

## Persuasive Cities: Health Behavior Change at Scale

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**Abstract.** Can you imagine a city that feels, understands, and cares about your wellbeing? Future cities will reshape human behavior in countless ways. New strategies and models of urban spaces are required for creating future cities to properly respond to human activity, environmental conditions, and market dynamics. Persuasive urban systems will play an important role in making cities more livable and resource-efficient by addressing current environmental problems and enabling healthier routines. Drawing on socio-psychological theories and integrating them with new concepts for urban design, the persuasive cities research focuses on improving wellbeing across societies. This research presents an ecosystem of future cities, describes three generic groups of people depending on their susceptibility to persuasive technology, explains the process of defining behavior change, and provides tools for social engineering of persuasive cities. Further research should continue exploring how urban design in combination with socially influencing systems could encourage healthy and sustainable behaviors at scale.

**Keywords:** persuasive cities, social engineering, socially influencing systems, behavior change, wellbeing, health, persuasive technology

### 1 Perspective

As population in cities continue grow exponentially the architecture and design of future urban places will become more dominant in impacting human behavior. According to social cognitive theory [1], any well-designed environment can become a strong influencer of what people think and do. There is an endlessly dynamic interaction between a person, a particular behavior, and an environment in which that behavior is performed. The persuasive cities research leverages this knowledge to engineer persuasive environments for altering human behavior on societal levels.

The proposed research reflects on novel ways of how persuasive technology [2] and socially influencing systems [3-4] enable mechanisms to perpetually support motivation of individuals comparing to conventional methods, such as those that are based on carrots and sticks. Instead, persuasive urban systems harness social influence from crowd behavior to craft influential messaging aimed at shifting behavior and attitude of an individual, who naturally is an integral part of the same crowd. Such continuous interplay can ultimately result in an ongoing process that reshapes communities and societies without any other incentives.

## 2 Emergence of Persuasive Cities

Ongoing research streams focus on *sensible cities* (researching sensing technologies to read human behavior in urban spaces) and *smart cities* (analyzing big data to classify groups of people based on their distinct behavioral patterns), however there is a lack of knowledge about perspective ways to achieve persistent behavioral changes at scale. Therefore, the proposed research extends an ecosystem of future cities (Table 1) by introducing the notion of *persuasive cities* that aims to advance and refine influential strategies designed for intentionally reshaping how people think and act in urban environments.

**Table 1.** Ecosystem of future cities

Role	Character	Technology
<b>PERSUASIVE</b>		
Change	Care	Socially Influencing Systems
<b>SMART</b>		
Classify	Understand	Big Data Analytics
<b>SENSIBLE</b>		
Read	Feel	Sensor Networks

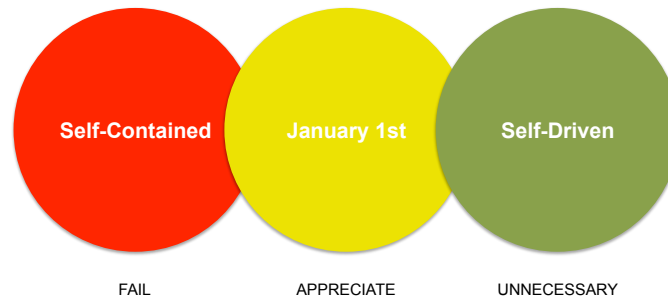
Each *layer* of future cities has its *role*, *character*, and supportive *technology*. Sensible cities employ sensor networks to read crowd behaviors. In other words, these cities feel human movements. These crowd behaviors further serve as an input for big data analytics that smart cities apply to classify groups of people according to similar behavioral patterns (profiles). When that is accomplished, the groups having better routines can be exemplified to other underperforming groups through intentionally designed socially influencing systems, which are at the core of persuasive cities.

## 3 Susceptibility to Persuasive Technology

People generally can fall into one of the three generic categories depending on their susceptibility to persuasive technology (Fig. 1). *Self-contained* people (the red circle) most likely are not open for changing anything in them. They are fully satisfied with who they are and what they do on daily basis, thus many behavioral interventions might fail in attempts to influence this group of individuals. *Self-driven* people (the green circle) typically have comparatively high levels of motivation and can achieve everything that they have envisioned. Thus, these people most likely are not looking for additional sources of encouragement, and therefore persuasive technologies might become unnecessary for this group.

However, there is another group of people that oftentimes would like to change their routines, but rarely succeed in doing so. That reminds of New Year's resolutions that in many cases end around February. Therefore, this group is entitled as January 1st (the yellow circle) and seem to be the most welcoming towards technology sup-

ported behavioral interventions designed to help achieving target behaviors. Although, Fig. 1 presents all three groups as equal circles, in reality the size of each group might significantly vary depending on the context and particular behavior.



**Fig. 1.** Susceptibility to persuasive technology

#### 4 Defining Behavior Change

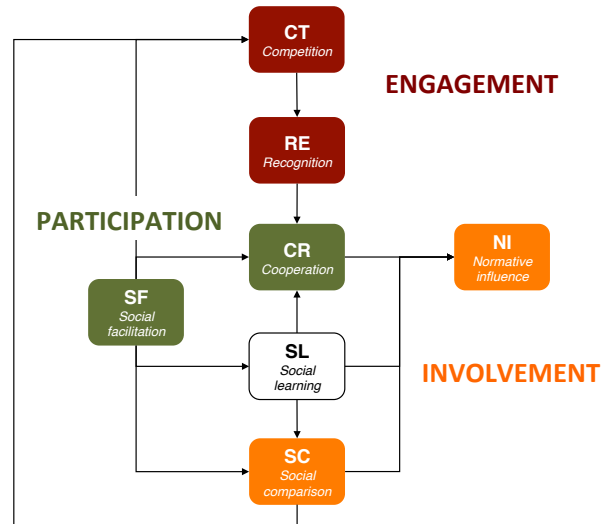
To achieve an envisioned target behavior, the process and components of behavior change have to be well understood and clearly defined. In the process of defining behavior change, there are three main components, namely the target group, its present behavior, and its envisioned future behavior (Table 2).

**Table 2.** The three main components for defining behavior change

Target Group	Current Behavior	Future Behavior
<b>Description</b>		
A group of people currently having an unsatisfactory behavior. It is important to narrow down the target group as precise as possible.	A certain behavior of the target group that currently is not in line with an envisioned future behavior in a given context.	An ultimate future behavior of the target group that is envisioned to be more beneficial for everyone.
<b>Example</b>		
There are MIT faculty members.	Who currently commute alone in their private cars.	They could commute by bicycles instead whenever possible.

#### 5 Tools for Social Engineering

Earlier research on persuasive technology [2] describes several ways how social dynamics can influence human behavior, which have been further refined and structured as a framework for Socially Influencing Systems (SIS) [3], depicted in Fig. 2. The SIS framework is a useful tool for scholars and practitioners aiming at improving future cities by introducing persuasive urban interventions targeted to support wellbeing.



**Fig. 2.** Socially Influencing Systems (SIS) framework

The framework describes seven socially influencing principles that can support persuasive urban interventions. The principles are interlinked and have potential to exert stronger effects depending on the context of a particular behavioral challenge. Normative influence and social comparison seem to be more effective to achieve involvement of the target group as the two principles focus on attitudinal changes. Cooperation and social facilitation seem to be more effective to make individuals participate and do the envisioned future behavior even without a formed attitude towards it. Competition and recognition seem to be more effective in engaging the target group to do the future behavior as the principles focus on both attitude and behavior simultaneously. For example, the effects several socially influencing principles have already been studied in the context of urban mobility, e.g. bicycling [5].

## 6 References

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