Institution: Oxford Brookes University

Unit of Assessment: 17 - Geography, Environmental Studies and Archaeology

Title of case study: WildKnowledge® enabled citizen science

1. Summary of the impact (indicative maximum 100 words)

Previous research by the applicant indicated the need to enable field-based ecology and environmental researchers to collect and gather real-time data. Research and development by the group led to a suite of software 'apps' marketed by WildKnowledge, a spin-out company from Oxford Brookes University. The apps are adapted by the user to meet their specific research requirements for use on mobile technologies (smartphones and tablets) in a wide-ranging variety of contexts. WildKnowledge has subsequently developed bespoke apps for a broad range of users, from charitable/NGOs to commercial businesses. This has included applications in environment and conservation, museums and heritage, clinical diagnostics and games-based learning environments, the majority of which taking advantage of the unique opportunity to build their own real-time mobile data capture and management system.

2. Underpinning research (indicative maximum 500 words)

Stewart Thompson (appointed January 1994) has a 19-year track record in biodiversity management and environment related research, supported by the Spatial Ecology and Landuse Unit (SELU) at Oxford Brookes University which he leads. Through this extensive experience in ecological gathering data in the field, Thompson identified a need for a mobile system for the collection and management of real-time geo-spatial data. This led to projects funded by statutory and non-statutory bodies which contributed to understanding how this might be achieved. This research was carried out at a time when mobile technologies were in their infancy, and therefore highly innovative.

A BBSRC-funded Research Grant to develop a Landscape Opportunities Visualisation Toolkit (LOViT), 2002-2005, enabled users to create and collate datasets and to enable visualisation of alternative scenarios for conservation management. In particular, this linked to the research group's expertise in the development of Geographical Information Systems (GIS) techniques for spatially targeting conservation and enhancement effort at the landscape scale. The LOViT project indicated the need for a database offering web - based access to a variety of users and their specific requirements which could receive, collate and manage geo-spatial data.

Subsequently, Thompson partnered a local School under the Royal Society Partnership Grant Initiative (2005), in response to a call to improve youth engagement in outdoor learning. Thompson and his post-doctoral researcher (Neil Bailey) had already devised a simple wildlife identification key/recording tool - 'WildKey', which operated on a GPS enabled mobile (PDA) platform (this was before the arrival on the mass-market of smartphone devices in 2007). This identification tool allowed students to save, within a single database, text-based information, a GPS location-tag and photos of the species being recorded; the 'WildKey' software was adapted to help students identify British butterfly species, through a user-friendly, image-driven, interactive branching database. Via the same software, students could then record the details of their sighting (What, Where, When) and add a GPS tag and photo of the butterfly. The data was subsequently used to investigate the spatial distribution and habitat associations of butterfly species and to perform simple analysis in line with national curriculum requirements.

The success of the Royal Society partnership lead to further application development ahead of a Heritage Lottery Funded Project (2006) to extend the use of the WildKey software to 30 schools in the Oxfordshire area. In collaboration with four partner organisations (Field Studies Council, Natural History Museum, Pond Conservation and Woodland Trust) four further bespoke applications were developed during this trial process. The trials allowed testing of the utility of the mobile learning against a wide age range of users, though predominantly school children in the 10–16 range.

In parallel with the work described above, from 2004 to 2007, Thompson supervised research (Hemsley-Flint) in a related area of work through an Ordnance-Survey grant which explored how semantic web / web technologies might be employed to share and re-use environmental data

across user domains. This research provided enhanced appreciation of the potential for ecological and environmental data to be collected and uploaded via mobile technologies.

3. References to the research (indicative maximum of six references)

Publications:

Hemsley-Flint, F., Hart, G., Lee, J. & Thompson, S. (2009). *Developing Ontologies from a Domain Expert Perspective*, 41 – 55. *In* Representing, Modelling, and Visualizing the Natural Environment (Eds. Mount, N., Harvey, G., Aplin, P. & Priestnall, G.). Taylor & Francis. DOI: 10.1201/9781420055504.ch

Davies, B.R., Biggs, J., Williams, P.J., Lee, J.T. and Thompson, S. (2008). *A comparison of the catchment sizes of rivers, streams, ponds, ditches and lakes: implications for protecting aquatic biodiversity in an agricultural landscape.* Hydrobiologia, 597, 7 – 17. DOI: 10.1007/s10750-007-9227-6
Submitted to REF2014, Oxford Brookes University, UoA17-Geography, Environmental Studies and Archaeology, REF2, S Thompson, Output identifier 6684.

Bailey, N., Lee, J.T., Thompson S., (2006). *Maximising the natural capital benefits of habitat creation: Spatially targeting native woodland using GIS*. Landscape and Urban Planning, 227 - 243. DOI: 10.1016/j.landurbplan.2005.03.004

Bayliss, J., Simonite, V. & Thompson, S. (2005). *The use of probabilistic habitat suitability models for Biodiversity Action Planning*. Agriculture, Ecosystems and Environment, 108, 228 – 250. DOI: 10.1016/j.agee.2005.02.008
Submitted to RAE2008, Oxford Brookes University, UoA14-Biological Sciences, RA2, S Thompson, Output 3.

Bailey, N., Clements, T., Lee, J. T., and Thompson, S. (2003). *Modelling soil series data to facilitate targeted habitat restoration: a polytomous logistic regression approach*. Journal of Environmental Management, 67, 395 - 407. DOI: 10.1016/S0301-4797(02)00227-X

Bayliss, J., Simonite, V. & Thompson, S. (2002). *An innovative approach to multi-species avian conservation*. Proceedings of Avian Landscape Ecology- Pure and Applied Issues in the Large Scale Ecology of Birds, ISBN: 9780952426394,165 – 174.

Grant funding details:

Heritage Lottery Fund, 2006, Your Heritage programme grant, *'Engendering a New Generation of Biological Recorders with Digital Identification Keys'*, Neil Bailey (Post-doctoral researcher supervised by Thompson), £49,900 (http://bit.ly/H19eGA)

Ordnance Survey funded PhD student (Fiona Hemsley-Flint), (2004-2007) '*Towards interoperability between ecological and topographical data'*, £52,562.

BBSRC Research Grant, (2002-2005), 332/BEP17101, '*Developing a strategic approach to protecting biodiversity – Landscape Opportunities Visualisation Toolkit (LOViT)*', £146,764 (http://bit.ly/19KBpQW)

4. Details of the impact (indicative maximum 750 words)

In 2006, Thompson & Bailey took the original WildKey application to "Venturefest" – a major investment opportunity platform for the South East of England, held annually in Oxford. This generated considerable interest in commercialisation, with private equity investment secured – (£100k) to bring the software to market. This led to the creation of 'WildKnowledge' in 2007, a University spin-out company which specialises in developing software applications that facilitate multi-media data collection and collation. The company has been managed by Neil Bailey since its launch with Thompson as its Chairmen and scientific advisor.

To date the company has continued to marry the research needs of its clients to the creation of a broad spectrum of new applications, regularly securing contracts with industry and Government for

further Research and Development into the use of mobile systems for real-time data collection and management [1].

By 2008 WildKnowledge had created the complementary (to WildKey) applications WildForm, WildMap and WildImage which resulted in a second tranche of funding secured (£350k) to add these products to the market place. In 2008 WildKnowledge were given the Public Choice Award for Innovation at Venturefest. With the advent of the emerging IoS and Android devices market in 2008 WildKnowledge identified the need to transfer their (then) Windows Mobile driven applications to those compatible with these platforms. Therefore in the period 2008 -10, WildKnowledge core staff, overseen by Thompson, researched ways in which to repurpose their existing products to operate on these systems. Central to this was the extensive re-writing of those programmes initially written to deliver the original applications. To that end in 2010 a BBSRC-sponsored Knowledge Transfer Partnership (KTP007850; total project value £144,220, including Company contribution £47593), allowed Thompson in collaboration with Professor David Duce – (Head of Web Technology and Digital Forensics, Department of Computing and Communication Technologies, Oxford Brookes University) to work with WildKnowledge (with KTP Associate) to generate collaborative data creation and management projects which links users to repositories of multimedia content, and facilitates the repurposing of existing content. This improved understanding later helped in the development of a platform for supporting the WildKey suite of software on high end devices such as iPhone/Android, thus bringing mobile computing/data collection to a new application era.

WildKnowledge specialises in mobile applications designed to facilitate recording of data and exploring. In addition to operating its own suite of “apps”, WildKnowledge also creates apps for external clients. Currently the business links itself to previous research work which considered the need to generate (and subsequently manage) collaborative data creation and management projects; to link users to repositories of multimedia content, and to facilitate the repurposing of existing content. This has allowed them to appeal to new markets outside the original remit (environmental data collection and management), such as Continued Professional Development, interactive multi-media heritage trail construction and distance learning. [2].

The software has been utilised under contract to a variety of partners to undertake work similar to that for which it was originally designed, and therefore has impact on conservation practitioners, who have adopted a new technology to encourage various forms of ‘citizen science’, for example;

Ewaso Lions project & Warrior Watch – WildKnowledge worked in an advisory capacity to the project in the use of their software to construct an app to facilitate identification of individual lions and record real-time information about them. This has been used by the ‘Warrior Watch’ initiative since 2011, in which local tribesmen are engaged as lion data collectors and as wildlife ambassadors in human wildlife conflict initiatives. [3]. The main impact has been to provide a mechanism for evidencing compensation available as a consequence of human-wildlife conflict and to collect much needed management data on a rapidly declining species.

WildCru Ethiopian Wolf Conservation project (EWCP) - WildKnowledge worked with the WildCru research leader of the EWCP to provide an app toolkit for monitoring the populations of Ethiopian Wolves and to record their efforts in reducing disease impacts to the wolves (e.g. rabies vaccinations to feral dogs) . The toolkit is used by EWCP staff, volunteers and local people [4].

Earthwatch ‘Bee friend your garden’ app launched June 2013 which enables UK-based gardeners to help the bee population by learning what plants will encourage bees into their gardens, and also to learn about the species they see [5]. Currently c.4,000 downloads with 12,000 records uploaded.

These conservation-focussed applications have also opened up public education prospects, aiding a greater public understanding of conservation issues local to them and on a global level;

Sussex Wildlife Trust (2011) – An app with very positive user reviews (see

https://itunes.apple.com/gb/app/swt-explorer/id465469394?mt=8) designed to allow visitors to explore SWT's nature reserves and learn about the wildlife there. [6]

Applications beyond the wildlife conservation origins of the apps have included;

'Track the Ripper' 2012 – Gold Medal winning app in the 2012 *Race for Apps*, which required companies to devise 'apps' that would enthuse visitors to the Olympics to explore London. Here spatial data collecting expertise was combined into the app which retraces the events surrounding 'Jack the Ripper' in Victorian times [7].

Paediatric Observation Priority Score (POPS) 2011 – POPS is a rapid patient assessment tool which quickly scores acutely ill children on a combination of physiological, behavioural and risk identifiers using easy to collect data. A mobile app was created by Leicester NHS Trust and a third party, using adaptation of the original suite of WildKnowledge utilities as the platform for data collection. The app helps to train junior doctors identify paediatric conditions and enables staff (even if inexperienced) to assess, prioritise and treat acutely ill children, and manage risk in busy clinical area. The use of the form has coincided with a fall in admissions.[8]

SCAPE Trust, Scotland's Coastal Heritage @ Risk Project (SCH@RP) 2011 - enables amateur archaeologists/the public to view and update records on thousands of archaeological sites that are threatened by erosion in Scotland. [9]

The impacts demonstrated here are therefore on improving public understanding of local and global conservation issues and a greater engagement of practice with 'citizen science', facilitating access to the huge resource of information that can be generated using the public and special interest groups. These projects also demonstrate how, since its launch, WildKnowledge has established itself as a successful business through generation of revenue and continuing contracts with external client/investors for both commercial and R&D projects.

5. Sources to corroborate the impact (indicative maximum of 10 references)

[1] News item about WildKnowledge, May 2012: http://bit.ly/1fewDkj
[2] Details of a number of bespoke suites generated can be found at http://www.wildknowledge.co.uk/news/ including;
[3] EWASO Lions and Warrior Watch.http://ewasolions.org/training-the-first-lion-watch-guides/
[4] Corroborating statement author 1. Statement from Deputy Director Wildcru, Head of the Ethiopian Wolves Project
[5] 'Bee-Friendly' app for Earthwatch, in association with Waitrose and the Crown Estate http://bit.ly/11AsMJH
[6] Sussex Wildlife Trust http://bit.ly/MqgMBW; http://bit.ly/PyUSuo
[7] Track the Ripper: http://raceforapps.com; http://bit.ly/TyIn9T
[8] POPS. http://bit.ly/SvDDfp; http://bit.ly/1cH0FLR
[9] SCAPE Trust http://bit.ly/HqTNrL