Re-thinking App Design Processes: Applying Established Psychological Principles to Promote Behaviour Change – A Case Study from the Domain of Dynamic Personalized Travel Planning

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ABSTRACT
In this paper, the authors outline one scenario for the application of ‘next generation’ personalized travel planning to the context of the ‘home to school’ run. Specifically, we offer a vision for the design of a ‘next generation’ school walking bus facilitated through a customized mobile phone app called ‘Sixth Sense Travel’. The design of the app is informed by perspectives in behavioural science – first, by adoption of scientifically established techniques of behavioural change. Second, by applying outcomes from research on individual time ‘typologies’ to the usability of the interface. The value of rethinking the app design process to incorporate psychological principles is with a view to facilitating a shift in mode, by increasing the proportion of children who uptake active transportation to primary school.

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Behaviour change, app, children, school.

1. INTRODUCTION
Personalised travel planning (PTP), a concept integral to the ‘Smarter Choices’ framework championed by the UK DoT (2005), constitutes one of the ‘softer’ policy measures aimed at reducing car use while simultaneously encouraging uptake of active modes of transportation. Significantly, the role of ‘technology’ in facilitating PTP did not receive any notable inclusion in ‘Making Personal Travel Work’ (DoT, 2007), except in relation to the potential for dissemination of travel related information, for example, by mobile phone technology. Yet by 2015, approximately 80% of internet users will access the internet via their mobile phone (Johnson, Smith, Willis & Haywood, 2010) enabling widespread access to information potentially available as a tool to aid a personalized style of travel planning on a 24/7 basis. However, an emerging evidence base demonstrates that the provision of information alone to user is not necessarily effective in resulting in behavioural change or sustained behaviour change (e.g. Abrahamse, Steg, Vlek and Rothengatter, 2005). Notably, serial UK ‘nudge’ initiatives have attracted much controversy and have yet to lead to robust evidence of effectiveness.

With the increasing availability of apps (e.g. Android) and downloads (Hsu, Rice & Dawley, 2012), typically any apps on the market tend to focus on the result in a desired ‘named’ behavioural outcome, with no studies we were aware of reporting any systematic integration of established psychological principles of behavioural change into app design. On this basis, it is timely to innovate mobile computing products which integrate recognized psychological principles of behavioural change (e.g. Abraham & Michie, 2008) throughout the design process so that scope for behavioural change can be underpinned by valid theory and evidence.

Influentially, Abraham and Michie (2008) developed a 26-item taxonomy of behavioural change techniques where, according to large-scale systematic reviews (e.g. Michie et al., 2009; Michie et al., 2011) in health related fields, particular techniques have subsequently been statistically associated with intervention effectiveness, thereby leading to more effective behaviour change. To highlight five key findings from the literature (e.g. Michie et al., 2011) here where there is scope for psychologists and app designers to collaborate:

- Those interventions where users were prompted to engage in ‘self-monitoring’ activity were found to be beneficial.
- Interventions which used fewer behavioural change techniques overall tended to be more successful.
- At the level of user-groups, ‘imagining successfully performing the behaviour’ is more effective with lower income groups than middle.
- Also relevant to lower income bracket users was that ‘environmental restructuring’ to encourage a new the person to change the environment to be more supportive of their behaviour.
- There was merit for differentiation of use of different behavioural change techniques dependent on context (e.g. starting/stopping behaviours; across domains).

These sorts of outcomes suggest that there is a need to move beyond exclusive focus on ‘user’ and ‘usability’ testing modes towards coining new paradigms of collaborative integration between app designers and behavioural scientists.

A project called ‘Sixth Sense Transport’ is being carried out by a consortium of UK Universities. The University of Salford is collaborating with four other Universities - University of Southampton (lead); University of Bournemouth; University of...
Edinburgh & University of Lancaster. The purpose of 6th Sense Transport (6ST) is to aim to revolutionize the process of decision making in travel behaviour by using social networking principles to create 'visibility' of potential transport options in time and space. At the University of Salford, psychologists Dr Sarah Norgate and Dr Liz Smith are applying this project to the context of primary education – specifically, the morning school run. From a combination of research and user testing phases ongoing in 2012-2013 we are investigating how to most effectively integrate relevant behavioural change principles into the design of the app, and undertake interventions involving primary schools in 2013.

National UK statistics demonstrate that in 2010, the percentage of pupils travelling to primary school by car was 43 percent which compares with 38 percent in 1995/7 (National Travel Survey, 2010). Clearly, not only does this trend contribute to school gate congestion but also potentially compromised child health (e.g. in terms of both child pedestrian road casualties and obesity) and air quality. Crucially, estimates of around 200 kg carbon per year are associated with making five trips of 1.2 miles during term time (this is based on an ‘average’ 4x4 vehicle). In the light of these collective issues, working through consultative approach with relevant organizations (e.g. Modeshift, UK), the aim is to innovate ‘next generation’ personalized travel planning for the primary school run. To this end, a variety of role holders (e.g. district travel planners, road safety role holders) are being consulted about the concept of ‘next generation’ school walking buses (SWB).

The underpinning concept of ‘next generation’ SWB is to offer new temporal visibility to users (particularly parents and school walking school bus facilitators) to optimise fluidity across scheduling boundaries between the morning school run and any scheduling constraints (e.g. parental morning work start times), reducing the barriers to ‘punctuality’ for school start time reported previously by SWB coordinators and head teachers for traditional style SWB. For those parent users registered into the scheme, the passage of the SWB will be visible on the screen window of a mobile phone. The leader of the SWB continually shares their position and the app would allow parents (and involving children where appropriate) to visualise temporal and dynamic spatial options around joining the SWB. Especially on routes where the pattern of SWB joining points coincides with street intersections (and hence designated SWB stopping points), yet the route is sufficiently long, the passage of the SWB will be more prone to variation in speed. Particularly in these more ‘unpredictable’ contexts, there is value in users being able to monitor the progress of the ‘next generation’ SWB to the next stopping point to enable their child both a safe and potentially temporally ‘seamless’ join.

To aid further the focus on ‘next generation’ personalized travel planning, the role of parental time ‘typology’ in planning the home to school run will be taken into account into the design phase. One example is an individual’s ‘time perspective’ (e.g. Zimbardo, Keough and Boyd, 1997) – the individual’s tendency to adopt a mindset towards ‘present’ or ‘future’. Arguably, it could be hypothesized that users who adopt a ‘future’ time perspective rather than a ‘present’ time perspective will be more likely to adopt sixth sense transport to facilitate shift mode of travel from private car to ‘next generation’ SWB. That is, users who are persuaded by any ‘future-oriented’ benefits – say either personal (e.g. ease burden of morning ‘rush’; less school-to-work scheduling constraints), child related (e.g. increased child-related quality of life) and societal benefits (e.g. reduced carbon footprint) benefits of a next generation of a SWB will be more likely to develop new habits towards more active mode of transportation on the ‘home to school’ run. Clearly, in the light of any associations between user time ‘typology’ and uptake of SWB, there is not only scope for targeted ‘marketing’ towards uptake in ‘future’ oriented user groups but also opportunities for development of community education programmes in underrepresented groups (e.g. ‘present’ time perspective).

The design, delivery, implementation and evaluation of the ‘next’ generation SWB will involve input from key organizations, local authorities and traffic analysis teams to enable identification of a ‘portfolio’ of safe routes to school from within appropriate catchment areas. The final decisions around the recruitment of primary schools for the intervention trials will be informed partially by measures of mode use as well as other indicators of school ‘readiness’ for change.

In conclusion, the design of a ‘next generation’ personalized travel planning app will be underpinned by user-centered research collaboration between psychologists and app-designers. The next steps will involve systematic identification of the relevant valid/reliable behavioural change techniques alongside identification of relevant individual differences in individual time ‘typology’. Outcomes from this phase of scoping and research will be reported in peer review journal articles.

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2. **REFERENCES**