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Using and appropriating the smart city for community and capacity building amongst migrant language learners

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Using and appropriating the smart city for community and capacity building amongst migrant language learners

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Abstract. Smart cities promise citizens access to networked services to improve their urban living, whilst offering city planners and managers detailed and current information about how services are used to enable better provision and responsive developments. We explore two educational approaches that enable citizens to take advantage of network infrastructures found in smart cities and other highly developed urban environments, combined with domesticated mobile devices (smartphones) to meet their needs and build community. We focus on a group that is particularly at risk of exclusion: recent migrants to the city who are language learners. This group faces challenges of cultural, social and linguistic inclusion. Providing information resources and language learning via smartphones which are integrated into their daily routines, and leveraging a city's network infrastructure facilitates not only individual knowledge development, but also the opportunity to build communities. We suggest how technologies devised to support a top-down service provision model might also be used to enable a community managed knowledge repository triggering location-specific resources, the Open Beacons concept.

1 Introduction

The emergence of high speed urban communications networks coupled with detailed data reporting and analysis has led to the reconceptualisation of technology supported urban environments as 'smart cities': "places where information technology is combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic, and environmental problems" (Townsend 2013, p15). Over the last twenty years the term has seen widespread global adoption (Hollands 2008), emphasising the value of data reporting within urban areas to enable strategic planning and management of resources and more effective provision of services for citizens.

The emergence of powerful personal mobile computing including smartphones and tablets, and the emerging Internet of Things promising networked computing embedded in domestic devices, moves the smart city concept from large scale urban infrastructure engineering to a more pervasive, personal level. Data traces left by people as they travel around the urban environment promises highly detailed modelling of citizen activity which can be used to plan and manage public services, enable surveillance, and target commercial opportunities. A networked environment may benefit citizens, but also leads to more reflective considerations of smart cities: "urban digital networks and ICTs ought not to be seen as neutral, banal, [or] benign" (Sadoway and Shekhar 2014). There has been a move towards considering how to reimagine the relationship between people and urban technologies to ensure smart cities are smart for the citizen, as well as the planners (Hemment and Townsend 2014).

One group who are particularly at risk of marginalisation in urban environments are recent migrants; new to the city and potentially excluded through linguistic, social and cultural barriers. However for this group, smartphones can be a valuable tool in enabling inclusion, providing access to information resources and language learning on a familiar device during daily activities (Kluzer et al. 2011). The networking capabilities of smartphones enable vulnerable newcomers to reach out to other citizens and build social networks and a sense of community. These require network access, and a smart city, with its emphasis on the provision of high speed, ubiquitous network connectivity, provides the ideal place to take advantage of these affordances (Gaved et al. 2012). In this paper, we describe two projects that have been exploring how smartphones might be used in the context of networked urban environments to support immigrants' and migrants' social inclusion and language learning needs. We recognize that smart city infrastructures imply more than network connectivity, however the smart city as an exemplar provides an increasingly common and highly pertinent context against which the social, ethical and technical challenges around citizens' negotiation of urban challenges mediated by personal technologies are played out. For the authors, this focus is of particular interest as our work is carried out against the backdrop of our university town being the recipient of major research funding to explore smart city solutions to support economic growth (http://www.mksmart.org).

The MASELTOV project has been exploring a range of services to support immigrants learning through their daily activities in urban environments, while the more recent SALSA project is investigating location-triggered language learning. Each project provides opportunities for citizens to take what is often presented as a top-down provision model of services and utilise them for their own community building purposes. Furthermore, these potentially enable grassroots appropriation of infrastructure for unplanned purposes and we describe one potential development, the Open Beacons concept.

2 Smartphones for smart city inclusion

MASELTOV (http://www.maseltov.eu) is a three year European Union funded project exploring how smartphones may be used by recent immigrants to Europe support their language learning and social inclusion. A central element is the development of a smartphone app ('MApp') containing a range of integrated services that the target audience can use in their daily lives.

The aim is to resolve immigrants' immediate needs, but also to enable reflection and further planning of learning goals to help them to become integrated into their new home and work environments, particularly in urban localities. As our target audience is likely to have work and family commitments, attending formal educational classes is often difficult (Kluzer et al. 2011). An app which can be accessed anywhere and uses the lived environment as a contextual resource may therefore provide a practical alternative or complementary learning aid. MApp includes navigation tools, language learning activities, a social forum, a translation tool, and a help radar that enables the user to find local volunteers and other community members who might be near to help with a problem. Underpinning the system is the concept of incidental learning, "unintentional or unplanned learning that results from other activities" (Kerka 2000, p.1), using situations occurring in daily lives as the basis for learning, recognising the power of authentic situations and personally relevant contexts to motivate learners.

A number of the MApp services require a network connection for optimal performance; for example the navigation service requires a connection to an internet based mapping service. The translation tool can offer offline translations of text within photos the user has taken by referring to a downloaded dictionary for word-by-word translations, but with a network connection can access online services for more complex translation tasks, such as the understanding of phrases and other similar lexical chunks. Some MApp services are explicitly social; for example, the social forum which enables a user to participate in an online community of fellow learners, and the help radar, which enables the learner to find a volunteer in the vicinity to come to their aid and resolve a problem (e.g. translating at the doctor's surgery). These social elements of the service have been well received: for example, in a 2015 trial in Milton Keynes, UK, in two weeks 17 participants made 468 posts, and resolved real life issues benefitting from community support, including managing a difficult health issue. MApp, therefore,

best works in a location where the user can be assured of high quality network connectivity, which enables the full range of services and enables social interactions mediated by the app: peer support and community feedback are particularly valuable in self-directed, informal learning (Jones et al. 2014). While this is achievable in many places via 3G phone network access, our target audience of low-income earners has indicated a strong preference for free network access via WiFi, as connectivity via phone networks can be costly and hence adds an additional dimension of inequality for an already disadvantaged group. This finding has been echoed in other research exploring smartphones as personal learning environments, for example Aladjem and Nachmias (2014) found that while international travelers find their smartphones can "potentially turn a city visit into a personal, active, and collaborative learning experience" (p.160), a WiFi connection was identified as "a basic and critical need" (p.163).

A smart city, with a highly developed network infrastructure (including free or low cost city wide WiFi) is the ideal location for the use of MApp, which is targeted at economically vulnerable citizens (Gaved et al. 2012). However, our audience has expressed concerns of how their interaction data from apps on their smartphone may be tracked or used, a highly sensitive issue for vulnerable and marginalized citizens such as migrants (Taylor 2014), and of particular relevance when considering networked technologies operating within an environment where user/usage data is actively sought for analysis. The approach adapted by MASELTOV is to provide guidance within the app so users can understand which options they can switch on or off within MApp, and to understand the benefits and consequences of each decision. For example, users are asked whether they want GPS tracking enabled or disabled. An information box explains that this will record locational data (and this will not be shared with third parties other than to fulfil legal commitments), but enabling this function will enable higher performance of the pedestrian navigation service, and better locational accuracy to enable faster support from volunteers responding to calls via the help radar.

However GPS can only provide locational data outdoors, and other forms of location triangulation available on smartphones (e.g. from cellphone tower signal strength) are limited in their accuracy. Given the value of location- and context-sensitive resources, we have recently begun to explore how other technologies deployed in urban environments might enable highly accurate location-based learning, potentially support community building and take into account users' concerns around privacy.

3 Location triggered language learning

The SALSA project (Sensors and Apps for Languages in Smart Areas) is investigating how to effectively provide location-specific language learning activities for learners out and about in a smart city. The project was initiated in 2014 in response to a call from the 'MK:Smart' collaborative initiative exploring

new technologies for smart cities in the UK; proposals were invited to explore key themes including education and citizen engagement.

Language learning educators identify that location-based and context-sensitive resources and activities are a powerful resource for learners (e.g. Edge et al. 2011). A number of approaches have been explored to enable accurate identification of location, however they need active input by the learner, such as manually entering the location into an app (Holden and Sykes 2011), taking photos of QR codes (Power 2012) or swiping RFID tags (Ogata and Yano 2004). These add a barrier to user participation, requiring effort and often very apparent engagement with a triggering object in the location. We were keen to provide a more discrete solution that could leverage the existing functionality of a smartphone and lower the barrier to use. Feedback from MASELTOV participants has indicated that requiring the active and obvious use of a smartphone to trigger learning resources (such as taking a photo of a sign in a public place) can deter potential users from taking advantage of potential learning opportunities. A recent emerging approach that provides accurate location detection and more discrete engagement is the use of Bluetooth beacons, and the SALSA project has turned to explore their possibilities.

Beacons are low cost devices broadcasting a simple identifier over Bluetooth LE that can be picked up by smartphones. They enable accurate identification of a smartphone user's relative location (to a few metres). A custom app on a user's phone triggers actions based on picking up a beacon's broadcast and can present content stored in the app on the phone, so no connectivity is required (and hence no network cost) for the user to access resources. In locations where WiFi access is assured, the app can also be programmed to command the phone to access remote web content. Furthermore, as the beacon is only broadcasting an identifier which is then interpreted by the app on the user's phone, no data about who is receiving the signal and acting upon it is collected, offering users an anonymous interaction with the smart city; which may be valued by a group such as recent migrants who are sensitive to privacy issues. The receipt of a broadcast from a beacon can be indicated in a standard app notification form, such as phone vibration, on screen message, or audio signal.

Beacons have primarily been developed for commercial applications, such as alerting shoppers to new products and special offers. However, there is emerging interest in exploring their wider potential, including guiding visually impaired people to navigate metropolitan transport[1] and improving museum experiences (Nilsson 2014). Beacons could also provide the trigger for educational resources around the city, such as language learning activities. By identifying locations where language learners would benefit from contextually relevant educational resources, we can assist them while out and about in their daily routines. The app containing the learning resources can be downloaded at the learners' convenience in a location where there is free WiFi (e.g. library or community centre). On

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[1] e.g. http://www.rlsb.org.uk/blogs/rlsb-youth-forum-set-a-new-direction-for-tube-travel

travelling around the city, the learner will be notified (similar to an SMS text notification) that they are in the proximity of a beacon, and invited to trigger the associated learning resources. These may be stored within the app on the learner's phone, or alternatively could also trigger links to web resources where we can be confident the learner will be able to access free WiFi. For example, while waiting at a bus stop, a learner might be notified of a nearby beacon which triggers a small language activity held in the associated phone app on purchasing a bus ticket and asking the driver about ticket options (e.g. 'single', 'concession', 'off-peak', 'season ticket'). On the bus, the learner might be notified that there is a beacon on board, which can link via the bus's free WiFi to a web based learning activity about the city centre, the final destination of the bus. Learning activities may be weighted to enable the majority of the resources and interactions to be carried out on the learner's phone when there is no network connectivity, however where access to the internet is available we might include a recommendation to share observations and experiences of the context with other learners, e.g. via a social network space.

We have been considering two metaphors of use: the 'radar' metaphor where the user is notified about what is around them at the time, and carries out a learning activity about the location, while in the location. However a learner might not be receptive to learning at the time: they may be talking to a friend or it may be socially inappropriate to engage in a learning activity on a phone. We are therefore also developing services based on an 'SMS' metaphor, where the learner can check notifications at a later time suitable for them (e.g. in the evening when relaxing at home) and be reminded of where they visited during the day, and notified of associated learning activities. In this latter mode, the user may be more likely to have more time and inclination to share their observations and experiences with other learners and build a community of location-focused learners sharing experiences and challenges in different locations around the city. We recognise the power of connecting learners with each other to share insights and generate content from their own experiences, as well as take advantage of existing content: the city as a resource for interaction and learning (Foth et al. 2011).

We are currently undergoing initial testing of our prototypes and first user trials and deployment will take place in Summer 2015. However, even at this stage, we are recognising that this approach to location-trigger learning may offer potential for community appropriation as well as community usage.

4 An Open Beacons approach: appropriating the infrastructure

As beacons only broadcast a simple signal, and the work of interpreting the signal is carried out by an app on the users' phones, this allows for the possibility that community developed apps could associate existing beacons with alternative resources from that provided by their official associated app (e.g. provided by the

city council or a commercial concern). These resources might complement existing content, provide alternative content, or even conflicting content depending on what the community app developers and content providers choose. For example, a department store might operate a set of beacons across their store and distribute an app that provides detailed information about various products as a user passes by these beacons. However, an alternative app might be developed by community groups to use the same beacons' broadcasts to trigger similar descriptions but in a second language preferred by locals in the area; reviews of the products created by community app content providers could be presented; or fair trade activists might report on the provenance of the goods to identify which are sourced ethically.

This approach would require (1) capturing and recording the identifiers broadcast by active beacons in the area to be covered by the alternative, community derived app; (2) members of the community to record these identifiers of the beacons (e.g. to an online database with a web based interface); (3) the ability for members of the community to generate and upload their own data for each beacon listed along with metadata to enable interest-based searching; (4) the creation and maintenance of an alternative community beacon app that can be downloaded with the data from this database, perhaps with the opportunity to make selections based on some sort of filtering, e.g. allowing a user to download all beacons in a particular area, or retrieve particular types of data associated with each beacon, such as a in a preferred second language, or those with user reviews. Figure 1 shows a conceptual model of these elements.
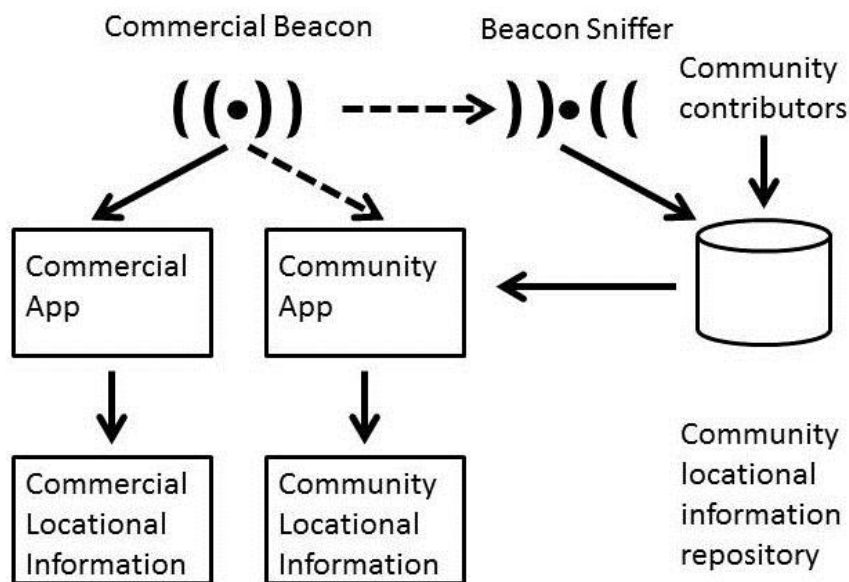

Figure 1. Appropriation of existing commercial beacons to support community developed alternative app

This 'Open Beacons' approach would allow the association of user generated content with existing beacons, as well as that provided by the original beacon provider. Given the opportunity for richer content provided by a user community,

commercial providers themselves may enter their beacons and their associated descriptions into such a community app. For example, a city council that has provided beacons around a city to inform citizens about services (e.g. at the housing support office) may enlist the help of local community groups to enrich their existing content with complimentary content in other languages, as well as cultural guidance.

5 Conclusion

Emerging urban environments such as smart cities bring networked infrastructures which allow for near ubiquitous access to the internet and city-provided services, such as travel information, environmental data, and educational resources. While this is often approached from the perspective of city planners and managers, with the emphasis on achieving efficient and effective use of resources and leveraging the affordances of emerging information technologies and their resultant data traces, such services also benefit citizens both in terms of information provision but also enable community capacity building.

In this paper we have described two projects that explore how networked urban infrastructures can be used to support language learning for often disadvantaged and vulnerable citizens, recent immigrants, and shown that this can be used not only to enable access to information but also to facilitate community interactions and mutual support.

Furthermore, we have identified that such infrastructures opens the possibility for citizen appropriations, and have described one approach we are investigating, the Open Beacons concept.

6 Acknowledgments

7 References

Aladjem, R. and Nachmias, R. (2014): 'The mobile as an ad hoc PLE: learning serendipitously in urban contexts', *Journal of Literacy and Technology*, vol. 15 no.2, June 2014, pp.157 – 170.

Edge, D., Searle, E., Chiu, K., Zhao, J., & Landay, J. (2011): 'MicroMandarin: mobile language learning in context'. *Proc. CHI2011,* ACM Press, pp. 3169-3178.

Foth, M., Forlano, L., Satchell, C., & Gibbs, M. (Eds.) (2011): *From social butterfly to engaged citizen: urban informatics, social media, ubiquitous computing, and mobile technology to support citizen engagement.* MIT Press, Cambridge, MA, USA.

Gaved, M., Jones, A., Kukulska-Hulme, A. and Scanlon, E. (2012): 'A citizen-centred approach to education in the smart city: incidental language learning for supporting the inclusion of recent migrants', *International Journal of Digital Literacy and Digital Competence,* vol. 3, no. 4, pp. 50–64.

Hemment, D., & Townsend, A. (2014). Smart Citizens. Manchester, UK: FutureEverything Publications. Retrieved from

http://futureeverything.org/wp-content/uploads/2014/03/smartcitizens1.pdf

Holden, C., and Sykes, J. (2011): 'Leveraging mobile games for place-based language learning', *International Journal of Game-Based Learning*, vol. 1, no. 2, pp. 1-18.

Hollands, R. (2008): 'Will the real smart city stand up? creative, progressive, or just entrepreneurial?', *City,* vol. 12, no.3, pp.302–320.

Jones, A., Gaved, M., Kukulska-Hulme, A., Scanlon, E., Pearson, C., Lameras, P., Dunwell, I. and Jones, J. (2014): 'Creating coherent incidental learning journeys on smartphones using feedback and progress indicators: the SCAMP framework', *International Journal of Mobile and Blended Learning,* vol. 6, no. 4, pp.75-93.

Kerka, S. (2000): *Incidental learning: trends and issues Alert No. 18*. Retrieved from http://www.eric.ed.gov/PDFS/ED446234.pdf

Kluzer, S., Ferrari, A., and Centeno, C. (2011): *Language learning by adult migrants: policy challenges and ICT responses*. Joint Research Centre Institute for Prospective Technological Studies, Seville, Spain.

Nilsson, T. (2014): *Smart spaces : challenges and opportunities of BLE-centered mobile systems for public environments*. Masters Thesis, Umeå University, Sweden.

Ogata, H., and Yano, Y. (2004): *'Context-aware support for computer-supported ubiquitous learning', Proc. WMTE '04*, IEEE Computer Society, pp.27-34.

Power, R. (2012): 'QR Cache: connecting mLearning practice with theory', *Proc. mLearn2012,* Ceur-WS, 346-349. http://ceur-ws.org/Vol-955/

Sadoway, D. and Shekhar, S. (2014): '(Re)Prioritizing citizens in smart cities governance: examples of smart citizenship from urban India', *The Journal of Community Informatics,* vol. 10 http://ci-journal.net/index.php/ciej/article/view/1179/1115

Taylor, L. (2014): *No place to hide? the ethics and analytics of tracking mobility using mobile phone data*. Available at: http://bordercriminologies.law.ox.ac.uk/no-place-to-hide/

Townsend, A.M. (2013): *Smart Cities: big data, civic hackers, and the quest for a new utopia*. W.W. Norton & Co., New York, USA.

8   Biographies

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Alice Peasgood is an educational consultant, currently working with the Institute of Educational Technology, The Open University. Her research focuses on

learners' perceptions of computers and mobile learning. Her work is informed by her 25 years' experience as a university lecturer, working in widening participation and Access.