

# **Recognizing Individual Needs and Desires in the Case of Designing an Inventory of Humanity-centered, Sustainability-directed Concepts for Time and Travel**

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**Abstract.** Beginning with a concern for issues of sustainability in the area of time and travel, we used a methodical process to construct an inventory of concepts and coherent systems of concepts targeted at meeting individual transportation needs while promoting sustainable social behaviors. As a first impression, one might assume that any such rational process might tend to target reductive optimal solutions that yield uniform, one-size-fits-all, and consequently banal results. Insofar as one can escape from the constraints of method, we have endeavored to take into account a wide variety of viewpoints and circumstances in order to create tailored, individualized systems that taken together improve our collective condition. In this essay, we present our designs for time and travel and reflect on the degree to which we have been successful in preserving designerly notions of the particular and individual while suggesting concept systems with a social and ecological mission.

## **1 Introduction**

In this essay, we present a design case study for the domain of time and travel. The goal of our design was to create an inventory of sustainable, humanity-centered design concept systems that improve the general ecology and social conditions surrounding travel activities. We sought systems that create positive environmental change while specifically recognizing the needs and desires of individuals as opposed to relying on Draconian notions of public policy or legislation.

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We present our design according to a specific framework. This framework consists of notions of predispositions, research and observations, insights, concepts, and concept systems [1]. Briefly, predispositions are an enumeration of various conventional points of view about a design domain. Research involves techniques of observation, literature review, and collections of artifacts from and knowledge about popular culture. Insights are key understandings akin to research hypotheses that follow from research and observations. Concepts are design “ideas” that follow from insights. Finally, concept systems are a coordinated complex of individual concepts that work together to create a coherent improvement in a particular group’s human condition. This essay is organized according to this framework. In the following, we elaborate on each of these elements in the context of our particular design study of time and travel. In addition, we consider in step-by-step fashion our design apropos of key questions about the role of time and travel and especially technologies of time and travel as a catalyst for social interaction.

## **2 Predispositions**

Predispositions describe our best guess about the varied points of view that people have about a current state of affairs. With respect to time and travel, we reasoned that people are concerned about lost time, reclaiming time, their preference for private spaces over public ones, the unsustainability of private transportation with respect to the environment, and that people hold misconceptions about the nature and potential of public transportation.

### **2.1 Lost Time and Reclaiming Time**

One of the biggest perceived needs in modern life is the need to reclaim time (Fig. 1). Thus, rather than viewing time spent in transit as an opportunity to relax and collect one’s thoughts, people often feel the need to conduct business on the mobile phone, catch up with friends, or work on laptops. Of course, such perceived needs affect some people more than others. Nonetheless, the need to reclaim time is a key assumption we made about why people are motivated to engage in certain kinds of travel behaviors.

### **2.2 The Comfort of Private Spaces**

People prefer their own private spaces to shared spaces (Fig. 2). The use of individual technologies, familiar interfaces, and personal artifacts are important to most people who use private transportation. They find the transition from private to public spaces inconvenient and uncomfortable.



**Fig. 1.** Time spent in transit is often viewed as lost time



**Fig. 2.** Private spaces are deemed more comfortable than public ones



**Fig. 3.** Private vehicle use is unsustainable



**Fig. 4.** People have misconceptions about public transportation

### **2.3 The Unsustainability of Private Transportation**

Ultimately private transportation as we know it is environmentally unsustainable (Fig. 3). Congestion and inefficiently designed vehicles increase emissions and have detrimental effects on the environment. Furthermore, the use of private vehicles depends on the availability of limited resources. Forms of mass transit and alternative, sustainable modes of transportation could use these resources more efficiently. The increasingly egocentric cycle of society has caused pro-social behavior to become less important or even forgotten making the transition away from private vehicle use difficult. The immediate gratification of convenience outweighs the lasting effects of environmental degradation.

### **2.4 Misconceptions about Public Transportation**

Convenience, reliability, self-expression, and autonomy are the determining factors that keep people in their cars and are ultimately the barriers to the use of public transportation. Some people have negative attitudes and misconceptions that increase their resistance to forms of mass transit. Public transportation is viewed as unclean, unreliable, uncomfortable, and dehumanizing (Fig. 4).

## **3 Literature Review**

These five predispositions—lost time and reclaiming time, private spaces, unsustainability of private transportation, misconceptions about public transportation—helped us determine the directions to take in our research and literature review.

### **3.1 Lost Time and Reclaiming Time**

People often feel that the time spent in travel is wasted [2]. They attempt to reclaim time by engaging in other activities while driving, many taking for granted the complexity of the driving task [3]. Because events that draw on attention reduce the effectiveness of the driver, 29% of driver distraction can be attributed to events outside of the car and not related to the driving task. Furthermore 25% of all serious or fatal crashes were due to moving objects around inside of the car [4].

The human-car interaction has influenced the research and development of technologies that enable mobile communication and productivity [5]. Information technology has the potential to change the way people view transportation. The mobility afforded by information technologies means that travel time can become more productive. Time spent in the car can be utilized more safely, and time spent using public transportation can be used more efficiently [2]. Mobile technologies have increased the ability to engage in

professional and personal activities virtually anywhere. Information technologies are becoming invisible as society takes them for granted. The choice of transportation mode can be influenced by technology; the demand of space and time are changed based on the role technology plays.

### **3.2 Private Spaces**

Moving people from their cars to alternative forms of transportation is affected by the motivating factors of each individual. These motivation factors can be broken down into the following eight areas: convenience, experience in transit, safety, autonomy, cost, identity, freedom, and comfort [6]. Society associates human attributes to automobiles, creating a powerful identity. Owning and driving a car provides an emotional interaction. A car has ambient affordances that intensify the emotional bond between the car and driver [7]. Due to this emotional connection, many people have often unexplainable objections against transitioning from private to public spaces. The physical, emotional, and societal effects of the use of private cars is difficult to duplicate within the context of public spaces [5].

### **3.3 Unsustainability of Private Transportation**

The extensive use of private vehicles is not environmentally sustainable. The effects of the United States' car culture in particular have negative impacts on the environment, such as global warming, acid rain, congestion, noise pollution, and depletion of resources [8]. These effects can be minimized by the development and use of more sustainable forms of private transportation, the increase in the use of public transportation, or combining the two [9]. In the United States alone, there were 230 million private vehicles on the roads in 2003: 57% trucks, 21% SUVs and Vans, 19% light trucks [10]. Of further concern is the rapid growth of automobile usage in developing countries. For example, we learned there were 15 million private vehicles in Korea. There were no correlated statistics for China, but we learned that 13.6 billion people traveled by private car in China in 2004 and that the number of cars in China increased by 272% from 1990 to 2002 [11].

### **3.4 Misconceptions**

People often have misconceptions of the experience associated with public transportation. They consider it to be unreliable and dehumanizing [12]. The car is viewed as an extension of self, an embodiment of our values, and a form of expression [13,14]. Because the car is seen as a symbol of freedom and identity in American culture, there is an underlying psychological resistance to the use of public transportation [15,16]. Ways of creating

incentives for the use of more sustainable forms of transportation have been heavily debated over the past decade [17]. One way to create incentives is to address the factors determining mode choice. Several European countries have incentive strategies targeting public opinion and seeking acceptance by involving the public in the design and decision making process [18]. Unfortunately outside of European examples, most development and implementation of alternative modes of transportation have occurred without consideration of user needs, acceptance, or satisfaction [19]. Significant research has indicated that a combination of approaches is needed to overcome users' misconceptions. Neither a single incentive nor a single solution will address each individual's measure of the factors determining mode choice [20].

### **3.5 Summary of Research**

We identified several key areas of findings which we used to inform the insight generation process. These areas included knowledge about private vehicles, public transit, safety, travel trends, technology, environment and sustainability, public attitude, and perceptual change.

From a social interaction point of view, the existing state of transportation is a complex web of interactions. The impact of the private vehicle is both environmental and social in nature. Over the last several decades, the increase in private car usage in the United States has contributed to negative changes in society. The shared experience of travel has been removed from most people's lives. Personal interaction has decreased, not only between friends and family, but also between community members. People's interests have become more centered on their private lives and reclaiming time, while being less involved in public activities such as politics, social welfare, and community building. This has contributed to the deterioration of community. Diversity and new experiences are avoided while people transition privately through life.

## **4 Observation Study**

There is no substitute for seeing things with your own eyes. Accordingly, we used our predispositions to formulate an observation study. The purpose of the observation study was to further explore draws on attention, use of cognitive resources while driving, and the ways in which the drivers attempted to use their time in transit.

## 4.1 Method

We observed fourteen drivers ranging from 21 to 65 years old. Of those, 57% were female, and 43% were male. They were observed while driving for single sessions averaging one hour in duration. The environment varied from session to session, but the majority of the sessions occurred with a passenger present, and all sessions included some degree of interstate/freeway driving. We took 300 to 800 rapid sequence photographs of the driver while seated in the backseat on the passenger side of the car. The photographs were analyzed after each session, and the observations were placed into a framework of the following four cognitive aspects: cognitive overload, cognitive underload, fatigue, and distraction.

## 4.2 Findings

The first cognitive aspect of the observation framework was cognitive overload (Fig. 5). One example of cognitive overload was people engaged in activities other than the driving task. In our participant observation these activities included attending to personal hygiene, eating and drinking, using a cell phone, and reading written directions. Looking at the dashboard and in-car gauges was another example of cognitive overload. The subjects often glanced at the controls for longer than 15 seconds at a time resulting in lane departures and panic braking. The most frequent occurrence of cognitive overload resulted from the subjects concerning themselves with objects and events outside of the car that were not related to the driving task. To one degree or another, the subjects experienced difficulty effectively driving when processing the outside events. These occurrences also resulted in swerving, decreased (in one instance increased) speed, and erratic behavior.

The next observation was cognitive underload (Fig. 6). Cognitive underload is driving impairment due to under stimulation. People need a certain amount of stimulation to maintain attention to a task, and often the monotony of driving a familiar route or for long periods of time can cause underload. The observed drivers were visibly bored at times, and they found other activities such as drumming the steering wheel to the music or talking to themselves to pass the time.

Fatigue was another cognitive aspect in our study (Fig. 7). The subjects became tired and uncomfortable during the sessions. Since most of the sessions lasted an average of an hour, they often exhibited symptoms of fatigue. The majority of the signs of fatigue were observed after they drove in heavy traffic. The draw on their cognitive resources was greater at those times, and the subjects experiencing fatigue became fidgety and appeared uncomfortable.





**Fig. 5.** The subject focuses on choosing a CD



**Fig. 6.** The subject is overcome with boredom



**Fig. 7.** The subject becomes fatigued after driving for an extended period of time



**Fig. 8.** The subject engages in a lively conversation with her passenger

Distraction was the final and most prevalent observation (Fig. 8). The most common type of distraction was engaging in conversation with a passenger. The subjects had a tendency to gesture during their conversations thus removing their hands from the steering wheel. The conversations resulted in behavior similar to that of cognitive overload.

We did not observe a single subject whose driving behavior during their study session fell into all of the categories of the observational framework. However each subject exhibited some form of distraction.

## **5 Insights**

Based on our research and observations we developed a number of insights that are interpretations of what we learned that yield design opportunities. We were able to classify our insights into the following five dimensions: value propositions, recovering time, physical transitions, personalization, and appropriate technology interventions.

At least intuitively, we suggest that our methodological approach makes it possible for us to arrive at these insights which we claim are truly human and humanity-centered. In the following we elaborate on the connections between our research and observations and our insights.

### **5.1 Value Propositions**

If people are to appreciate and use public transportation, they need to be shown appealing forms of public transportation. Such forms can vary widely from country to country. In the US in particular, these forms must present a better value than current forms of public transportation, which are commonly perceived as being slow and antiquated. Public transportation has the potential to be safer than private vehicle use. Public transportation would have to be enjoyable, not just an alternative to the worst-case scenarios of private transportation. Technologies have been designed or are in development to aid the use of sustainable and public transportation, but the distances traveled in North America may reduce the use of more sustainable technologies such as the use of smaller vehicles. A multi-faceted approach that makes private transportation more sustainable and public transportation more palatable needs to address the environmental and social issues surrounding transportation choices. At least with respect to the social isolation of individuals in modern industrialized societies, a renewed look at motivating public transportation as a mechanism for social interactions holds great promise.

## **5.2 Recovering Time**

People attempt to recover small pieces of time virtually anywhere. Now these bits of time can be more productive by taking advantage of the invisibility of communication technologies. It is possible that mobile technologies have the potential to change the nature of social interaction and the demand for a mode of transportation: perhaps people who like to drive will give up private transportation if they can accomplish work *en route* by means of mobile technologies. Other strategies such as removing the need for a driver altogether or improving vehicle interiors to enable more efficient use of time while in the car could be employed.

## **5.3 Physical Transitions**

The transition between private and public space could be made transparent. This can be accomplished by creating environments already equipped with the items needed for effective use of time and designing the shared space to mimic familiar private spaces. One approach is to miniaturize necessary items or eliminate the need to carry them altogether. Another approach is to create ways of conveniently transporting personal items. Each of these approaches affects the transition in positive ways.

## **5.4 Personalization**

Allowing personalization and preserving preferences from one space to another creates a feeling of familiarity with surroundings. Environments can be created that mimic home and encourage self-expression and identity, thus opening the possibility of greater interaction. The use of networks can extend and enhance private services in public spaces. Maintaining private space advantages within the context of public spaces will encourage the use of public transportation.

## **5.5 Appropriate Use of Information Technologies**

There are opportunities to enhance the human condition by the integration or removal of information technologies during transit. Information technologies allow more effective use of time in transit and also make transit more reliable and comfortable. Information technologies allow the passengers to have a greater sense of identity and community, making transit less socially exclusive.

## 6 Concepts

We developed an inventory of concepts that built on our insights. Using a human-centered approach we addressed the reasons for resistance to public transportation, while paying special attention to environmental sustainability. We classified the concepts into a number of groups: sustainable private vehicles, small-scale public transportation, innovative uses of existing transit systems, and changing perceptions of transportation users. We analyzed each classification of concepts using the insights as criteria. In addition, we considered the risks and advantages of each classification of concepts.

### 6.1 Sustainable Private Vehicles

The first group of concepts focuses on environmentally sustainable private vehicles. Although there are many vehicles in development that are environmentally friendly, these concepts were designed to enable more productive use of time in transit. They remove the driving task for a portion of the journey. An Automated Highway System decreases the environmental impact of private vehicles by reducing the roadway infrastructure required and by operating vehicles more efficiently. The opportunity for the addition of information technologies may enhance the ability to reclaim the time lost in transit. These concepts maintain personal space allowing indirect interaction via information technologies.

**Smart Highway.** The Smart Highway is an automated highway that takes control of the car once it is off secondary roads and removes the driving task from the driver (Fig. 9).

**Car Interior as a Creative Space.** The Car Interior as a Creative Space allows people to share their created artifacts on the outside of the car. The interior of the car affords creativity by engaging in such activities as pottery making or painting (Fig. 10).

**Music Maker.** The interior of the car is made into a music-creating interface. People can make music in transit and then share it during or after the journey (Fig. 11).

**Commute-a-Degree.** The Commute-a-Degree also utilizes automated highway systems, and it gives people an opportunity to enrich their lives by allowing them to pursue education while traveling.

**Car Ferry.** People can load their cars onto a subway or train and socialize with other drivers, and then have use of their private cars once they are at their destination (Fig. 12).

**Modular Car.** The car's cabin is separate from the chassis. It can either be placed on a platform that transforms it into an individual car, or it can be placed on shared platforms to link many cabins together.

**Morphing Egg Capsule.** Drivers may operate their vehicle as a private entity or relinquish control of their vehicle to more safely and productively use their time. The capsules can link together to morph into a larger vessel to carry more people. This concept allows the drivers to maintain their personal space, personal items, and some degree of autonomy (Fig. 13).

**Relationship of Sustainable Private Vehicle Concepts to Insights.** These concepts owe to our insights in the following ways:

**Value Proposition:** The increased safety and fuel efficiency gained from removing the driving task may encourage people to use more sustainable forms of transportation. People would benefit from an automated system that affords self-expression, relaxation, and a creative environment.

**Reclaiming Time:** Automated Highway Systems encourage alternative use of time by freeing the driver from the driving task for the majority of the journey. The user is able to engage in non driving activities.

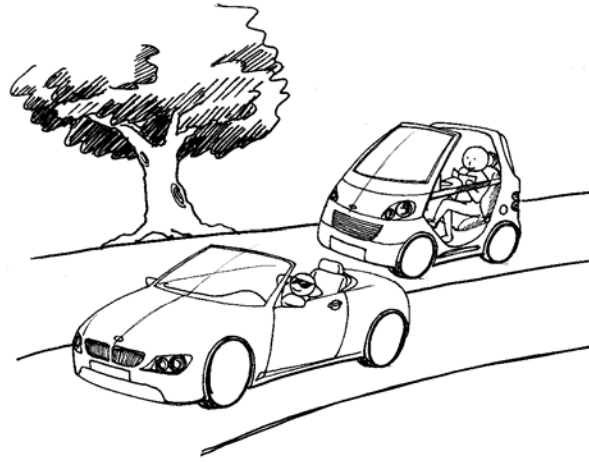
**Physical Transitions:** There may be feelings of control loss, but the transition can be transparent. People are able to maintain a private, familiar environment during the journey.

**Personalization:** There are possibilities for the use of interiors that facilitate alternative uses of time, and there are opportunities for personalization and self-expression. People are free to engage in conversation and communication without the danger of distraction, and since people maintain a personal space they have an opportunity to strengthen or create bonds with friends and family.

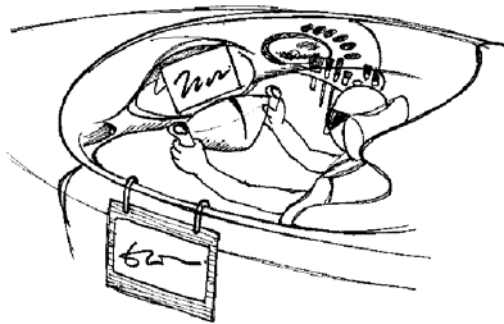
**Appropriate Technology Interventions:** Additional information technologies may enhance the experience and the use of time using wireless, networks, multimedia entertainment, telematics, and spaces for on board computing. There is an opportunity for permanent, personal technologies.

**Advantages:** Safety is increased by removing human error, and people maintain their private space by remaining in their vehicles. The technology to implement Automated Highway Systems already exist. These concepts may build a sense of community and identity through the sharing of creative artifacts.

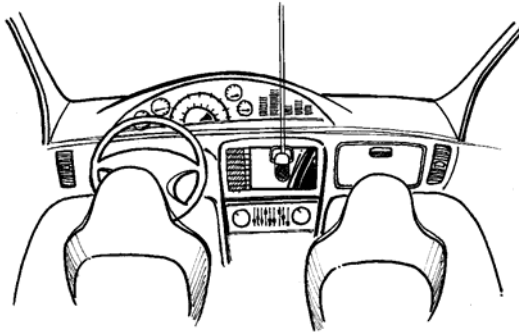
**Risks:** There is a risk of low public acceptance due to issues of autonomy and misunderstanding of the technology behind Automated Highway Systems. The implementation and interior modifications to the car may be costly.



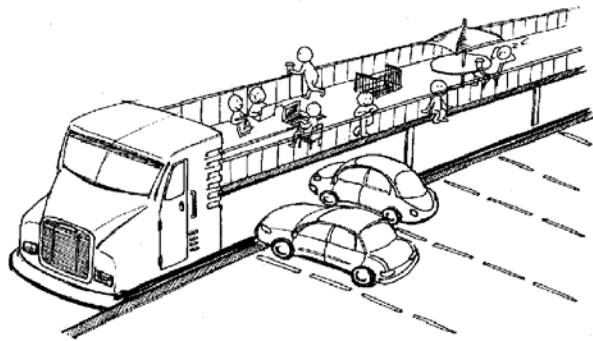
**Fig. 9.** Smart Highway



**Fig. 10.** Car Interior as a Creative Space

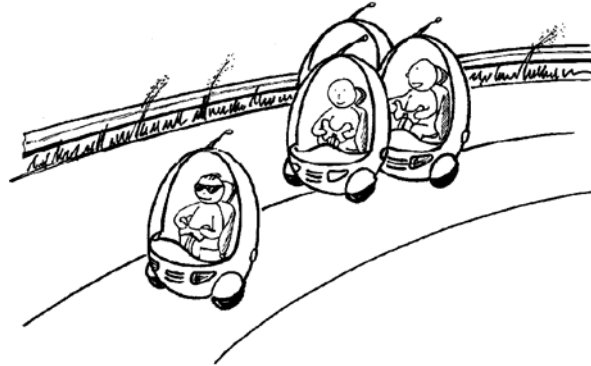


**Fig. 11.** Music Maker



**Fig. 12.** Car Ferry





**Fig. 13.** Morphing Egg Capsule

## 6.2 Small-scale Public Transportation

Small-scale public transportation serves as an alternative to wholly private transportation and mass transit systems. These concepts minimize the negative environmental impact of private vehicles while also lessening the common objections to public transportation. As opposed to large scale mass transit, these concepts utilize a smaller platform and retain an intimate space. Unlike single private cars, these concepts move more people and allow small group interaction.

**Spa-a-Go-Go.** The Spa-a-Go-Go is a mobile spa in which passengers are able to have a massage or manicure, practice yoga, and relax in transit (Fig. 14).

**Comfy Van.** Small groups of people can travel in the Comfy Van. It's interior is similar to the living room in someone's home, and it offers a comfortable and familiar environment that encourages social interaction (Fig 15).

**Interest Carpool.** People commute with others of like interests, hobbies, and activities. It is a meeting place for people who engage in similar activities, and a place where people can form new friendships.

**Relationship of Small-scale Public Transportation Concepts to Insights.** These concepts owe to our insights in the following ways:

**Value proposition:** People may use public transportation if the space is comfortable and time is allowed for healthy and more social activities. They may consider alternatives to driving alone if they have access to a semi-private vehicle that offers incentives such as facilities for doing work, surfing the net, relaxing, enjoying conversation, sightseeing, and connecting with others of like interests.

**Reclaiming time:** These concepts encourage alternative use of time by allowing passengers to engage in alternate activities and allow people to use the time in transit for relaxing, pleasurable activities.

**Physical transitions:** These concepts offer some of the benefits of private transportation. There is storage for personal items, and the space is intimate and comfortable.

**Personalization:** Self-expression is encouraged, and there are opportunities to form and strengthen relationships.

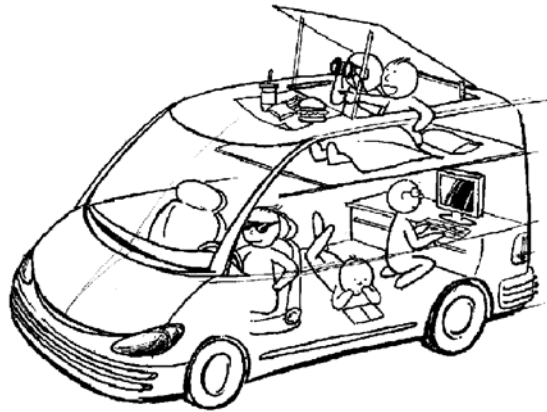
**Appropriate technology interventions:** Information technologies such as mobile communications, local networks, wireless, entertainment, and on board computing can enhance the use of time. There is the opportunity to incorporate telematics and integrated personal technologies

**Advantages:** The environments are relaxing, and they foster communication, identity, and social inclusion.

**Risks:** The cost of implementation may be prohibitive. There are inherent problems with shared spaces, misuse, health regulations, and cleanliness.



**Fig. 14.** Spa-a-Go-Go



**Fig. 15.** Comfy Van

### **6.3 Innovative Use of Existing Transit Systems**

Traditional forms of public transportation can be made palatable by adding character or offering distinctive choices, thus sustain self-expression. Reconfigurations of traditional forms of mass transportation modify the physical characteristics of subway and train car interiors in order to use the space for alternative activities. These modifications ease the physical transition from private to public spaces by creating familiar and intimate spaces that encourage productivity and social interaction. The following concepts are modifications of familiar forms of public transportation.

**Dining and Drinking Subway/Train.** Dining cars are familiar to most people. Dining and Drinking Subway/Train cars have facilities for dining, drinking, and socializing (Fig. 16).

**Theme Subway/Train.** The Theme Subway/Train offers cars with different themes such as: games, zoos, costumes, quiet cars, smoking cars, single people cars, or church cars. People can ride the car that appeals to them (Fig. 17).

**Dance Club Subway/Train.** The Dance Club Subway/Train is a fun and familiar environment in which people can dance and socialize (Fig. 18).

**Country Club Subway/Train.** The Country Club Subway/Train is similar to “landed” country clubs. People have to join to ride which fosters identity and appeals to smaller venues in which interaction may occur.

**Subway/Train as a Park.** People can enjoy a park in transit, complete with trees and grass. The relaxing environment encourages social activities and interaction (Fig. 19).

**Celebrity Subway/Train.** The Celebrity Subway/Train allows people ride on subways or trains with celebrities. This increases the appeal of public transportation while bringing people of like interests together for a shared experience.

**Small Subway/Train Booth.** The interior of a subway or train is divided into fixed private compartments. The space is sized for individuals or small groups of people (Fig. 20).

**Day Care Subway/Train.** Subway or train cars could have childcare services for the parents in transit.

**Company Skybox Subway/Train.** Employees and clients can ride and conduct business in an exclusive, company owned area of a train or subway. Corporate identity is increased, and people have an opportunity to form relationships in a familiar setting (Fig. 21).

**Shopping Mall in Transit.** People shop in mini-malls while they ride on a subway or train. They have an opportunity to meet new people and interact in a neutral setting.

**Glass Subway/Train.** The Glass Subway/Train is a glassed-in subway or train car used for sightseeing and provides unobstructed views of scenery and surroundings (Fig. 22).

**Movable Subway/Train Compartment.** The interior of a subway or train can be divided into passenger configurable compartments. Passengers can maintain their comfort zone and ride alone or travel with others as the density of the subway or train changes. Interaction may take place in the more intimate spaces.

**Relationship of Innovative Use of Existing Transit System Concepts to Insights.** These concepts owe to our insights in the following ways:

Value proposition: People may be inclined to use mass transit if it increases their productivity and offers opportunities for social interaction. People may also use public transportation if they feel they are able to maintain comfortable, intimate spaces.

Reclaiming time: People benefit from combining activities, allowing the time outside of the journey to be used in other ways. These concepts allow people to spend time reconnecting with others and engaging in activities for which they previously did not have

necting with others and engaging in activities for which they previously did not have time.

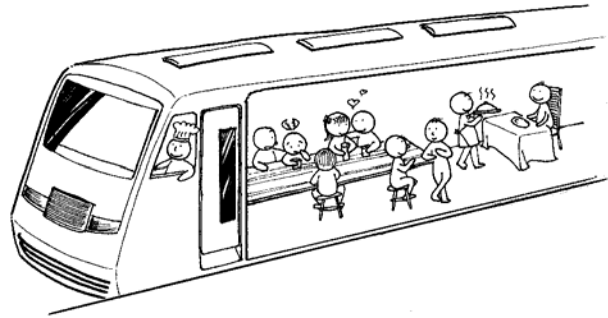
Physical transitions: People may look forward to their time using public transportation. The intimacy of the spaces make the transition almost transparent as necessary items have temporary and safe storage. Many conveniences of the private car can be maintained.

Personalization: These concepts increase social interaction and a sense of community. There are opportunities for personalization and self-expression. People will have shared experiences and have the opportunity to identify with others; finding common interests enables them build new friendships. People may try new activities and broaden their horizons.

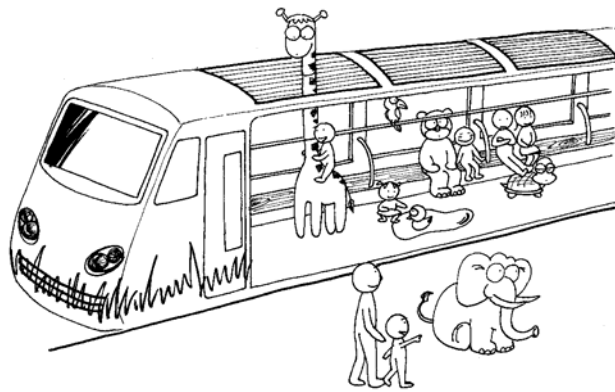
Appropriate technology interventions: Additional information technologies may enhance the use of time by implementing networks, wireless communication, multimedia entertainment, telematics, and on board computing. There is permanent individualized technology.

Advantages: These concepts bring people with similar interests together and foster creativity. People can identify with others, and increase social cohesion and a sense of community. The concepts allow people to personalize spaces according to their activities. Time may be productive, and there is the potential to strengthen relationships and feelings of community.

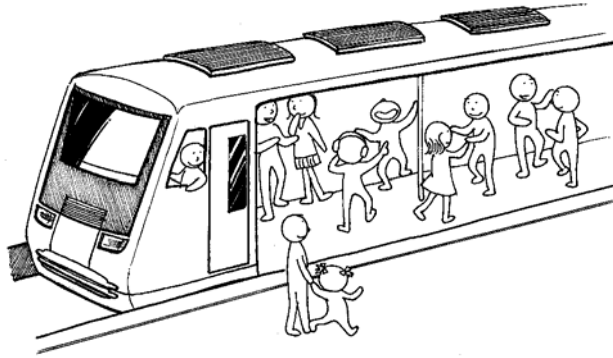
Risks: There are risks of liability, safety, and privacy as well as the misuse of facilities. Some of these concepts may blur the separation of home and work.



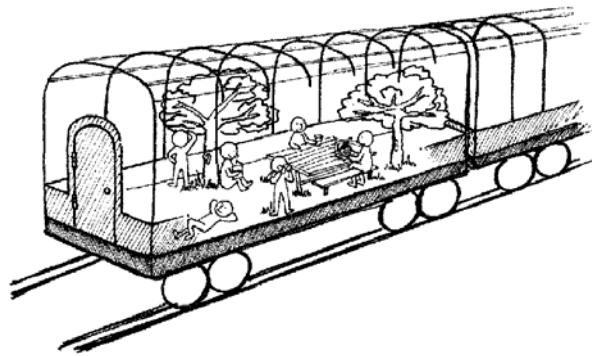
**Fig. 16.** Dining and Drinking Subway/Train



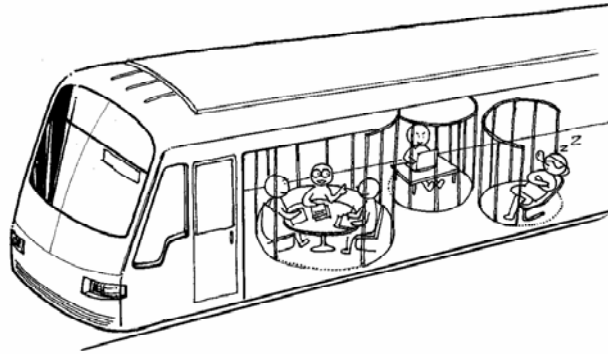
**Fig. 17.** Theme Subway/Train



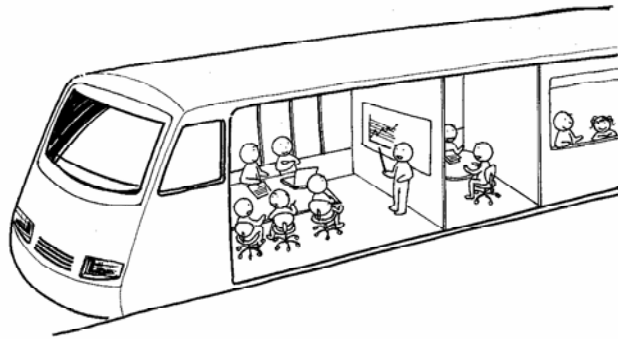
**Fig. 18.** Dance Club Subway/Train



**Fig. 19.** Subway/Train as a Park

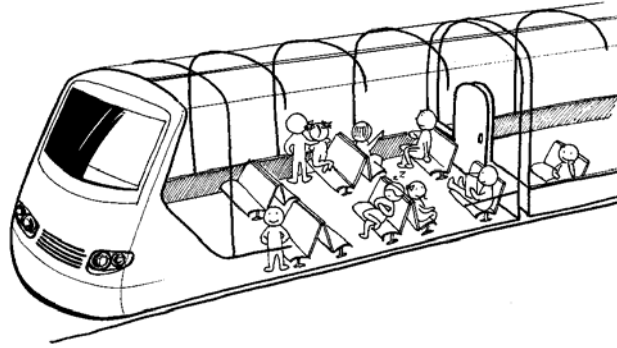


**Fig. 20.** Small Subway/Train Booth



**Fig. 21.** Company Skybox Subway/Train





**Fig. 22.** Glass Subway/Train

#### **6.4 Changing Perceptions**

These concepts address a variety of the reasons for resistance to public transportation including identity, self-expression, social responsibility, and the maintenance of personal effects. Encouraging people to reconsider their personal motivations for mode choice is necessary for the successful use of alternative and sustainable forms of transportation. Altering public opinion generates several benefits. It is positive for society as a whole to change the way they think about the environment, their stewardship of the earth, and community. Another benefit is for the individual to have diverse opportunities to enrich their life and the lives of others by learning to interact, form new relationships, and care for other people.

**Subway/Train Station as Art Destination.** Intermediate destinations are designed to act like museums with exhibits, installations, and artwork. They can represent the history or identity of the area in which the station or stop is located. People are able to familiarize themselves with the community and its residents. They will have an opportunity for open communication with others using the museums as a catalyst (Fig. 23).

**Hierarchy of Service.** As with the airline industry, different levels of service are applied to other forms of public transportation. They are similar to classes with different ameni-

ties at each level. People experience a sense of community through this benign level of exclusion (Fig. 24).

**Hip Public Transportation.** The public image of mass transit is changed through marketing campaigns that target a specific type of user. Making it cooler to ride than drive creates an environment of inclusion and unites groups of people.

**Baggage Handler.** People do not have the inconvenience of carrying personal items while in transit. They are able to concentrate on their external surroundings instead of focusing on personal issues.

**Environment for Sale.** People take ownership of their environment. It is similar to adopting a panda or naming a star. It fosters identity and creates a feeling of being part of a greater whole.

**Group Field Trip.** Groups of people travel to a vacation spot or go on a sightseeing tour. Leisure driving is curbed. The shared experience of the journey and events during the trip strengthens personal bonds and creates new friendships.

**Subway/Train as Representation.** The outside of subway or train cars is modified or decorated to attract different types of people. People would choose based on personal preference, thus allowing people with similar interests or beliefs to come together.

**Subway/Train Personalization.** People may personalize the space inside of a subway or train car. A dry erase or transitional medium will enable passengers to temporarily personalize their immediate space. This encourages self-expression and communication other passengers. People can share stories, current events, and personal history.

**Relationship of Changing Perception Concepts to Insights.** These concepts owe to our insights in the following ways:

Value proposition: People often do not use public transportation due to their attitudes or misconceptions. If the services of public transportation are diverse enough to appeal to many people, the fears and negative attitudes of public transportation may be dispelled. People's expression of identity will no longer be limited to the type of car they drive. People may gain a greater respect for the environment if they feel personally responsible for it. People may be persuaded to stop using their private car if public transportation seemed less dehumanizing and more personal.

Reclaiming time: Leisure trips become more convenient and less expensive. Passengers may reclaim the time and convenience lost from keeping up with cumbersome personal items. The time spent in transit can be enjoyable, and people have the added value of using their time in transit more effectively.

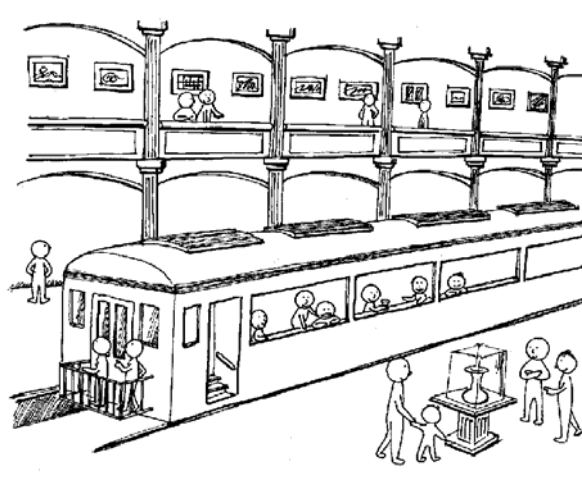
**Physical transitions:** The increased familiarity derived from using public transportation for leisure will ease the transition from private to public spaces.

**Personalization:** These concepts encourage self-expression and education, and they allow for social interaction and shared experiences. Because they have fewer physical distractions, people are free to engage in conversation. Since people have control over the factors affecting environmental degradation, they may feel empowered and have a greater sense of community.

**Appropriate technology interventions:** There are opportunities for multimedia installations, wireless networks, global positioning systems, on board computing, data management, and enhanced communication. As public use and interest in public transportation increases, more resources could be allocated for information technologies.

**Advantages:** These concepts promote education, tourism, and sense of community. People will be able to familiarize themselves with public transportation. Several of these concepts have the potential to increase the public's attitude towards the stewardship of the earth. There are increased feelings of community.

**Risks:** It may be difficult to keep artifacts secure from vandalism and theft, and there may be a high cost of upkeep. Several of these concepts may promote inappropriate exclusion.



**Fig. 23.** Subway/Train Station as Art Destination

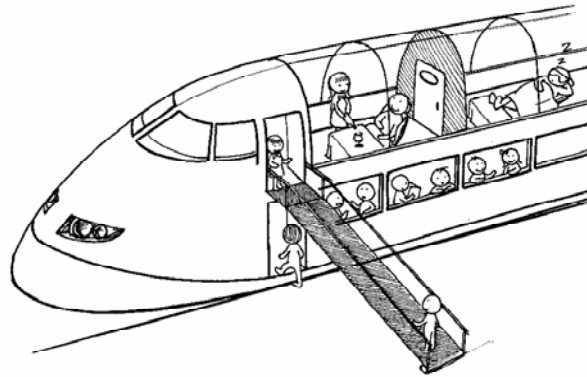


Fig. 24. Hierarchy of Service

## 7 Concept Systems

Concept systems are groupings of concepts that create a coherent improvement for a particular context. We devised a number of concept systems defined by our estimations of the needs and desires of particular prototypical kinds of people in particular situations. The situations we envisioned were short trips, medium-length trips, long trips, leisure trips, and commuting trips. Note that these situations are not mutually exclusive. We also envisioned several “personae”, which we named somewhat whimsically “Snappy Suit”, “Techies Delight”, “Busy Bee”, “The Fun-Fun”, “Parent’s Dream”, and “The Golden Years”. We developed scenarios for each persona, and we tested them informally by interviewing 28 people and asking them to select among the scenarios to indicate the most appealing concept system. We learned that people were able to identify with particular personae in the context of these concept systems.

Our concept systems and personae served as a rational design process that yielded systems of travel that may appeal to specific kinds of individuals and yet create coherent improvement for everyone. Individual preference for different concept systems still contribute to an overall improvement in sustainability despite the differences in alterations of behaviors. Our creation of individual-directed systems of concepts relies on generalized

notions of individuals. While this design inventory is better than creating a one-size-fits-all design, there is much to be gained from even greater individualization. The following concept systems are suggestions of possible ways that our concepts may be motivated; ultimately particular individuals need to mix and match concepts to create their own coherent way of being. It is therefore important not to dictate from the top but instead make such concepts available as the material of individual construction.

## **7.1 Concept System Personae**

### **Snappy Suit.**

Short Trip: Small Subway/Train Booths

Medium-Length Trip: Dining and Drinking Subway/Train

Long Trip: Car Ferry

Leisure Trip: Glass Subway/Train

Commuting Trip: Company Skybox Subway/Train

### **Techie's Delight.**

Short Trip – Comfy Van

Medium-Length Trip: Modular Vehicle

Long Trip: Smart Highway

Leisure Trip: Subway/Train Station as Art Destination

Commuting Trip: Morphing Egg Capsule

### **Busy Bee.**

Short Trip: Hip Public Transportation

Medium-Length Trip: Movable Subway/Train Compartment

Long Trip: Subway/train Personalization

Leisure Trip: Dance Club Subway/Train

Commuting Trip: Commute-a-Degree

### **The Fun-Fun.**

Short Trip: Music Maker

Medium-Length Trip: Car Interior as a Creative Space

Long Trip: Theme Subway/Train

Leisure Trip: Subway/train as a Park

Commuting Trip: Spa-a-Go-Go

**Parent's Dream.**

Short Trip: Baggage Handler  
Medium-Length Trip: Shopping Mall in Transit  
Long Trip: Celebrity Subway/Train  
Leisure Trip: Group Field Trip  
Commuting Trip: Day Care Subway/Train

**The Golden Years.**

Short Trip: Hierarchy of Service  
Medium-Length Trip: Subway/Train as Representation  
Long Trip: Environment for Sale  
Leisure Trip: Interest Carpool  
Commuting Trip: Country Club Subway/Train

**7.2 Concept System Summary**

Our use of personae and scenario techniques was drawn from human-computer interaction literature, such as Alan Cooper's *The Inmates Are Running the Asylum* [21] and John Carroll's *Making Use* [22]. A designerly approach demands that we understand such techniques as a starting point for establishing and understanding the context and suitability of the concept systems in our inventory. The utility of such techniques was augmented as we developed even more detailed concepts and concept systems.

We suggest that concept systems such as ours must create widespread awareness about the benefits of sustainable use of time and travel. The concept systems are not intended as dictates. The actual appeal of these concept systems to real individuals in the real world would determine the systems' effectiveness. Ultimately, concepts must be judged by observation of user's interaction with actual prototypes. The importance of our contributions lies in the number and diversity of our inventory of concepts. A next step would be to consider which of the concepts are most promising and merit further prototyping efforts.

**8 Conclusion**

The design process we have outlined can be used to develop and implement forms of transportation that are valued by the public. The goal is to enable positive experiences and decrease private vehicle use. The end result will be decreased environmental degradation, decreased identity loss, and increased feelings of community and inclusion. Since the combination of factors motivating transportation mode choice varies between individuals, a single solution is not appropriate to encourage the use of alternative and sustainable forms of transportation. Designing one solution for one particular type of person is not

reasonable. Instead, a variety of choices should be available, each addressing unique combinations of factors. It is necessary to reach as many people as possible to decrease the impact of private vehicle use.

In summary, we used a framework to construct a design for time and travel. We have summarized what we learned in creating a design according to the framework. We reflected on the benefits and shortcomings of the framework and techniques such as concept systems and scenarios in terms of balance between design for the individual and the need for collective benefit. Finally and throughout the essay, we have reflected on the ways in which our inventory of concepts could help to promote social interaction and sustainable behaviors.

## Acknowledgements

[Withheld for review]

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