

Leveraging Organizations for Sustainable Commuting: A Field Study

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ABSTRACT

Local governments are seeking effective ways to promote sustainable commuting for reducing energy consumption and improving commuters' experience. We present a three-pronged field study of transportation practices, focusing on commuters, organizations, and public administrators. In this position paper we describe the study, our preliminary findings, requirements, and open questions for designing technologies that could help to better leverage organizations as proactive stakeholders for sustainable commuting.

INTRODUCTION

This position paper focuses on sustainability in people's transportation behaviors. In particular, it focuses on promoting sustainable commuting. Consistently with the workshop aims, this research project tries to put into practice knowledge from both within and beyond the CHI community in order to better promote sustainable behaviors by individual commuters. While past HCI research has predominantly focused on individual behaviors and technology, research outside HCI has focused on policies, institutions, and infrastructure [12]. The work draws on studies of transportation policies, social studies of behavior change, and HCI studies and systems in support of healthy and sustainable behaviors. As a contribution to design, theory, and methods, this work proposes a three-level approach to promote behavior change. The approach involves characterizing roles, specifying requirements, and envisioning technologies for three key stakeholders: public administrators, organizational personnel, and commuters.

Transportation is a key domain for promoting sustainability in the EU and in the US as it accounts for about one third of their energy consumption. Nevertheless, changing the transportation habits of large populations of citizens is a hard challenge. Local governments and companies have developed interventions to support sustainable mobility. However, most of the interventions did not reach the critical mass necessary to have sufficient impact [9].

Our work is motivated by an emerging practice among numerous local governments: using "travel plans" as policy interventions and, in so doing, engaging organizations as active players to promote sustainable commuting among their employees. While travel plans have been successfully

used in some countries, it still remains difficult to *systematically* engage organizations and their employees in such efforts. To understand the issues that limit the impact of current practices, we propose a three-level approach (see Figure 1), which was implemented in our field study. From the study we extracted implications for the design of new technologies to better leverage organizations as proactive stakeholders in support of sustainable commuting.

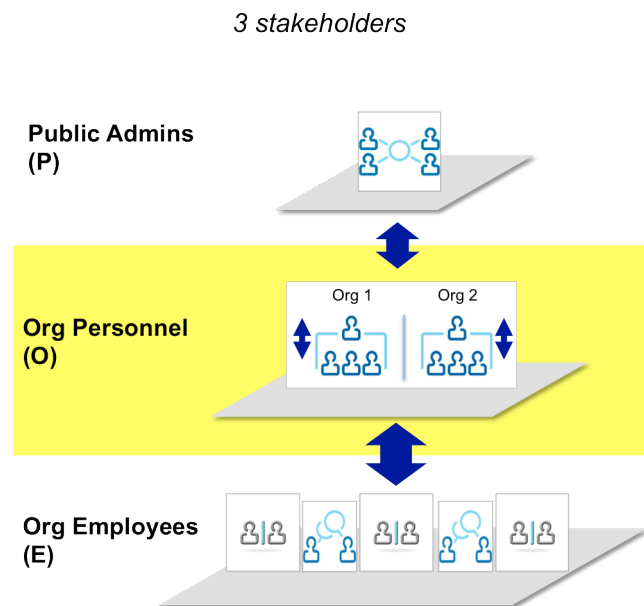


Figure 1. Three-level approach used in the field study (11 interviewees: 2 P, 5 O, 4 E)

RELATED WORK

Studies of "travel plans" or transportation policies constitute a first area of related research. A travel plan consists of a set of policies and incentives to reduce Single Occupancy Vehicle (SOV) usage and promote greener commuting choices instead. E.g., a travel plan includes targeted subsidies for using buses, trains, or car sharing, and lets the individual organizations adopt selected elements. A few recent studies commenced evaluating the success of travel plans. In a study of 25 organizations in the UK, Roby

[10] found that they tend to work in organizations that progress from a reactive to a proactive role. These are organizations that progressively recognize the benefits of travel plans and that adapt them to their own objectives, such as organizational change management, or flexible working practices. Roby also points to the new role that Human Resource managers are having as travel planners for the employees of their organization [10].

A second area of related work pertains to social studies of behavior change, and factors that affect it. These include qualitative studies of commuters such as Dalla Rosa's [4] research on automobile ownership and mode choice, quantitative or survey-based studies by psychologists, and theoretical models of behavior change for HCI purposes, such those reviewed by Hekler *et al.* [5].

A third area of related work pertains to emerging technologies or services in support of healthy and sustainable behaviors (e.g., UbiGreen [6]) or, specifically, sustainable mobility (e.g., CarbonDiem [2] Ozenc [9], SuperHub [11]). Some tools, such as CarbonDiem, focus on detecting and representing people's habits and energy consumption. Some government-funded research projects such as SuperHub [11] proposed prototypes that integrate tools for commuters, such as mobile apps, with tools for administrators, such as a city dashboard for managing incentives and communications. However, most of these tools focus primarily on the individual citizen and do not involve the organization as a proactive stakeholder.

FIELD STUDY

Study Setting

To study existing best practices and gain insights on new technologies for promoting sustainable commuting, we run our field study in the metropolitan area of Grenoble, France. This region was an interesting study setting because of the various interventions it pioneered to enable more sustainable mobility. Over the past decade, it has built new infrastructure for sustainable transportation (new tram lines, bike sharing service, bike paths etc.) and has promoted travel plans by interacting with local organizations.

A 2011 report based on data from various agencies in this region presented travel plans as having a promising impact [3]. Between 2004 and 2009 travel plans were implemented in about 100 organizations, involving 50 thousand commuters. The report estimates that these commuters reduced their SOV usage by 9.7%. Similar positive results of travel plans have also been reported for other regions in France (e.g. [5]) and in other countries, such as the UK [10].

Study Method

In our field study we interviewed representatives of the three different stakeholders: (1) public administrators (P), engaged by local government to promote travel planning among organizations, (2) organizational personnel or travel planners in charge of managing travel plans (O), and (3)

employees working in such organizations (E). For P, we interviewed personnel at the Grenoble chamber of commerce and at a local industry campus. For O, we interviewed personnel at three private and two public organizations with different size and connection to public transport. For E, we interviewed four employees with different commuting habits from one of the organizations.

In each semi-structured interview, lasting 40-60 minutes, the researcher followed a written guide and collected data on the following themes (see method in [10] and [4]): the stakeholder's profile, motivations & constraints, actions undertaken, tools used, and wishes & barriers with respect to sustainable commuting. P (and O) explained how they engaged organizations (and employees, respectively) in the sustainable commuting efforts. Conversely, O (and E) described their reactions to those incentives and the type of technology that could help them. Each interview was audio-recorded. Two researchers wrote and revised the summary of the answers on each theme and used qualitative coding to abstract lessons from the cases of each stakeholder [8].

Results

Below we present the most salient and recurring issues that emerged from the qualitative analysis of the interviews.

1. Challenges for public administrators

The interviews with the P pointed to two general issues that have limited the impact of travel plans in this region. First, since the organizations have very diverse profiles (resources, needs, motivations), it is difficult for local government to understand the unique problems of each organization and thus to design travel plans that satisfy all of them. Second, it is inherently hard to show clear and precise evidence of the costs and benefits of travel plans. Thus, it is hard to motivate organizations to invest sufficient resources to make travel plans successful in the long term.

The poor understanding of the different organizations' profiles (or the lack of resources to build such understanding) leads to solutions that are not optimal for each individual organization. For instance, an interviewee pinpointed a solution put in place by the local government for providing cars to be shared *one way* across organizations. This was seen as "a model that will not work" from the outset, with poor communication between local government and organizations: "We discovered these cars by chance on the parking lot", as an interviewee said. The role of the P interviewed was to facilitate the communication with the organizations, but they reported lacking sufficient support and instruments to do it effectively. On one hand, they communicated only periodically with local government and public transportation providers, generally through monthly meetings. On the other hand, they reported difficulties in engaging smaller organizations. Compared to larger organizations, these have fewer funds to allocate, need more support for implementing travel plans, and are thus less proactive. But, on the front of opportunities, we found

that these organizations often have already built a network to lobby for better public transportation connections to their sites. This network was mentioned as a useful enabler that could be used more systematically in order to co-design more effective travel plans with the local government.

Often organizations misunderstood travel plans as short-term efforts and tended to take minimal action without continuation and deeper reflection. Consistently with the findings by Roby [10] in the UK, the P at the chamber of commerce stated that these organizations “adopt a travel plan to comply with law and benefit from additional subsidiaries, whereas a serious travel plan requires diagnostic steps, and continuous assessment and adaptation to be successful”. It seems indeed very difficult to motivate organizations to allocate significant resources for travel planning, even if some exceptions confirm the rule: a few usual suspects, always the same organizations, are very proactive. The interviews suggested that these organizations are sustainable businesses themselves and have dedicated job roles that are allocated to manage travel plans. For the remaining organizations, the first challenge is to help them understand what benefits a travel plan can bring, *before* they allocate resources. This suggests that the impact of travel plans should be made more easily traceable and accountable. Currently, as pointed out by the representative of the chamber of commerce, “it is very difficult to gather data and to measure the impact of travel plans”.

While these challenges exist in regular times, organizations can become more sensitive to proactively implement a travel plan in situations of change. As both P observed, organizations can be easily engaged “when moving to a new location” since the accessibility of the site then becomes an issue they consider.

2. Lessons from organizational personnel

The interviews with the O, who managed travel plans in organizations, pointed to challenges and opportunities at the organization level. First, the five O interviewed had very diverse job profiles, ranging from human resources manager or employee safety manager, as institutional roles in charge of the travel plan, to volunteers motivated by their environmental interests. Second, travel planning was typically seen as an *extra* task. For the volunteers, in particular, it was neither recognized nor explicitly linked to their work objectives, which made their experience more frustrating. A volunteer stated: “only once I had an intern who could focus on travel planning full time, the project made clear progress”. “So I think that sustainable development based on volunteers doesn’t work”. Third, there was a very limited budget available for implementing the travel plan. In brief, O had limited incentives and time to devote to travel planning, while they all recognized that a significant investment in time and budget is required for making travel plans successful. Consistently, also one of the P (see above) had observed that effective travel plans require dedicated, supported personnel in the organization.

Also the activities and objectives included in the travel plan were diverse across organizations and were impacted by the job profile of the person implementing it. For example, for the human resources manager, the accessibility of the site for future hires and the security of the commute were key motivations. This justified her decision to focus on public transport as the favorite option. Cycling was promoted as a secondary option due to the perceived higher risks of accidents. Other reasons for privileging public transportation included public subsidies for public transport whereas there were no such subsidies and no rules to account for organizational subsidies for other transportation means. Thus, in one organization, even if it was cheaper to support employees cycling than subsidizing their public transportation passes, this was not deemed feasible.

Consistently with the observations from P, one of the O stated that travel planning is intrinsically a long-term effort: “The program took 4-5 years to actually have a significant effect”. The organization can and must *not force* employees to change but rather *facilitate* behavior change. For instance, two O reported that the introduction of an appropriate infrastructure facilitating biking, such as shower and locker rooms, did change the employees’ commuting habits. An O stated that instead of trying to evangelize employees, they “were more easily convinced by observing their colleagues *enjoying* cycling” or other forms of sustainable commuting. Also other O stressed that employees should not feel “judged on their commuting habits” because in some cases they cannot change their habits due to various constraints, e.g., a working mother that must commute via SOV.

In addition to public transportation and cycling, several organizations tried to promote car sharing. Nevertheless, none of them had succeeded for various reasons. A major obstacle was to put car-sharing partners in touch with each other. Therefore, to facilitate connections among for *work-home commuting*, one O planned to organize “a car sharing breakfast where everyone would wear a badge indicating his home location”. Another O identified *work-work commuting* as a new opportunity for car sharing. He estimated that, on an average day, in his organization “10% of the workforce, although not always the same people, needs to move among work sites”. “Car sharing would definitely be an option for these trips”, but “people do not know about each other’s trips”. This seems an underexploited opportunity in multi-site organizations.

As organizations, which were more easily engaged while changing location, also individual employees were seen by some O as more open to adopt new habits in times of change, e.g., new / relocated employees, who are interested in learning about available transportation options (cf [4]).

3. Lessons from commuters

We interviewed four commuters with different profiles: one female using SOV and sometimes car-sharing (E1); one male using SOV, but would use the bus if less noisy (E2);

one male cycling when weather and health allow it, otherwise using SOV or car sharing (E3); one working mother previously using SOV, but now public transport, because more secure and less stressful (E4). The four commuters reported widely diverse motivational factors for their habits: flexibility and comfort; flexibility and independence; health and enjoyment of the commute; budget, security and stress reduction.

All of them had already considered the sustainable aspect of their commute before our interview and some had modified their habits accordingly. For E3, it was an occasional event that had triggered a new stable commuting habit: some friends had offered him a bike “so he had to try it out”, started cycling to work, and, over time, really enjoyed it. E4 started using the bus after the birth of her baby: she felt too tired to drive, feared accidents, and considered it safer to commute by bus. Still, she planned to return to her personal car when getting more sleep, as the bus trip was longer and more convoluted. This illustrates that trigger events make people reconsider their commuting habits, as long as they are practical and compatible with their current life stage.

Personal awareness of the environmental impact of one’s commuting can also shape individual commuting habits: E1, while still coming to work alone, in her personal car, started offering rides home to colleagues, whom she knew lived closed to her. She felt, this solution allowed her to do something positive for the environment, while still keeping sufficient independence and flexibility for herself and with respect to her private and work activities. E2 had tried a new bus line, but refrained from doing so, as he was “really annoyed by the usual [loud] radio station emitted, which he was forced to listen to”. He would have liked to be able to communicate this problem to the city administrators, so that it could be resolved but he did not have means to do so.

Overall all the commuters appeared ready to take action but not willing to completely trade off their comfort for the sole goal of promoting sustainability. Three out of our four interviewees mentioned that they would prefer doing more car sharing, especially with colleagues, but various reasons prevent them from doing it: they do not know with whom they can car share, fear to be too constrained, or do not want to plan the commuting in advance. Another obstacle was the difficult coordination among individuals with flexible working hours. For these employees, such as E1 and E2, it was difficult to agree in advance on stable car sharing schedules with colleagues. Conversely, the employees with fixed working hours, such as E4, can find it difficult to agree on car sharing schedules with employees from other organizations. She had the opportunity to car share with an external partner and wanted to adapt her working hours to the constraints of that partner. However, her organization did not allow her to do so.

REQUIREMENTS AND QUESTIONS

We presented a field study on sustainable commuting with three stakeholders (public administrators, organizational

personnel, and commuters). The interviews with the three stakeholders pointed to some general problems that undercut the potential of travel plans in promoting sustainable commuting. First, current travel plans are not adaptable to the unique profile of each organization and commuter. Second, their benefits, costs, and impact are not systematically tracked, making it hard for organizations to understand the benefits before allocating resources. Third, there is poor synergy among the three stakeholders, which reduces the impact of their “siloeed” initiatives. We are currently specifying early design requirements (Table 1, first column), which we will iteratively present and refine to the same stakeholders. We are also identifying questions that remain to be addressed (Table 1, second column).

| Requirements | Research questions |
|--|--|
| General requirement: support <i>tailored, traceable, and continuous</i> interactions among the stakeholders. Below we list three specific requirements. | How can HCI help to foster synergy across the different stakeholders, engage them in interactions around sustainable commuting, and keep them involved over time? What is the possible impact of HCI, compared to other factors (policy, infrastructure etc.)? |
| 1. Multi-level profiling of organizations and commuters for low-cost tailoring of the travel plan to fit the individual actor’s resources, needs, and motivational factors. | What are the components of the profile at the different levels, and, how can they be automatically constructed and aggregated over the successive levels? |
| 2. Traceable benefits, costs, and impact. Public administrators and organizational planners should be able to measure and predict change based on past experience. Conversely, organizations and commuters should be able to engage in a plan based on traced benefits. | Which (type of) relevant travel behavior data can be reasonably collected on one hand and is sufficient to enable evaluating the benefits, costs and impact of respective travel plans or measures on the other hand? What about privacy in this context? |
| 3. Continuous behavior-change interventions planned in the long term. Not every moment is favorable to change habits. The system should help to intercept favorable moments for organizations or commuters to change. | Can existing behavior change theories be applied or adapted to the domain of sustainable commuting? Can such theories be applied not only to the individual but also to organizations as a whole? |

Table 1. Requirements and Questions

A general requirement that designers can draw from our

findings is the need to support *tailored, traceable, and continuous* interactions (e.g., for communication, coordination, and deliberation) among the stakeholders.

The resulting technology should support:

- *Multi-level profiling* (of organizations and commuters) for *low-cost tailoring* of the travel plan to fit the individual actor's resources, needs, and motivational factors. E.g., analytics tools for public administrators can allow adapting the travel plan and the communication on it to each organization. Similar tools can enable travel planners to tailor the organization's plan and communications to each employee.
- *Tracking of benefits, costs, and impact.* Public administrators and organizational travel planners should be able to measure and predict change based on past experience. Conversely, organizations and commuters should be able to engage in a travel plan or in individual activities based on traceable benefits. An integrated system should therefore offer low-cost traceability of interventions, e.g., a survey toolkit for public administrators and organizations with adaptable templates for surveys, metrics, and objectives.
- *Continuous* (and not only episodic) *behavior-change interventions* with a *long-term* perspective. Not every moment is favorable for changing transportation habits. The system should help to intercept favorable moments when individual organizations or commuters might be open for change. Also, since a travel plan takes years to run, the interventions should be scheduled and monitored to capture the long-term impact.

Specific issues voiced by multiple stakeholders suggested also examples of more specific requirements for design:

- To enable car sharing, dedicated individual, organizational and public applications should allow reducing the costs of coordination, networking, and awareness of weekly schedules.
- Since the behavior of peers is an effective motivator, silent awareness displays can highlight sustainable commuting behaviors such as cycling or walking to work at various levels of disclosure: among peer organizations that share data, within an organization, among known colleagues, or within personal devices as aggregated traces of anonymized behavior by others.
- Multi-site organizations could facilitate sustainable work-work commuting by leveraging the rich set of information available from participating employees: work patterns, shared calendar events, etc.

Following up with this qualitative study, we are mapping the presented requirements onto a system design that allows the organization to act as facilitator between commuters and government. We will test the resulting prototype in one of the observed organizations and complement this qualitative study with quantitative measures. At the same time, we will address the corresponding research questions mentioned in Table 1, which are related to workshop themes [12]. This work also aims to contribute to Sustainable Interaction Design [1], where design consists in informing user choices of more sustainable ways of being "commuters", for instance, by enabling them to better exploit existing and more sustainable commuting alternatives such as public transportation, car sharing, biking, or walking.

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REFERENCES

- [1] Blevins, E. Sustainable interaction design: invention & disposal, renewal & reuse. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07)*. ACM, New York, NY, USA, 503-512
- [2] Carbondiem: www.carbondiem.com, 09/18/2013.
- [3] CCI Grenoble: www.grenoble.cci.fr/entreprises-et-economie/observatoire-2011-pde-pda-21668.kjsp, 2013.
- [4] Dalla Rosa J. (2007). A step towards sustainable transportation behaviour, MS Thesis, Univ. of Waterloo.
- [5] Eltis: eltis.org/index.php?id=13&study_id=158, 2013
- [6] Froehlich J., Dillahunt T., Klasnja P., Mankoff J., Consolvo S., Harrison B., and Landay J.A. (2009). UbiGreen. In *Proceedings of CHI '09*. ACM, 1043-1052.
- [7] Hekler E.B., Klasnja P., Froehlich J. E., and Buman M.P. (2013). Mind the theoretical gap. In *Proc. of CHI '13*.
- [8] Miles, M & Huberman, A (1994). *Qualitative data analysis*, Thousand Oakes: Sage
- [9] Ozenc F.K., Cranor L.F., and Morris J.H. (2011). Adapt-a-ride. In *Proceedings of DPPI '11*. ACM, NY, USA.
- [10] Roby H. (2010). Workplace travel plans: past, present and future, *Journal of Transport Geography* 18, 23-30
- [11] SuperHub: superhub-project.eu, 09/18/2013.
- [12] Silberman M.S., Blevins E., Huang E., Nardi B.A., Nathan L.P., Busse D., Preist C., Mann S. (2014) What Have We Learned? A SIGCHI HCI & Sustainability Workshop. In *Proceedings of CHI 2014*.