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## Gamification and social dynamics behind corporate cycling campaigns

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### Abstract

The promotion of cycling is of great importance for fostering sustainable and healthy modes of transport in urban areas. For this reason, many cities around the world organize biking competitions in order to motivate citizens to commute by bike. The success of such campaigns appears to demonstrate the positive effects of using playful settings for encouraging a specific type of behavior; however, the actual determinants of behavior changes have yet to be thoroughly investigated.

This paper presents the results of an experimental bike commuting challenge among 14 companies, which has been conducted in Boston, MA. This six week study involved 239 participants using a socially influencing system for reporting commutes and displaying the rankings. The results revealed a variety of different motivation strategies developed by the companies. Social dynamics (motivating others or being motivated by others) had a very strong effect on the participants, suggesting that emotional aspects (team spirit, fun) have higher potential than more rational factors like health or environment.

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### 1. Introduction

Being among the oldest forms of transportation, cycling is also one of the most promising future transport modes, especially in urban areas. The benefits of cycling comprise ecological, economic, structural, social as well as

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individual advantages, e.g. cycling is a carbon neutral form of transportation and requires only 1/30 of resources as compared to private motorized vehicles during its life cycle (Lähteenoja et al., 2006); cycling provides major health and financial benefits both on the individual side (low costs) as on the economic side: the estimated value of health benefits and respective reduced mortality resulting from the average 5% modal share of cycling for Austria is 405 million Euro per year according to the WHO Health economic assessment tool (HEAT) for cycling and walking, related health benefits “save” 412 lives every year owing to regular physical activity (WHO, n.d.), and cycling requires less space than private motorized transport (about 10% for parked vehicles and 60% for moving vehicles, only outperformed by walking and public transport with high occupancy levels; Randelhoff, 2015).

However, despite the documented advantages of cycling, in many cities there is still a very small share of cyclists. A range of different barriers to cycling are responsible for the fact that cycling is not perceived as a legitimate form of transport: a negative image of cycling and cyclists in general, perceived dangers involved with cycling, or cycling being considered as inconvenient (Scott and Span, 2009). As many of these barriers are based on individual perceptions and emotional aspects, the provision of cycling infrastructure and access to bikes is not sufficient for getting a large number of people to start biking. For this reason, there are several attempts to increase and foster bike usage by implementing initiatives to promote biking through e.g. gamification and socially engaging approaches in order to motivate citizens to voluntarily switch to more sustainable modes of transport (Richter et al., 2011). However, little is known about the effectiveness of specific factors within such approaches, i.e. whether incentives and prizes, game elements or social dynamics are most relevant in triggering behaviour changes, and how these factors can be initiated most successfully. In order to gain more insight into these mechanics, this paper describes a study investigating which factors are relevant for encouraging biking within a community based competitive biking challenge. Starting from a short overview on related work in this area, the paper describes the biking competition which has been set up for this purpose, the study design and the methodology. The following section summarizes the results and the closing section discusses how these results can be used for the future design of biking campaigns in order to increase biking in cities.

## 2. Gamification in biking campaigns

In the field of mobility a growing number of attempts for motivating behavioural changes using game elements such as incentives or rewards are emerging. A meta-study on the general use of gamification (Hamari et al., 2014) revealed that there is evidence that gamification produces positive effects and benefits, but that it can also have unexpected and undesired consequences: e.g. negative side effects can be provoked, impacts are very user specific and limited to specific groups, and usually only some – not all – of the mechanics and motivational affordances worked in the studies reviewed. Although the literature on the effects of gamification in mobility is somewhat limited, there are a few confirmed conclusions which can be identified based on the published findings (Millonig and Mitgutsch, 2014):

- Gamification is a useful tool to provoke behaviour and aptitude change in the area of mobility behaviour change (Hamari et al., 2014; Jylhä et al., 2013).
- In particular gamification can enrich the users' motivation and engagement in specific activities, but also in exploring new possibilities and options (Hamari et al., 2014; McCall et al., 2013).
- When players engage within the game mechanics, behaviour other than intended can occur due to the dynamics set in motion through the game (McCall et al., 2013; Ecker et al., 2011).
- The nature of the gamified systems strongly impacts the effect of the gamification (Hamari et al., 2014).
- Therefore it is key to get a good sense of the users' motivation, but also of player styles and types (McCall et al., 2013).

Recently, the positive effect of playful elements has increasingly been used in biking programs in order to increase e.g. bike commuting (Pucher et al., 2011). These promotional measures use elements like competition, lotteries, team experience or awards, adding an emotional quality to the more objective arguments for biking, such as health benefits, time saving or climate change mitigation. The campaigns show promising effects, but there are only a few examples

for scientific evaluations of such programs, like a study on the annual Austrian cycling campaign “Bike to Work” (Wunsch et al., 2016), which engages thousands of bikers each year and seems to achieve about one quarter of the participants to actually keep a higher level of biking. The results show that part of this success seems to be related to the boosting effect of having small teams in the campaign, which mutually encourage themselves to take as many bike trips as possible. Prizes that are provided as part of the campaign seem to play a less important role in motivating biking. The actual social dynamics and processes leading to behaviour changes (Stibbe, 2015) are still hardly examined; especially the effectiveness of initiatives aiming at creating/stimulating behaviour change in the absence of any tangible incentives needs to be studied.

As part of the cooperative research project “Persuasive Urban Mobility”, a large-scale real world experiment “Biking Tourney” (further, the tourney) has been conducted in Greater Boston area, aiming at encouraging employees riding bicycles to work. In this approach, companies serve as communities, thus provide a shared identity for their employees. That typically facilitates social interactions and mutual encouragement for biking just like for the teams in the Austrian example. Apart from the competition and related information (website, emails), no extra incentives were provided to the companies or participants. The study aimed at examining the following hypotheses:

1. Competition and cooperation (as social influence strategies) drive people to engage in activities.
2. If decision makers within companies are willing to join such a competition they will use or create strategies to motivate their employees to join and compete for a victory in such a competition.
3. Biking as a form of commuting becomes a conversation topic, people start considering biking and eventually are doing so. This effect is usually stronger within smaller social groups (low number of employees, small groups of bikers that formed within a company).

### 3. Study design

The tourney took place during 6 weeks in September/October 2015. 14 companies took part in the tourney, with in total 239 registered participants. The tourney standings were available on a website and on displays positioned in some of the participating companies (depending on available space and displays, see Fig 1 left). Participants registered on a website and reported their daily bike trips on the website or via an email form (see Fig 1 right)

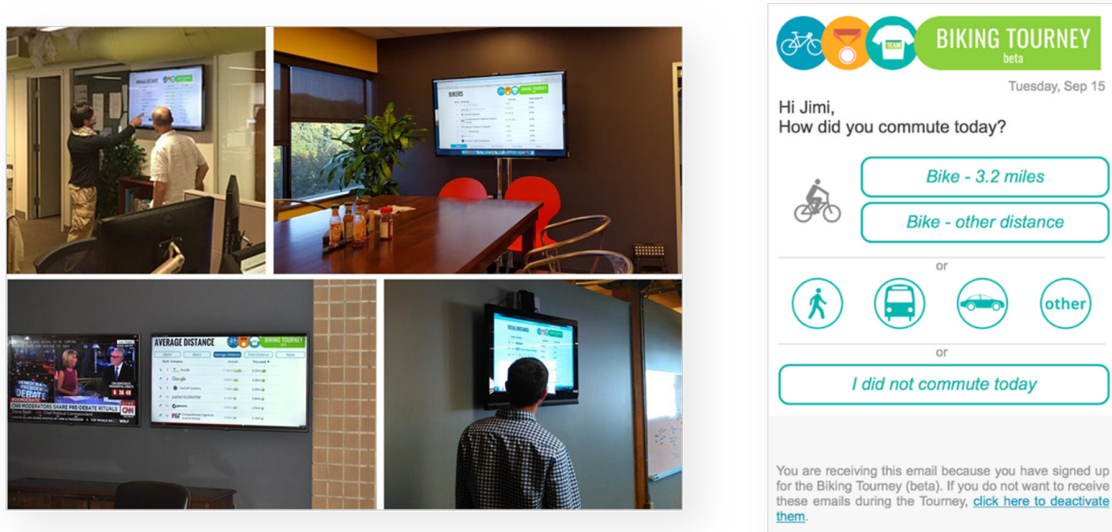


Fig. 1. Public displays with the tourney rankings in the participating companies (left), email reminder for participants (right).

Four different categories of rankings were created in order to provide the chance to win for up to four companies (see Fig. 2 for examples of standings in three categories):

- Bikers: share of employees who reported that they were bike commuting per company (last week and total).
- Average distance: average distances biked by all participants per company (last week and total).
- Total Distance: total distances biked by all participants per company (last week and total).
- Enthusiasm: changes in the share of bikers per company (in total)

The participating companies varied significantly in size: the smallest company had 17 employees, the largest about 10,000. The majority of the participants were male (81%), which is partly caused by the type of most of the companies (mainly technology oriented), and partly by the finding that in the US men are disproportionately more likely to bike than women (Heinen et al., 2010). A pre-survey showed that a large share of the participants was already biking on a regular basis (60% almost daily, 24% several times a week, and 16% were using their bike less often than that), which is not unusual for this type of biking campaigns.

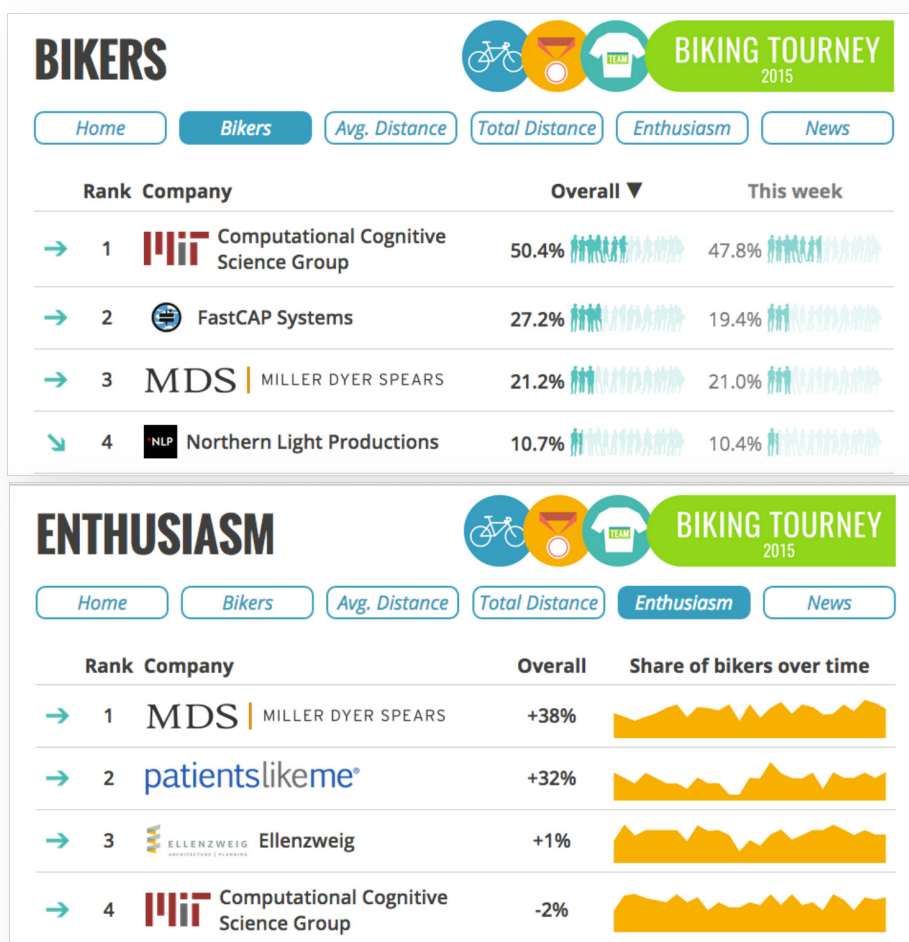


Fig. 2. Screenshots of standings in the category “Bikers” (percentage of bikers in the total employee population) and “Enthusiasm” (change in percentage of active bikers over time).

For evaluating the effects of the intervention on the engagement towards biking and the strategies that have been applied in the participating companies, a combination of quantitative-statistic methods (analysis of reported mobility behaviour and post-intervention survey data) as well as qualitative-interpretative methods comprising open questions in the surveys and interviews with company representatives, which provided deeper insight into the companies' motivation to join the competition and actual measures that have been taken to encourage the employees to participate and contribute to their company's joint efforts in the tourney.

#### 4. Results

In general, the tourney was perceived as very encouraging and successful by the participants. Quantitative results based on an ex-post survey (n=129) show that during the tourney 15% of participants biked more often than usual. More than 19% of the tourney participants planned to bike more often even after the tourney ended (see Fig 3 for changes in the biking behaviour of different categories of bikers).



Fig. 3: Changes in biking behavior after the Tourney for different categories of bikers.

The results of the analysis of interviews with the company representatives show considerable differences in the motivations to join and the strategies the companies applied for engaging their employees. The reasons for signing up for the tourney comprised various different aspects:

- Fun: people enjoyed the opportunity to do something “cool” and entertaining, compare their results to other and have something to talk frequently talk about.
- Team: several companies expressed their hope to strengthen the team by joining the competition, improve wellbeing and also increase their exposure among the bike commuter community as a way of networking.
- Higher goal: a frequent motivation was to foster more sustainable ways of transport both among the employees but also for the city; in addition there was also motivation to support research.
- Bike enthusiasm: most of the companies reported to have a significant amount of regular bikers – higher than the share of biking in the local modal split – among their staff who are always interested in participating in biking initiatives.
- Traffic “trauma”: some companies were also encouraged by the idea to find ways to decrease motorized traffic by promoting cycling.

Besides setting up screens to display standings during the tourney, the companies also developed different strategies with varying levels of engagement for encouraging their employees to participate and report biking mileage. The strategies ranged from installing mailing lists and a private social media page on the internal network for the company team to face-to-face-interactions with potential participants to simple email reminders to the staff.

Cooperation among employees of each organization was a driving factor for participation, with 45.7% of participants crediting “team spirit / participating together as a team” and 41.7% saying that their colleagues were motivating to them. A total of 29.9% agreed with “joining as a way to motivate others to bike”, highlighting the cooperative effect within the companies.

Personal health benefits were a relevant motivator for 40.9% of participants, the displayed statistics did motivate 34.6% of participants and competition with other companies has been a motivator for 34.6%. Although often

mentioned in relation to biking, environmental benefits were the least important motivating factors with a share of only 27.6%. Of course, for most participants a mix of motivators was present (see Fig 4).

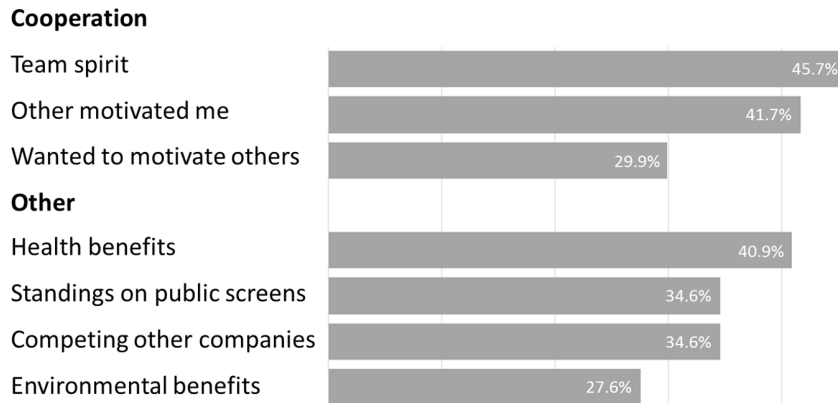


Fig. 4: Motivating factors for participating.

The level of engagement and activities of the company representatives varied to a large degree. All of them sent out informational emails to their colleagues, but some were more eager and actively engaged their colleagues to participate regardless of the routinely used mode of transportation. In order to support this, the company representatives set up specific mailing lists or social media groups and one even created and handed out promotional flyers.

Another motivator for participating was advocacy for improved bike policies. Company representatives and decision makers as well as individual tourney participants stated that they want to signal to the city that there is demand for better infrastructure for utilitarian biking.

## 5. Conclusions and future work

The results of the study generally support the hypotheses. The competition between the companies served as initial trigger for signing up for the tourney, and collaboration within teams was the main driving factor for continuous participation. The displays showing the standings supported constant awareness of the campaign and the conversation among the employees about the topic. Collaboration in the form of motivating others to join worked especially well in smaller companies, which is for example demonstrated by one small company where employees particularly convinced one of their colleagues to join during the last days of the tourney in order to win the “enthusiasm” category. The companies’ representatives responsible for the decision to join played an important role for the development of motivational strategies within the companies. All decision makers took action in order to motivate employees to join; however, the quality and intensity of the motivational strategies were strongly related to the level of personal engagement of the person responsible. Representatives who were enthusiastic about biking themselves took particular effort to persuade their colleagues to commute by bike.

The experiment shows that the social dynamics initiated within communities (in this case companies) by introducing a playful competition can provide strong motivational factors for increasing a desired behavior. Emotional factors such as fun, personal engagement or team spirit have more influential power than rational factors like health benefits or environmental reasons. The absence of actual prizes did not seem to have a limiting effect on the success of the competition.



Future work has to show if the effectiveness of such a competition can be increased by addressing different types of communities (e.g. communities with strong social bonds), or can be run on a larger scale (e.g. nationwide). Overall this study illustrates how gamified and socially engaging approaches can be useful for promoting sustainable transportation beyond hard-policy measures or tangible incentives, thereby providing an example for future research, policies and campaigns.

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