The contribution that a co-design approach can make to idea generation for workplace travel plans

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The contribution that a co-design approach can make to idea generation for workplace travel plans

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Abstract
This study proposed the cooperative processes of ‘co-design’ as a means by which to increase ‘active’ participation in the early stages of workplace travel plan development. In particular, the research takes a first step towards a quantitative comparison of solutions/ideas generated using a co-design approach versus the more traditional methods normally used in travel planning by comparing the number, originality, breadth and type of ideas generated. One group of staff took part in a co-design study and another in a non-co-design study. The main findings were that co-design techniques appear to: encourage a greater number of ideas overall, a greater number of ideas that are innovative in the specific organisational context and different types of idea (particularly ones that tend towards more psychological-based interventions). However both approaches are similar in terms of the global innovativeness of the ideas they generate which was generally low.

Introduction
The contribution of car travel to CO₂ emissions in the developed world is well-documented. Alongside technological solutions, such as low-carbon vehicle and fuel technologies, it is recognised that reduction in vehicle miles, as a result of behavioural change can potentially play a major part in the reduction of CO₂ emissions and can have an impact in the shorter-term (Cambridge Systematics, 2009). In the UK, travel plans have existed since the 1990s and are described by DfT (2008, p7) as ‘a strategy for managing the travel generated by your organisation, with the aim of reducing its environmental impact’. Research has been carried out on the immediate, resultant behaviours, e.g. the impact that interventions have had on trip reduction or shift to more sustainable modes (Rye, 2002; Steer Davies Gleave, 2001) or, more recently, the longer-term integration of travel plans into business practice (Roby, 2010). In addition, wider reviews of interventions to reduce car use have focused on methodological issues in terms of measuring outcomes (Graham-Rowe et al, 2011).

In addition to the above research on ‘outcomes’, the UK Department for Transport has also funded research on the ‘front end’ of the process (designing and implementing effective travel plans), providing several sources of best-practice which focus on encouraging behaviour change (Cairns et al, 2004; DfT, 2008). The importance of public (or ‘end user’) participation in travel planning was also recognised as part of a policy shift (DETR 1998) as
well as in more recent guidance documents (DfT 2008). Research into the process of public involvement has, however, been limited, an exception being a study by Bickerstaff et al (2002). They found that traditional modes of information provision and user involvement dominated (e.g. questionnaires, consultation documents, focus groups) and that, although some more ‘interactive, deliberative’ approaches (e.g. citizens’ juries, visioning exercises) were being experimented with, these were infrequent. In addition, early involvement in problem identification was only briefly mentioned in half of the plans, with half of those being more ‘passive’ (i.e. level of agreement with pre-established local authority priorities) rather than ‘active’ generation of problem areas and priorities. Similarly, only a fifth of plans identified a role for public engagement in objective setting, with little evidence of how it had actually contributed. Finally, Bickerstaff et al conclude that, in terms of the nature of the individuals that constituted the ‘public’, considerable efforts were made to engage ‘special interest’ groups, often to the exclusion of ‘ordinary people’, hence questioning the representativeness of the outcomes.

This paper investigates the proposition that the methods and techniques used in ‘co-design’ (as an example of an ‘interactive, deliberative’ approach) can overcome some of the limitations of current approaches to travel plan development identified by Bickerstaff et al (2002) and can be more effective (in generating novel ideas) than more traditional approaches. Co-design can be defined as “a cooperative, continuous process bringing everyday people together with design professionals to find new and better ideas for daily life” (Scott et al, 2009). In contrast to traditional ‘user-centred’ design approaches where users involvement in the earliest stages of design are largely passive (users are predominantly observed and interviewed), co-design approaches actively engage users in the idea generation process (Sanders & Stappers, 2008). Within co-design, users are treated as ‘experts of their own experience’ and are enabled, through the collaborative design process, to play a significant role in problem definition, knowledge development, idea generation and concept development (Sanders & Stappers, 2008). The concept of using co-design as a method by which to develop effective public service provision or tackle social issues is not new. Leading design agencies such as IDEO have been commissioned to apply ‘design thinking’ (which may include co-design) to what are often termed ‘wicked problems’ (see for example Burns et al, 2006; Brown, 2008; Fuad-Luke, 2009). Wicked problems is a term first coined by Rittel to characterise social policy problems that are “ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing” (in Churchman 1967). Development of sustainable transportation polices and services is invariably a ‘wicked problem’ (Coyne 2005; Wahl & Baxter, 2008).

The role of users as ‘experts’ is also a key part of the phenomena of ‘grassroots innovation’ within the transport sector as described by Ross et al (2012). In a study of the motivations, barriers and enablers for the development of 16 bottom-up sustainable travel innovations, Ross et al found that, a key feature of all the innovators was that they were immersed in the problem space with a deep understanding of the issues faced and the nature of the solutions needed. It would seem, therefore, that the techniques of co-design could potentially make a contribution to the generation of new ideas for sustainable travel.

The application of co-design as a method to generate new ideas within travel planning (particularly relating to a shift to more sustainable transport) has been little researched. Some literature does indicate the potential for co-design in a transport context: Bradwell and Marr (2008) found that the transport sector is ‘remarkably open to some elements of co-design given the scale of projects involved, and the necessity of their interacting with complex transport infrastructures’ (p31); Brass and Bowden (2008) provide an example from sustainable transport of ‘innovative and unexpected’ co-designed solutions. So, there is little doubt from the co-design community that this approach has value, but there is a dearth of research that attempts to quantify this value (Kristensson and Magnusson, 2010) – something the transport sector would need to be convinced of before considering such an approach. This paper takes the first step towards a quantitative comparison of solutions/ideas generated by a co-design approach versus more traditional methods.
normally used in travel planning by comparing the number, originality, breadth and type of ideas generated.

**Study context and recruitment**

The study involved employees of Loughborough University in the UK. The most recent staff travel survey (response rate 61%, n=2040) had shown that walking was the predominant mode for staff living less than a mile away but, for all distances beyond that, single occupancy car journeys were the main mode (33% of 1-2 mile journeys; 56% of 2-5 mile journeys; 70% of 2-5 mile journeys and 75% of journeys over 10 miles).

To generate interest in the study and to begin to ‘sensitise’ and engage participants with the problem space, recruitment was via a regular weekly staff email, with a web link to an information page and animations of the commute to the workplace (see Fig 1). The animations (now available here: [http://www.youtube.com/ideasintransit](http://www.youtube.com/ideasintransit)) were based on the data from the most recent staff travel survey and showed a simulation of the morning commute indicating start points, end points, modes, times of travel and routes. Staff were asked to get in touch to comment on the animation and/or to volunteer for the study. Sixty participants made contact, with most commenting on the animation. All were sent an information sheet and 32 volunteered for the study.

![Fig 1. Recruitment webpage showing animation of the staff commute](http://www.youtube.com/ideasintransit)

**Study groups**

The volunteers were sent a screening questionnaire which included questions on commute mode(s), attitudes to climate change and intentions to change with respect to sustainable behaviours (the latter two sets of questions were taken from DEFRA, 2007). They were also asked to complete the ‘Foursight’ online 37-question survey (Puccio, 2002) which determined their approach to creative problem solving in terms of a score (between 9 and 45) for each of the following ‘preferences’ relating to the stages of problem solving: ‘Clarifier’, ‘Ideator’, ‘Developer’, ‘Implementer’. As the aim of the study was to assess the innovativeness of ideas generated by each group, the score on the preference ‘Ideator’ was the most relevant to this study. From the responses to the screening questionnaire and
online survey, three key characteristics were used to allocate volunteers to each of the
groups in order that the groups were balanced:

1. Commute mode(s): car, train, bike, walk, mix.
2. Ideator score: Mean 33.9, Range 22-43
3. Intention to change score: based on intentions to use car less, take fewer flights, reduce
   energy use, waste less food, reduce water user, recycle more, buy food produced locally.
   Range 2.7-4, mean 3.5.

Study protocol
Each group followed the same generic protocol but with the addition of sensitisation and
ideation activities for the co-design group. The two groups were synchronised in terms of the
time at which the key questionnaires and activities took place so as to reduce any
confounding effects of external influences such as workplace travel initiatives, issues being
raised by the media, or time of year (weather, holiday periods). The protocol is shown in
Table 1.

Table 1: The stages of the study and the nature of participation for each group

<table>
<thead>
<tr>
<th>Stage</th>
<th>Rationale</th>
<th>Co-design group</th>
<th>Non-co-design group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-study questionnaire &amp; online</td>
<td>Participant data on job, household, commute, attitudes to climate change,</td>
<td>Received &amp; returned by email/internet</td>
<td>Received &amp; returned by email/internet</td>
</tr>
<tr>
<td>survey on approach to problem solving</td>
<td>intentions to change with respect to sustainable behaviours and 'ideator' score in order to enable groups to be balanced</td>
<td></td>
<td></td>
</tr>
<tr>
<td>storytelling</td>
<td>To relate the experience of their commute, this constituted the 'sensitisation' phase of co-design</td>
<td>20-30min face-to-face interview</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Main points produced as text and photo 'story sheet' and checked with participant for accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idea-generation</td>
<td>To generate ideas that could cause a reduction in the number of single-occupancy car journeys for the University commute</td>
<td>2hour session with 4 stages typical to a co-design process:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Context setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Story sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Problem definition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Idea generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 sessions were held with between 2 and 6 participants in each.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-study questionnaire</td>
<td>Participant data on commute, attitudes to climate change and intentions to change with respect to sustainable behaviours to detect any shifts in behaviour or attitudes</td>
<td>Received and returned by email</td>
<td>Received and returned by email</td>
</tr>
<tr>
<td>Evaluation of methods &amp; payment given</td>
<td>Feedback on the study methods they were subjected to and the response they provoked</td>
<td>10min face-to-face interview 13 questions</td>
<td>Received and returned by email 3 questions</td>
</tr>
</tbody>
</table>
The two-hour idea-generation session for the co-design group used the following stages:

**Context-setting:** The context and problem were defined, i.e. “the University wishes to reduce single occupancy car journeys but there is recognition that there may not be one solution given the range of constraints and preferences people have”.

**Story-sharing:** Each participant was given the ‘commute story’ sheet of another participant and asked to ‘tell that story’ to the rest of the group and then, for all stories, to identify: ‘things that are similar to me’, ‘things that are different to me’, anything ‘interesting or surprising’.

**Problem definition:** Participants were asked to brainstorm ‘barriers’ and ‘enablers’ to reducing single-occupancy car travel for the commute. These were discussed then clustered according to similar themes.

**Idea generation:** Participants were asked (for each barrier/enabler cluster) to develop ‘How might we..?’ statements, e.g. ‘How might we.. provide flexibility for people who need to pick up and drop young children whilst reducing single occupancy car travel?’. This is an ideation technique contained within the IDEO Human Centred Design toolkit produced to support social innovation (IDEO 2009, Brown and Wyatt 2010). They were then asked to generate ideas/solutions for each of the statements.

**Study outputs**

The output of each group was a list of ‘ideas’ for reducing the number of single-occupancy car journeys to and from campus (specifically for the commute). Examples included ‘free bus from local schools to campus to bring parents to work’, 'technology to compare people’s carbon footprints – visual portraits’ and ‘have one relaxed working day where people can try out public transport/cycling without being concerned about arrival times’. By combining duplicates, a set of unique ideas was produced along with identification of which group(s) produced the idea. This resulted in a data set of 140 unique ideas.

The ideas generated from the two groups were assessed in terms of 3 characteristics:

1. **Number of ideas**
   Each unique idea was coded according to whether it had emerged from the Co-design group and/or the Non-co-design group. Totals for each were produced.

2. **Innovativeness of the ideas**
   The innovativeness of the idea was firstly evaluated at a national/international level using four independent transport experts to rate them according to Table 2 (NOTE: ‘seen’ was defined as an idea they had seen tried/implemented, i.e. not just mentioned or proposed. In addition, it had to have been tried/implemented for the commute and with a ‘sustainable travel’ objective)

<table>
<thead>
<tr>
<th>Rating category</th>
<th>Definition of rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not innovative</td>
<td>All respondents that rated that idea had seen it tried/implemented</td>
</tr>
<tr>
<td>Split view</td>
<td>Respondents were not unanimous in their ratings</td>
</tr>
<tr>
<td>Innovative</td>
<td>All respondents that rated that idea had not seen it tried/implemented</td>
</tr>
</tbody>
</table>

   Secondly, the innovativeness of each idea at a local level was assessed by a representative of the workplace travel plan team at the University. In line with the ratings from the transport behaviour experts, it had to have been tried/implemented for the commute and with a ‘sustainable travel’ objective. The resulting rating categories are shown in Table 3.
Table 3: Innovativeness at a local level

<table>
<thead>
<tr>
<th>Rating category</th>
<th>Definition of rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implemented</td>
<td>The respondent had seen it tried or implemented in a University context</td>
</tr>
<tr>
<td>Mentioned only</td>
<td>The respondent had seen it mentioned or proposed in a University context (but not tried or implemented)</td>
</tr>
<tr>
<td>Innovative</td>
<td>The respondent had not seen it tried, implemented, mentioned or proposed in a University context</td>
</tr>
</tbody>
</table>

3. Categorisation of ideas

The categorisation of ideas was taken from that used in the ‘Behavioural Insights Toolkit’ (DfT 2011) to describe the different types of approaches that can be used, in the transport context, to “address key influences on behaviour, and achieve the objectives of <government/delivery partner/local authority> policy”. In addition, because a large number of the resulting ideas fell into two of these categories (‘Knowledge and Awareness’ and ‘Structural’) but were quite diverse in nature, the research team developed further sub-categories post-hoc, based on a card-sorting/grouping activity, on the ideas there-in. The categories and sub-categories are shown in Table 4 (along with their short codes, as used in the Results section)

Table 4: Categorisation of idea type

<table>
<thead>
<tr>
<th>DfT (2011) category</th>
<th>Sub-category</th>
<th>Short code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>n/a</td>
<td>Attitude</td>
</tr>
<tr>
<td>Cost</td>
<td>n/a</td>
<td>Cost</td>
</tr>
<tr>
<td>Habit</td>
<td>n/a</td>
<td>Habit</td>
</tr>
<tr>
<td>Knowledge and Awareness</td>
<td>Comparative or personalised information</td>
<td>Knowledge-comparative info</td>
</tr>
<tr>
<td></td>
<td>Corporate information</td>
<td>Knowledge-corporate info</td>
</tr>
<tr>
<td></td>
<td>Experiential</td>
<td>Knowledge-experiential</td>
</tr>
<tr>
<td></td>
<td>Promotional/awareness-raising</td>
<td>Knowledge-promotion</td>
</tr>
<tr>
<td></td>
<td>Providing generic information</td>
<td>Knowledge–generic info</td>
</tr>
<tr>
<td></td>
<td>Real-time information</td>
<td>Knowledge-real-time info</td>
</tr>
<tr>
<td></td>
<td>Social information</td>
<td>Knowledge-social info</td>
</tr>
<tr>
<td>Skills, Capability and Self-Efficacy</td>
<td>n/a</td>
<td>Skills</td>
</tr>
<tr>
<td>Social and Cultural Norms</td>
<td>n/a</td>
<td>Norms</td>
</tr>
<tr>
<td>Structural Factors</td>
<td>Organisational (flexi-time)</td>
<td>Structure-flexi-time</td>
</tr>
<tr>
<td></td>
<td>Organisational (incentives/dis-incentives)</td>
<td>Structure-incentive</td>
</tr>
<tr>
<td></td>
<td>Organisational (parking)</td>
<td>Structure-parking</td>
</tr>
<tr>
<td></td>
<td>Organisational (policy structure)</td>
<td>Structure-org-policy</td>
</tr>
<tr>
<td></td>
<td>Organisational (working at home)</td>
<td>Structure-home-working</td>
</tr>
<tr>
<td></td>
<td>Services</td>
<td>Structure-services</td>
</tr>
<tr>
<td></td>
<td>Supplementary infrastructure</td>
<td>Structure-infrastructure</td>
</tr>
<tr>
<td></td>
<td>Town policy</td>
<td>Structure-town-policy</td>
</tr>
<tr>
<td></td>
<td>Transport infrastructure (environment)</td>
<td>Structure-environment</td>
</tr>
<tr>
<td></td>
<td>Transport infrastructure (modes of transport)</td>
<td>Structure-mode</td>
</tr>
</tbody>
</table>

Results

The ideas generated in each group (number, innovativeness, and type) were subjected to a Chi-Square test (where test assumptions were met), applying Bonferroni corrections where multiple analyses were conducted.

Not all participants completed all stages. For the non-co-design group, 15 were recruited to the study but only 12 completed all the stages described in Table 1. One left the study after the first stage because they left the University and 2 did not respond to repeated email reminders at the idea generation stage. For the co-design group, 17 were recruited and 16
completed all stages. The one that did not complete found it difficult to commit to the idea-generation session due to a change of job role and resultant commitments.

The co-design group (n=16) generated 110 unique ideas (155 total ideas, including duplicates). By comparison the non-co-design group (n=12) produced 51 unique ideas (73 total ideas), see Figure 1. A Chi-Square test indicated a significant difference (Asymp. Sig. < 0.0005 < 0.05). When calculated as ideas per participant (due to the unequal numbers), each co-design participant contributed 6.9 ideas on average, whilst the non-co-design group generated 4.3.

The ratings of innovativeness were carried out in two contexts: global and local. In the global context (Fig. 2), a Chi-Square test showed no significant difference between the two groups. The number of ideas unanimously judged to be innovative in a worldwide context was very small in both groups (Co-design: 8 total. 0.5 per participant; Non-co-design: 3 total, 0.25 per participant).

![Fig 2: Innovativeness of ideas in the global context (number of ideas in each category as assessed by transport behaviour experts)](chart)

In the local context (Fig. 3), a Chi-Square test did not show a significant difference between the two groups. However, compared to the worldwide context, the number of ideas judged to be innovative for that specific workplace context was quite high for the Co-design group (52 in total, 3.3 per participant) compared with the Non-co-design group (23 in total, 1.9 per participant).
Fig 3: Innovativeness of ideas in the specific workplace context (number of ideas in each category, as assessed by local expert)

The results in Figure 4 show a difference in the type of ideas that were generated by each group in terms of the nature of the intervention (at the top level of categorisation). In the Knowledge category, the co-design group (in comparison to the non-co-design group) generated a significantly greater number of ideas (Chi-Square, Asymp. Sig. < 0.0005 < 0.05). In the Structure category the difference was only marginally non-significant, again with more ideas generated by the co-design group. The difference in the Cost category was non-significant. Data in the Attitudes, Habit, Norms and Skills categories did not meet Chi-Square test assumptions.

Neither of the groups generated ideas that fell into Attitudes, Habit or Skills.

Fig 4: Number of ideas in each group falling into each top-level category of behavioural interventions
Further analysis into sub-categories for the Knowledge and Structure groups produced the results shown in Figure 5.

Fig 5: Number of ideas in each group falling into each sub-category of Knowledge and Structure behavioural interventions

For the data represented in Figure 5, only the Structural-Incentives category showed a significant difference between number of ideas from each group (Chi-Square, Asymp. Sig. < 0.0005 < 0.05). The differences between groups for the sub-categories Environment and Organisational Policy were non-significant. The data from all other categories did not meet the test assumptions.

Discussion
The co-design group produced more ideas (per participant and overall) which, in a travel plan context would allow the organisation involved to have a wider pool of ideas from which to draw inspiration. The innovativeness of the ideas produced by each group did not show a significant difference when judged in a global context and the number of innovative ideas was very small. However, when judged in the 'local' context, though not statistically significant, the Co-design group did produce almost twice the number of innovative ideas compared with the Non-co-design group, as well as a large number of innovative ideas overall. That is, there were a greater number of ideas that had neither been implemented nor mentioned previously in the organisation’s travel plan process.

The nature of innovation is that it is context dependent so a difference between the innovativeness of ideas in a local versus global is not surprising. In addition, travel plans need to be very situation-specific if they are to have an impact on behaviours. The results of
the study suggest that co-design techniques could generate novel ideas for an organisation to consider alongside (or in place of) existing solutions. The study did exclude from the analysis ideas that were impossible to implement but it did not generate evidence to enable a judgement of likely impact of the remaining ideas (on reducing single occupancy car journeys). The focus was always on improving (in number and novelty) the early stage of ‘idea generation and in that respect co-design techniques appear to show promise. Proving the relative impact of the ideas generated by the co-design method would be a separate undertaking.

The other aspect of the study was to look at the types of ideas generated by co-design, as opposed to ‘traditional’ methods. The co-design techniques seemed to result in a greater number of ideas in both the ‘Knowledge and Awareness’ and ‘Structural Factors’ categories of behavioural interventions. Probing further into the ideas in these categories the figures seemed to indicate that ideas with a psychological element seemed to be more prevalent in the Co-design group. For example, the Knowledge and Awareness sub-categories of ‘comparative’ (modes/people), ‘experiential’, ‘promotion’ and ‘social’; and the Structural Factors sub-category of ‘incentives’. This suggests that the ideas focused around information to shift attitudes were more likely to be prompted by the co-design techniques. Ideas that focused on changes in organisational/town policy were also more prevalent in the Co-design group. The only sub-category where ideas were noticeably more prevalent in the Non-co-design group was the Structural Factors sub-category of ‘parking’. There are no studies in the literature against which to compare these results and numbers generated in some of the sub-categories (in this study) are small but, the generation of a greater range of ‘softer’ interventions should be of interest to those involved in travel plan development as they may offer new ideas for solutions that require a relatively low level of resource (e.g. compared with infrastructural changes of subsidised modes).

Conclusions
The study reported in this paper aimed to overcome some of the potential limitations of more traditional travel plan development by applying co-design techniques in the early stages of the process. The aim was to involve ‘ordinary’ users (rather than special interest groups) in problem identification and the generation of innovative ideas. By quantifying, rating and categorising the outputs (ideas) generated using co-design versus those from traditional methods, the study assessed the number, innovativeness and types of ideas generated by each method. No previous studies were found that attempted to measure the impact of co-design on idea generation in the travel plan context so this study is a first step towards quantifying any differences in outcomes.

The main conclusions are that co-design techniques (in comparison to non-co-design techniques) appear to: encourage a greater number of ideas, a greater number of ideas that are innovative in the specific organisational context and different types of idea (particularly ones that veer towards more psychological-based interventions). However both approaches are similar in terms of the global innovativeness of the ideas they generate, which was generally low.

As this was, potentially, the first study to attempt to quantify the outcomes of the two approaches, duplicate studies within other organisational contexts would further inform the area. However, applying co-design techniques does appear to offer promise where new solutions are needed. One limitation of co-design is that it is quite resource-intensive as it requires establishing face-to-face sessions which are time consuming due to the nature of the co-design techniques which aim to ‘build up to’ ideas (in this study, seventeen 30min interviews which were then transcribed and turned into ‘story sheets’, followed by four 2-hour sessions). So, if the findings of this study are repeatable, then the focus could be placed on employing co-design techniques in such a way as to build on what traditional approaches offer rather than replace them.
Ultimately, the proof of any benefits that co-design can offer in terms of improving travel plans will be in taking the ideas forward and iteratively developing, implementing and measuring the impact of the resulting solutions.

Acknowledgements
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