.

Other relevant demographic factors included level of education, family structure, marriage status, language proficiency, indigenous heritage, and age. Level of education was another significant factor determining internet access and type of internet access. The ABS (2007) found that individuals who earned an advanced degree were 83% more likely to have broadband service than those without an advanced degree. Families (including single parents and couples with children under age 15 and dependent students) are three to four more times likely to have broadband access compared to families without children. Unmarried men and women are less likely to have access to broadband (by 25% for men, and 37% for women) than married men and women. Those with little English proficiency are less likely (by 27%) to have broadband internet. For all internet types,



individuals with no English proficiency are 8% less likely to have access. Finally, people under the age of 24 are 50% more likely to have broadband access than those between the ages of 35 and 44. The Sensis group (2011) also found that age was an important factor in the utilization of social networking sites. On average, 93% of those under the age of 30 in Australia use a social networking site and usually access the site(s) daily. In contrast, Australians over the age of 40 are a lot less likely than those under age 30 to even access social networking sites, much less frequent them regularly. Again, these findings have important consequences for the use of internet as part of a community engagement strategy.

Organisational Use Patterns

In Australia, 1 out of 5 social networking users monitor social networking groups that are connected with a business or brand (Sensis, 2011). However the ways in which businesses and not for profit organisations have come to use social media, and the types of platforms that they employ, vary. According to the most recent data, 14% of small businesses, 25% of medium businesses and 50% of large businesses utilise some type of social media. For business use, Facebook was found to be the most popular social networking sites, followed by Twitter and then LinkedIn. In the future, it is expected that social media investment will result in sale increases for businesses; small businesses are likely to see a 10% increase in sales and large businesses are expected to see about a 4% increase.



A study completed by Wirth Consulting (2012) found that 97% of Australian not for profit organisations have an online website presence. Facebook, Twitter, YouTube and LinkedIn were some of the social media sites most commonly used in Australia by these types of organisations. Data suggested that Australian non-profit organisations made an average of three postings on Facebook and eight postings on Twitter per week. The authors suggest that that non-profit groups are now less likely than they were in the past to use blogs (users representing only 10% of the 97% that have an online presence) as they require more work, and Facebook and Twitter have emerged as easy-to-use replacements. The chart below captures the percentage of Australian not for profit organisations using various platforms.

This study also considered the sectors represented by not for profit organisations using social media platforms. Of the 595 groups utilising social media, Wirth Consulting (2012) concluded that 65% of the organisations were within the Health and Human Services sector, with the next largest sector being the Public/Societal Benefit at 11%. The Environment and Wildlife sector only accounted for 4% of the non-profit social media users. Despite their small presence, non-profit organisations from the Environment and Wildlife sector were the most likely to use Facebook, YouTube and LinkedIn.

As with individual use, geography was also a factor associated with organisations' social media use. Data suggest that organisations headquartered in Queensland are the most likely to use Twitter while those headquartered in Victoria are most likely to use LinkedIn or blogging sites. New South Wales and Victoria were also cited as the regions where organisations were most likely to use Facebook (Wirth Consulting, 2012). These patterns are illustrated below.



Figure 1 Forms of communication used, or expected to be used, by community groups involved in weed management



Wirth Consulting (2012) concluded their study by identifying the top 20 non-profit organisations in Australia that best utilised social media. The common keys to their success included being able to appropriately identify their target market, wisely invest their time and suitably measure their successes and failures in order to improve.

A report about the information pathways used by community groups, organisations and government organisations involved in weed management found that these stakeholders use a range of communication tools to engage communities about weed management (Thompson et al., 2013). A national survey of community groups involved in weed management found that e-mail and faceto-face communication were the most frequently used forms of communication (96 and 93 per cent, respectively), while Television and social media (such as Facebook and Twitter) were the least used tools (13 and 16 per cent respectively). Groups did indicate however that television, social media and radio might be used by more groups in future as these options rated relatively highly for 'expect to use' and 'would consider using' (Figure 1). Respondents also indicated how effective they though each tool was, with Face-to-face

communication and e-mail were rated as 'very effective', while television and social media were rated 'not very effective' by most respondents.

Government organisations (Including Federal, state and local) and other non-community groups indicated that face-to-face discussions; email; paper-based media (for example, newsletters and newspapers); web-based tools such as web pages; and phone-based consultations were currently in use (Figure 2). Figure 2 also indicates that more organisations expect to use web-based tools (12 per cent), than the other communication options in future (Thompson et al. 2013). Social media were the least used tools, rating the lowest for 'already use' and 'expect to use', and the highest for 'do not expect to use'.

As for community groups, face-to-face communication (83 per cent) was viewed as the most effective way to communicate; followed by email (40 per cent); and paper-based communication, phone consultations and television (all 29 percent). Institutional body representatives had the least confidence in the effectiveness of social media (47 per cent), television (26 per cent) and radio (16 per cent), the last of which rated the highest for 'not very effective' (Thompson et al. 2013, p. 45).



Figure 2 Forms of communication used, or expected to be used, by government and other non-community organisations

The results from this 2013 study give an indication of the probably level of use of similar communication tools by groups and organisations involved in invasive animals management as they are frequently the same.

Regulatory Environment

The Australian Communications and Media Authority (ACMA) is responsible for monitoring Australian internet activities. Legislation has been passed to protect consumers, including the Federal Trade Practices Act and State Fair Trading Acts. The ACMA also monitors industry codes and guidelines. Enforcement authority under the Telecommunications Acts of 1997 and 1999 includes remedial directions, formal warnings and enforceable actions. Restrictions are primarily geared towards content relating to illegal activities, child pornography, and sexual violence. A 2009 report from the OpenNet Initiative showed no evidence of Internet filtering in Australia; however, child pornography was not taken into consideration due to legal constraints. It is important to note that the Australian constitution does not explicitly grant freedom of speech, thus leaving potential for government regulation.

Many of the telecommunication policies in Australia today are set by the Department of Broadband, Communications and Digital Economy (DBCDE). Additionally the Telecommunications Industry Ombudsman (TIO) and the Australian Communications Consumer Action Network (ACCC) have roles in the regulation of the telecommunications industry in Australia. Moreover, there are fair trading offices and industries that seek to protect consumer rights and to develop code for telecommunication policies (ACMA, 2013). The image below depicts the various players involved in telecommunications and their role in the context of Australia.



DBCDE



Online Engagement for Invasive Animals Management

Editorial note:

This section provides an overview of the relevant 'organisations' use of online tools relating to invasive and pest animal management.

There is also brief discussion of the types of metrics available for evaluating the success of online tools. Evaluation is made challenging by the fact that each tool might have a different metric, and these metrics are necessarily tied to the particular engagement goals of different organisations. For example, an evaluation metric for a Facebook account might be the average number of "likes" that posts receive. However, even common metrics like this one must be targeted - 1,000 likes for one organisation may be considered a 'success' given their potential audience, while another organisation might consider this number a failure.

Given the incredible number of tools available and the range of uses to which these tools can be put, this section presents a brief overview as a platform or jumping off point for more detailed consideration of specific tools and engagement goals.

Social Media for Invasive Animal Management:

Examples from some US Organisations

While social media has become a highly celebrated tool, especially for cost-sensitive non-profit organisations, the role of social media differs across organisations depending on their goals and structure. One of the most important elements of mobilizing a successful presence online is the integration of social media on an organisation's website. Regardless of the strength of social media avenues, the website remains the hub of all information and connections, and should be viewed as so when developing social media strategies (Temin, 2014). Essentially, the website is an organisation's online headquarters.

In order to thoroughly and accessibly integrate social media throughout a website, organisations are utilising several strategies including: placing logo links, subscription links, and donation links in the site heading; providing links to social media channels near specific pictures, videos, and articles; displaying live feeds of social media channels; providing QR codes for mobile applications; and utilising effective language.

Below the organisation name and logo, The Nature Conservancy, the New York Department of Environmental Conservation, the Audubon Society, National Geography, and Tread Lightly all include images of logos of social media sites, such as Facebook, Twitter, YouTube, Flickr, and Pinterest. These logos provide a link to the organisation's platform on the individual social media sites. Like the website title, these icons remain static regardless of the specific page you are viewing, presenting a persistent and accessible opportunity to connect with the organisation through social media channels. Other than links to social media sites, providing prominent links to subscribe to email messages and to donate present important opportunities to capitalize on viewer attention and to forge a long-term relationship with community members.

Beyond the website heading, logo links to social media platforms can be placed near pictures, videos, and articles to provide an instant opportunity to share information. The Nature Conservancy, National Geographic, and the Audubon Society provide logo links to share, like, tweet, pin, or email specific pictures, videos, and articles. While displaying logo links can be an effective strategy to connect interested viewers, live feeds provide viewers with instant engagement as feeds display a preview of social media content. National Geographic and the Nebraska Game and Parks Commission (NGPC) include sections displaying a live feed of their Facebook page with a link to 'Like' their page. The live feed is a section on a website, which displays posts on the Facebook wall of an organisation revealing important updates, articles, pictures, and events. Included at the bottom portion of the live feed is also the number of people who current like the designated Facebook page, as well as pictures of people who like the page. For instance, the NGPC's live feed notes, "19,483 people like Nebraska Game and Parks Commission," and displays eight small pictures of people who like the page. This section of the live feed reveals the popularity of a page, and also allows a person to see if any of their Facebook friends like the organisation's page, promoting a bandwagon effect. Essentially, the live feed is a method to integrate information revealed on social media onto the organisation's website, while also serving as an advertisement encouraging viewers to connect with the organisation on social media (Grinberg, 2011).

The Nebraska Game and Parks Commission publicises their two mobile applications on their website by providing an image of the app and a link to download the app for iPhone and Android users. While the two apps provide informative guides about the parks, there are many applications available for invasive species information and reporting. The Center for Invasive Species and Ecosystem Health maintains the Bugwood Apps website, providing several mobile apps for invasive species management. Organisations can use For example, Florida's "IveGot1" invasive species campaign involves a mobile application, a website, and a hotline, a comprehensive approach to provide access to direct reporting and information. Specifically, the "IveGot1" app allows people to report sightings, by accessing the app, entering information about the siting into the text boxes, and submitting the form, the application records the animal and the GPS location of your phone at the time of submission (Bugwood Apps, n.d.).

In addition to images of the app and links to download the app, organisations can also utilise QR codes. Quick Response Codes, abbreviated as QR codes, are types of barcodes, which can be read by a camera with QR analyzing capacity. While this process sounds highly technical, QR codes have gained great popularity in marketing, as people with smart phones are able to simply take a picture of a QR code through a QR code reader mobile application. After taking the picture, the application reads the code and directs the user to the destination routed in the QR code. For example, users can take a picture of a QR code for and instantly arrive at a site to download a mobile app for invasive species (Finn, 2010).

Regardless of the social media platform, language is an important tool for organisations to mobilize action. When organisations post messages on social media platforms, or through other channels, organisations should focus on creating an authentic, approachable, and interesting voice (Kaplan, 2010). Messages should empower community members to support the organisation's mission, and should provide a welcoming environment for two-way communication between the organisation and its followers. The Wisconsin Department of Natural Resources successfully leverages two-way communication by hosting online chats through Facebook and their website about prominent invasive species issues. Additionally, using concise, captivating language that is consistent with the organisational voice is vital to spreading messages through social media. For instance, the Nature Conservancy uses lines, such as "Join the herd! Share your passion for nature with our online green communities," adjacent social media page links. The short call to action utilised by the Nature Conservancy informs audience members of these online communities, persuades viewers to jump onto the social media bandwagon, and reminds viewers of social media channels, as audience members may have noticed the social media links previously throughout the website.

The emergence and survival of social media activity depends on developing clear and smart goals and evaluation procedures. Many organisations have a tendency to overlook the evaluation process, seeing evaluation as a drain on staff time and



resources (Kiernan, 2004). However, evaluation is not only important, but necessary to creating and maintaining an effective social media presence and online evaluation tools are often free. The first step in evaluating progress is to recognize the social media campaign goals and to determine ways to measure success. Five avenues are often recognized by social media analytic companies to evaluate social media success: brand reach and exposure, engagement, share of voice and sentiment, influence, and measure conversions (Fuzz One Media, 2012). Organisations can measure brand reach and exposure by tracking the growth rate in areas such as number of Facebook fans, comments, and likes, as well as the number of YouTube views, subscribers, and bounce rate. The bounce rate, also known as video play rate, is the proportion of total video player loads to video player loads where the viewer watches some or all of the video. This metric shows the percentage of people who abandon the site early in the video.

Viewer engagement in social media can be measured through many ways, including but not limited to the number of clicks that Facebook and Twitter links receive, the number of times messages received Facebook comments and likes, and the number of times a Twitter hashtag was used. Beyond the numbers, measuring whether people share of the voice and sentiment of a post can help organisations determine viewers' perceptions of their brand by qualitatively analysing comments. Organisations can also separate feedback into positive, negative, and neutral categories and calculate the percentages of each sentiment from the total number of comments. While the previous categories have addressed viewers' interest in the organisation, measuring influence reveals the actions that users take in response to the content published. Influence can be measured through the number of Twitter retweets, Facebook shares, and the number of external links to your content. Finally, conversions are an extremely beneficial metric to determine the impact of social media campaigns on ROI. The concept of conversions involves pre-determining goals and measuring

how those goals were achieved through the use of social media - essentially how social media usage converted to ROI.

Today, there are many free online evaluation tools available to organisations. Google for Nonprofits offers free resources and tools exclusively for nonprofit organisations, including products such as Google Apps and Good Ad Grants. The site also includes helpful guides to using Google Analytics, a free site, which can be a helpful tool to examine conversions. Facebook Insights allows organisations to measure social media impact through Facebook. Twitter Analytics and Twitalyzer provide reports and information about Twitter use. Finally, Bitly, originally designed to help organisations shorten URL links, provides social media analytics across multiple channels.

US Case Study: The Nebraska Game and Parks Commission (NGPC) - 2014

NB: this case study data was collected in 2014 and may be out of date

The website for the Nebraska Game and Parks Commission (NGPC) provides a useful United States-based case study for the use of an array of online engagement tools to promote awareness and action related to invasive anima management. Our analysis of the site suggests several lessons that are applicable to the Australia setting, and to organisations working in this field.

While NGPC website does not provide exceptional visual display or a strategic layout of information, the NGPC employs interesting social media integration strategies across their website. On the left-side menu, viewers have the option of visiting a specific page designated to "Social Media and Mobile Apps". The page provides logo links to Facebook, the Official Nebraska Government Website, Twitter, Scribd, Flickr, YouTube, iPhone and Android. The page also includes links to several Facebook pages within the umbrella of the NGPC. However, the number of different social media outlets included and the number of Facebook pages listed may not be effective at garnering viewer connections. The NGPC may confuse viewers by including such an extensive list of diverse Facebook pages, as viewers may be unsure which page to 'Like'; and moreover, with so many pages, the organisation may not be able to convey a consistent message to all parks within their network. However, the NGPC has been able to overcome these potential difficulties by garnering 17,138 'Likes' to their main Facebook page.

Depending on the scope and the mission of the organisation, leaders should determine which social media platforms will be most effective to reach the target audience and to produce the desired outcomes. More does not necessarily equate to 'better' in the realm of social media; but rather, applying social media to meet specific strategic organisational goals is most pertinent. The NGPC also includes a miniature live-feed of their main Facebook page for viewers to see and 'Like' the page, without even navigating away from the website. However, the NGPC includes this live-feed at two different places on the same page - and this appears unprofessional and confusing to site users. The "Social Media and Mobile Apps" page also includes two mobile apps: The Official NE Fish & Wildlife Guide and The Official NE State Game & Parks Outdoors Guide. The site presents links for users to download the app from the App Store or the Android Market, appealing to both iPhone and Android owners. While an individual page dedicated to social media may be effective for some organisations, integration of social media outlets across the site is direct, effective and accessible to viewers regardless of the page they are viewing. Therefore, organisations should use the NGPC site as an example of ways to use and present various possible social media avenues. Organisations should emulate NPGC's vigour for social media campaigns while carefully discern how these various avenues are presented and which forms are effective given the organisation.

Observations for invasive species organisations

Organisations might consider the question: how can we expand beyond our current social media capacity? While there are many possible solutions to increasing social media presence, better integration of social media across the website is a potential first step worth testing or evaluating. Based upon comparison with other organisations in this field, some potentially useful ways to include more links to social media on your website include: logo links in the static header, logo links below pictures and articles, and links next to organisational events and important dates. Besides the links to social media in the heading, links to donate and to subscribe to an e-newsletter can present page viewers with additional ways to support the organisation. In addition to links, sites may also want to consider integrating other tools used by the organisations described above, such as live feeds, online chats, and apps to report sightings, such as technologies utilised by the IACRC Feral Scan. The IACRC's mobile application is comprehensive and user-friendly to achieve the goal of raising awareness of invasive species. Feral Scan provides apps to report sightings of various invasive species specific to the Australian context.

In order to effectively use social media, it is helpful to implement a monitoring and evaluation strategy. There are many free online evaluation tools available to organisations, such as Google for Nonprofits, including Google Analytics, Facebook Insights, Twitter Analytics, Twitalyzer, Cool Social, and Bitly. The IACRC should explore these diverse resources to determine how to best analyse progress according to the goals of the engagement strategy. This brief listing of free and widely available tools for evaluation may be helpful for anyone considering future research using online engagement.

Over the last ten years, people have started utilising social media to respond to crisis situations. While the presence of invasive species in Australia is not necessarily considered as an urgent crisis,



social media can be used to call for action and communication. The example of the BP oil spill in the Gulf of Mexico demonstrates how social media can be used by organisations and constituents during a crisis (Menck, 2012). In particular, social media can be used to spread an "explicit statement of value" from the organisation in response to a crisis and to respond to citizens' needs. The Louisiana Bucket Brigade (LABB) utilised Ushahidi, a webbased map, on which people could report events related to the spill and from which first responders and organisations could collect data to provide appropriate aid to areas in need. Additionally, the Louisiana Seafood Promotion Board and the Gulf Coast Restoration Network used Facebook and Twitter to provide citizens with an avenue to share their stories, allowing the people to seek the help they need, and allowing the organisations to collect a strong narrative describing the necessity of the organisation's work and mission (Menck, 2012). Approaching social media use through a crisis lens may allow the invasive species organisations to consider increasingly active and deliberate use of social media and to utilise constituent's stories to strengthen the organisational mission.

different uptakes and impacts in different regions and among different demographic groups. The first step in developing an effective suite of online tools is thus a systematic capacity and needs assessment for specific target populations in specific geographical contexts. No single tool or suite of tools will have universal applicability or even positive reception. This initial survey work should inform roll-out of any new or updated online tools as a lack of carefully researched and strategic implementation plans will undermine the effectiveness of online engagement tools for invasive species management. Though resourcing is a continual challenge in this regard, ultimately this kind of up-front work is essential to achieving outcomes and getting the most value from limited funds.

Conclusions

The use of social media tools to achieve a range of engagement goals is and will continue to be a rapidly changing phenomenon. Working in invasive species management, which is characterized by uncertainty, necessitates both a diverse portfolio of approaches and a responsive process of continuous experimentation, monitoring, and evaluation - components of empirical research that are often overlooked when adopting new technological advances. Though a full or even thorough understanding of the potential impact of a given suite of social media tools is not possible, it is important to develop a greater evidence base than currently exists for decision-making. As our review of internet access and use in Australia demonstrates, online tools will have significantly

While there are currently many resources addressing social media use and social media tools, there remains a wide gap in information regarding the efficacy of social media for invasive species management organisations and campaigns. Many environmentally-focused organisations have adopted social media tactics, but have not published evaluations of the effectiveness of these tactics. It is unclear whether organisations do not execute social media evaluation or whether organisations simply do not release their findings. Some organisations may not release their findings in order to maintain a competitive advantage, while other organisations may simply be unaware to the fact that their evaluations of social media efficacy are relevant and important. Also, organisations that are willing to release their findings may not know where to showcase such data and may lack

the staffing power or time to analyse their results for publication. While many organisations are involved in social media, there remains an untapped opportunity to increase the individual and collective strength of organisations by creating a space to collaborate about social media issues.

Furthermore, specific research experiments should be conducted to test a wide array of social media factors. Example experiments might involve testing the effects that differing levels of engagement distribution channels have on participation in a campaign. Online tools are only one category among many, and should be viewed in the context of overall engagement efforts, rather than independently. Therefore, future research should address the optimal distribution of engagement efforts in order for organisations to determine how much time and effort to allocate to social media, and how they should use social media.



Section 1: References

Bittle, S., Haller, C., & Kadlec, A. (2009). Promising practices in online engagement [Occsaional Paper No. 3]. Center for Advances in Public Engagement. Retrieved from http://www.publicagenda.org/files/PA_CAPE_Paper3_Promising_Mech2.pdf

Black, L. W. (2011). The promise and problems of online deliberation. Kettering Foundation Working Paper. Retrieved from http://kettering.org/publications/the-promise-and-problems-of-online-deliberation/

Dozier, A., Hacker, K., Silberberg, M., & Ziegahn, L. (2011). "The value of social networking in community engagement." In Principles of community engagement (2nd ed.) (pp. 151-160). NIH Publication No. 11-7782.

Fischer, F. (2000). Citizens, experts, and the environment: The politics of local knowledge. Durham, NC: Duke University Press.

Heierbacher, S. (2011, June 21). Tools for online participation [Blog post]. National Coalition for Dialogue & Deliberation. Retrieved from http://ncdd.org/rc/item/5785

Kaplan, A. M., & Haenlein, M. (2010). "Users of the world, unite! The challenges and opportunities of social media." Business Horizons, 53(1), 59-68.

Kietzmann, J. H. Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). "Social media? Get serious! Understanding the functional building blocks of social media." Business Horizons, 54(3), 241-251.

Manneh, C. (2012, September 5). Mojang and UN presents: Block by Block [Blog post]. Mojang. Retrieved from http://mojang.com/2012/09/mojang-and-un-presents-block-by-block/

Pasek, J., More, E., & Romer, D. (2009). "Realizing the social internet? Online social networking meets offline civic engagement." Journal of Information Technology & Politics, 6(3), 197-215.

Peters, S. J., Alter, T. R., & Schwartzbach, N. (2010). Democracy and higher education: Traditions and stories of civic engagement. Transformations in higher education: The scholarship of engagement. East Lansing, MI: Michigan State University Press.

Shuffstall, W., Shuffstall, P., & Frumento, P.Z. (2013, August). Community engagement: Social media tools and

considerations [PowerPoint]. Presented at the Community Leadership and Engagement short course, State College, PA.

Thompson, L. (2014). Leadership and community engagement for invasive animals management in Australia: Status quo and future vision [White paper]. Invasive Animals Cooperative Research Centre.

Urban Sustainability Directors Network. (2012). "Get ready: Assess your readiness for digital engagement." In Digital sustainability conversations: How local governments can engage residents online. Sustainable Cities Institute at the National League of Cities. Retrieved from http://www.albanysustainability.org/documents/DE%20Guidebook%20-%20Web.pdf

Williams, R. (2014, May 17). Citizen scientists produce real results [Podcast]. The Science Show. Retrieved from http://www.abc.net.au/radionational/programs/scienceshow/citizen-scientists-produce-real-results/5458340

Section 2: References

Australian Bureau of Statistics. (2007). Patterns of internet access in Australia, 2006 [Media release]. Retrieved from: http://www.abs.gov.au/ausstats/abs@.nsf/mf/8146.0.55.001

Australian Bureau of Statistics. (2009). Use of the internet on farms, Australia, 2007-08 [Media release]. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/8150.0

Australian Bureau of Statistics. (2013). Internet activity, Australia, June 2013[Media release]. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/ Products/8153.0~June+2013-Chapter-Type+of+access+connection?OpenDocument

Australian Communications and Media Authority. (2013). The regulatory framework and ACMA's Role [Word document]. Retrieved from http://www.acma.gov.au/

Inovact Consulting. (2011). New connections driving innovation and productivity: Opportunities for rural industry development from innovative use of broadband services [RIRDC Publication No. 11/038]. Canberra: Rural Industries Research and Development Corporation. Retrieved from https://rirdc.infoservices.com.au/ downloads/11-038

Institute for a Broadband-Enabled Society. (2013). Institute for a Broadband-Enabled Society Annual Report 2013. Retrieved from http://broadband.unimelb.edu.au/engage/pubs/ar/IBES-Annual-Report-2013.pdf



McCallum, K., & Papandrea, F. (2009). Community business: The internet in remote Australian Indigenous communities. New Media & Society, 11(7), 1230-1251.

Sensis. (2011). Sensis social media report: What Australian people and businesses are doing with social media. Retrieved from http://about.sensis.com.au/ignitionsuite/uploads/docs/sensis%20social%20media%20report.pdf

Thompson, L-J., Kruger, H., & Trestrail, C. (2013). Who's involved with weeds? A social network analysis of funding and information networks for weed management [RIRDC Publication No. 13/065). Rural Industries Research and Development Corporation. Forthcoming.

Wirth Consulting. (2012). The state of social media use in Australia non profit organisations [White paper]. Retrieved from http://www.wirthconsulting.com.au/research/social-media-research/the-state-of-social-media-use-in-australian-non-profits

Section 3: References

Finn, Greg. (2014, February 5). How to use QR codes in social media [Column]. Search Engine Land. Retrieved from http://searchengineland.com/how-to-use-qr-codes-in-social-media-52712

Fuzz One Media. (2012, February 16). 5 Ways to measure the success of a social media campaign [Blog post]. Retrieved from http://www.fuzzone.com/blog/919/social-media-marketing/5-ways-to-measure-the-success-of-a-social-media-campaign/

Grinberg, M. (2011, December 21). 10 Ways to add Facebook functionality to your website [Blog post]. Social Media Examiner. Retrieved from http://www.socialmediaexaminer.com/10-ways-to-add-facebook-functionality-to-your-website

Bugwood Apps. (n.d.) I'veGot1 [App]. Bugwood Center for Invasive Species and Ecosystem Health, The University of Georgia. Retrieved from http://apps.bugwood.org/ivegot1.html

Kiernan, N.E., & Alter, T.R. (2004). Can a web site be used as a vehicle for organizational learning about evaluation? Journal of Higher Education Outreach and Engagement, 10(1), 121-34.

Livingston, G. (2009, March 26). Social media for social causes study: The Results [Blog post]. Mashable. Retrieved from http://mashable.com/2009/03/26/social-media-nonprofit-study/

Menck, C. (2012). The use of social media in response to the Gulf of Mexico BP oil spill. In D.R. Gallagher (Ed.), Environmental leadership: A reference handbook (pp. 347-56). Thousand Oaks: SAGE Publications.

Nebraska Game and Parks Commission. (2014). Nebraska Game and Parks Commission [Web site]. Retrieved from http://outdoornebraska.ne.gov/

Temin, D., & Anderson, I. (2014, January 9). Don't kill off your website: Use it as the hub for your social media presence [Blog post]. Forbes. Retrieved from http://www.forbes.com/sites/daviatemin/2014/01/09/ dont-kill-off-your-website-use-it-as-the-hub-for-your-social-media-presence/





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