

Wearables and Beacons: Using Contextually-Aware Technology to Improve Navigation of Public Transportation Spaces for Customers with Visual, Language, and Aging Challenges.

Summary of Concept and Application for Practice

This IDEA proposal is to investigate the efficacy of contextually-aware technologies in improving the experience of customers with visual acuity, aging, and language challenges within public transportation spaces. The project, designed based on guidance from the APTA Emerging and Innovative Technology Subcommittee, will field test the combination of wearables and beacons to enhance the tools for customers to navigate through busy station environments. The research methodology, based on a combination of field testing, focus groups, in-depth observation and interviews, and open surveys, was chosen to optimize the utility of the funded program by other agencies and by the sponsor agency New York Metropolitan Transportation Authority (MTA).

To optimize the use of funds, the proposed research builds on previous innovation projects funded by the MTA and uses devices that have already been fielded in MTA stations and an information platform that already has messages and integrations with MTA systems. The team will use open source software development kits (SDKs) and will leverage existing technologies combined in new ways to minimize the development costs ahead of the field testing. The team's approach to the research is also innovative, incorporating other new wearables such as Google Glass into the research methodology.

The potential to positively impact both agencies and customers with this cost-effective innovative technology is high, with possible positive affects for ridership and safety as well as customer satisfaction.

Because the innovative technology project is based on both commercially available tools and on open source coding environments, the team believes the transfer to practice costs can be minimized as the tools will not be strictly proprietary in nature.

Introduction

Providing accessible and equitable service is a prime directive for public transportation agencies. Agencies must balance the needs of many populations to provide cost effective, safe, and efficient transportation for the largest number of customers while acknowledging that segments of their market have special challenges or needs. Of particular concern for transit agencies: the aging seniors, those with visual acuity and dexterity challenges, and communities lacking English as a primary or a proficient language present unique requirements that at times seem in contention with the need to move a large population quickly through their transportation system.

For agencies, providing specialized services such as paratransit are both essential and a significant operating cost driver. To the extent that agencies can create tools and spaces that encourage a larger percentage of their customer base to independently access bus and rail services rather than default to paratransit, the more freedom and flexibility the customer has to move through the system and the more cost effective the agency's services will be.

The American Public Transportation Association (APTA) Subcommittee on Emerging and Innovative Technology began an assessment in 2013 on emerging technologies that could provide new tools for those with visual acuity, dexterity, or language problems as they access public transportation environments. By surveying agencies and business members and working with a team of over 30 participants representing a cross section of the industry, the subcommittee determined to focus on a subset of technologies that included wearables, prescriptive analytics, location intelligence, virtual assistance, internet of things, and low energy Bluetooth beacons and devices, as defined by the Gartner 2013 Hype Cycle for emerging technology (please see Figure 1).

Based on the subcommittee's guidance, our team devised an IDEA project that focuses on practical research using some of these identified technologies. The goal of the IDEA project is to assess the viability of combining wearable technologies with beacons linked to existing devices to improve the experience specifically for those with visual acuity issues, dexterity issues, and language challenges. By combining wearable technology most likely in a wrist based format with beacons at selected locations throughout a public transportation space, and then assessing how those technologies affect the user experience, the team intends to prove whether leveraging wearables, analytics, and virtual assistance can improve the navigability of busy, crowded station environments for the selected test population.

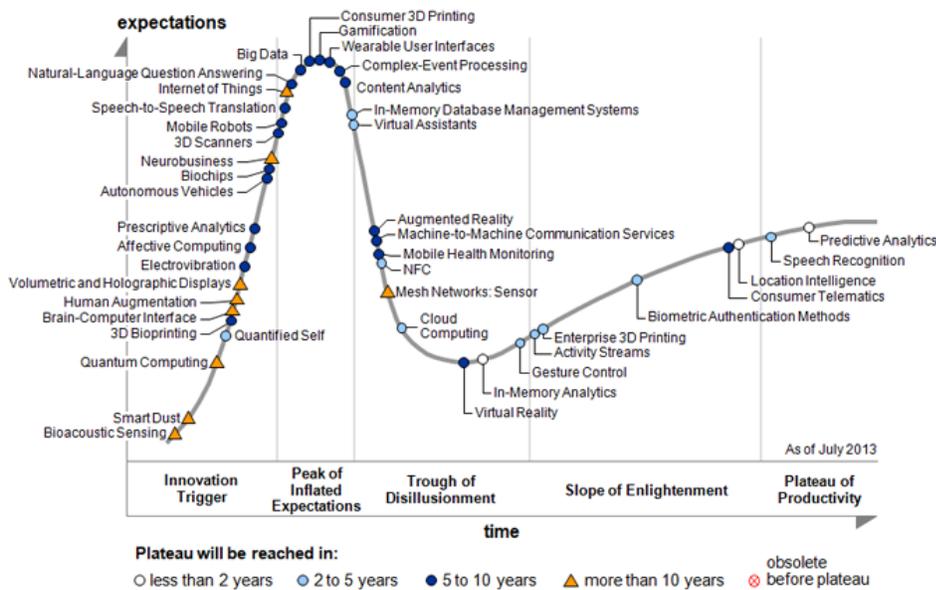


Figure 1. Gartner, 2013. Hype Cycle for Emerging Technologies

Our team – comprised of companies that specialize in research, design, innovation, systems implementation, and the United State’s largest public transportation agency – bring focus and experience in optimizing how technology and systems positively affect consumer behavior and lead to improved experiences that drive higher ridership, greater customer satisfaction, and safer and more efficient public transportation.

Literature Review

The APTA Emerging and Innovative Technology (EIT) Subcommittee conducted a literature review and a survey of industry association members to determine the previous research on the combination of wearables and beacons in public transportation spaces, and whether any existing research targeted those with visual acuity, dexterity, or language issues. The results provided some insight into aspects of the innovative solution – for example beacons have been tested in public spaces – but none combined these technologies into one overall solution for the industry.

The literature review did uncover similar ideas – not targeted toward the subject customers – for complementary industries like retail, airports, and medical devices. These studies verify the promise of personalization technologies and wearables for a variety of use cases, but none specifically addressed the research proposed in this IDEA Project.

The team reviewed the <http://trisonline.bts.gov> search site for all projects related to Bluetooth technologies, wearables, and assistive technologies. Previous projects on Bluetooth focused on transit time improvements and maintenance efficiencies using Bluetooth technologies, and on Intelligent Transportation Systems (ITS). Relevant assistive innovation projects centered around variable message signage and ITS tools that served the broad community. No projects combined the elements presented in this IDEA project proposal.

The literature review did support assumptions within the project, including:

- Research by several entities focused on medical use cases confirmed that wearable systems for monitoring mobility-related activities in older people showed promise, but required more analysis to

prove efficacy. (**Clinical Rehabilitation**, 2011)

- A survey of 800 Boomers and 10 deep dive focus groups on seniors revealed a statistically significant number of seniors adopting emerging mobile technologies and wearable technologies. (**Sachs Insights**, 2013)
- Research has previously been focused more on job efficiency in airports rather than navigation of airport spaces by those with visual acuity, dexterity, or language challenges.
- Research on beacon technology in retail spaces shows promise for positively affecting consumer behavior.
- Research on “aging in place” in the United States shows that the trend toward growth in the senior population will put strain on the resources of public transportation agencies.

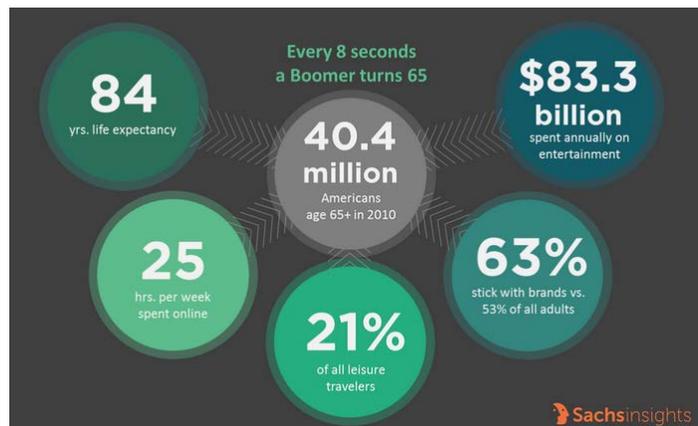


Figure 2. US Aging Population Statistics – 2010, Sachs Insights

Investigative Approach

The proposed project will provide two types of research for the installed technology: qualitative research groups or independent interviews with in depth analysis, and an open volunteer participation trial with survey results.

The team will select wearable technology – most likely in a wrist-based platform – and using open source software development kits create user interfaces designed for those with visual acuity and dexterity issues to solicit information from the wearable. To simplify the approach, the target audience will use a wearable connected to a smartphone device during the research project.

The Control Group will install beacons in one station on the New York MTA property for the purposes of conducting the research, and the wearable platform – most likely a wrist format - will engage with the beacons based on proximity.

Sachs Insights will select a group of individuals representing a cross section of ages, visual acuity challenges, dexterity issues, and language challenges, and guide a test of the technology group through either one-on-one or in a group setting (depending on access needs). In depth analysis of how the participants use the technology, including the use of Google Glasses to record their movements and interactions with the selected wearable technology and kiosk, will inform the success or failure of the tested technology using objective and subjective metrics.

The New York MTA will guide the choice of the installation location, provide basic facility requirements such as power and communications where necessary, and will oversee the definition of the success criteria for the project. MTA will also provide access to the installed kiosks within the station for the purpose of allowing a beacon to be installed, and feedback on the appropriate design of the wearable interfaces for the selected research participants.

After the intensive qualitative assessment, a small campaign to engage public users in an open trial with a survey of their use of the technology will provide a broader analysis of its usability. Surveys of these volunteer users will also inform the research project results.

Building on Existing Technology

OnTheGo is an integrated wayfinding, realtime information platform for busy transportation spaces. Customers can touch OnTheGo's bright, high-resolution screen to discover the best way to travel from the current station to any other, find nearby landmarks, see service disruptions that might affect their trip, or engage with sponsored content and digital experiences.

In addition to being a friendly guide for customers in a hurry, OnTheGo is an in station platform for transportation properties to deploy technology to understand how

customers use the system, improve operations and even innovative new safety features.

The MTA invested in this technology through an innovation project with the Control Group, and placed test kiosks into busy station environments to assess their efficacy. After nearly a year of public testing, MTA committed to installing units in additional stations for public customer usage.



Figure 3 MTA OnTheGo Kiosks Provided by Control Group

This project proposal builds off of the original innovation project to leverage both the development platform and the production kiosks. Because the kiosks today target the largest MTA customer segment – those without visual acuity, dexterity, or language challenges – the intent of the project is to provide a contextually-aware, location-aware wearable device that seamlessly communicates with beacons placed at strategic locations throughout a public station space and embedded in the OnTheGo kiosks. The intent is to provide personalized and responsive information delivered directly to the wearable device to assist the customer navigate successfully.

Research Methodology

Understanding the personal experience of the proposed wearable and beacon technology is imperative to exploring potential use and uptake. As part of the research approach, Sachs Insights would incorporate the use of Google Glass - a wearable hands-free video recording device- to capture footage of participants' first-person experiences in the moment. Glass offers several benefits over more traditional video recording devices (such as mobile phones and camcorders) including:

- **A Comfortable, Light-weight and Wireless form factor that is** flexible but also sturdy. Google Glass can be worn in three different ways: without frames, with connected frames, or over existing prescription glasses. Glass is additionally wire-free which allows for natural and unrestricted movement.

- **Hands-free and autonomous video capture** means that participants do not need to be accompanied by a researcher for duration of the experience and that the device does not restrict the use of hands or movement for participants. In this way, researchers are better able to explore and understand natural behaviors in the moment and get a clear read on how people are using tools and information in the transportation environment. When needed, Google Glass can be controlled remotely by a researcher, further removing any requirements for participant interaction with Glass itself.
- **Rich, contextual video output:** The video footage captured using Glass shows a line-of-sight perspective that is specific to the wearer. While wearing Google Glass, users are encouraged to “think aloud” while navigating to provide additional context and thoughts in the moment. Alongside conversations with participants, researchers analyze the footage along with participants to pull relevant examples that bring the experience of using new tools and technology to navigate transit environments to life.



Figure 4. Examples of Focus Group Experience through Google Glass

Workplan

The proposed workplan breaks the project into four stages: 1. Development, 2. Deployment, 3. Usability Research and Assessment, 4. Documentation of Results.

1. Development

The development phase of the project will identify the development framework, targeted wearable device, and requirements and functionality for the wearable based on the use cases for aging, visual acuity, and language. This stage of the project will create the basic tools and devices that will be deployed in the field.

At the end of this phase, there will be an assessment of the technology and a determination by the APTA EIT committee workgroup of go/no go for field installation. The final decision on go/no-go will be made by MTA.

2. Deployment

The deployment phase of the project will install the prototype technology with a MTA station, including the beacons and software updates to the kiosks.

3. Usability Research and Assessment

The usability research and assessment phase will engage focus groups of users representing the different demographic and use case scenarios in live experiential testing and in-depth analysis and feedback. The research will include video of how the focus group users engage with the innovative technology and how it changes their experience in the station. Through in-depth observation, analysis, and interviews, and data mining and modeling of the movements, the team will determine the efficacy of the proposed innovative technology.

This phase will also include opening up the tools to a small public volunteer group who can engage with the tools without oversight and will participate in surveys after their tests to contribute additional information and inform the research results.

4. Documentation of Results

The final phase will document the results of the research project, including potential plans for future development and commercialization of the technology. The results will be presented to at least two APTA conferences at the end of the project in addition to all TRB requirements.

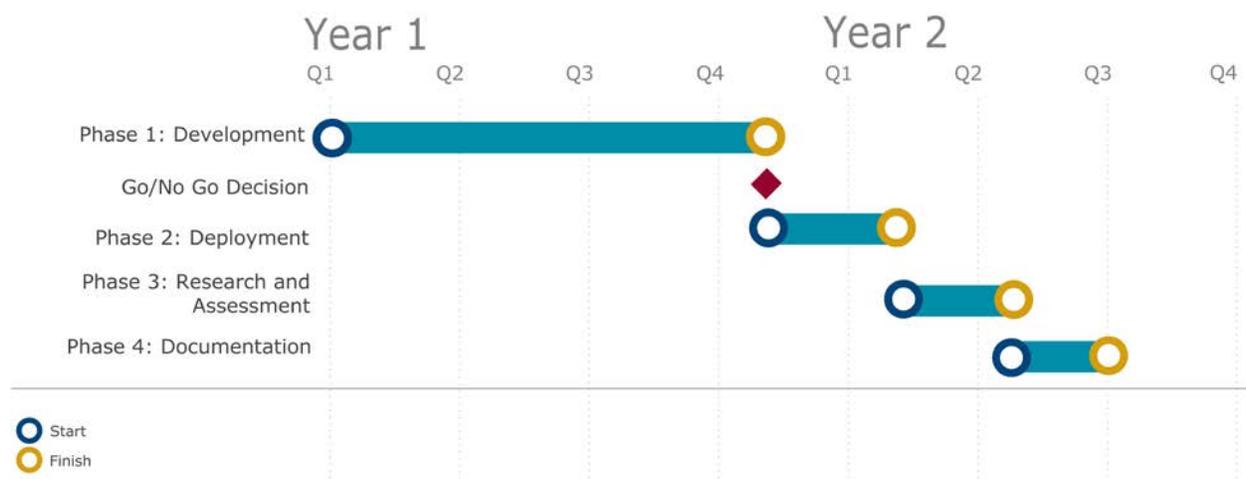


Figure 5. Project Workplan Schedule

Key Personnel and Facilities

This IDEA project proposal brings together a team with extensive experience in technology, user experience, and public transportation. The team has years of experience in development, research, usability analysis, focus group assessment, and even in the emerging technology wearables, prescriptive analytics, and virtual assistant spaces. Partnered with MTA, an agency that serves more than 8 million customers a day, the research project is positioned to provide significant value to the industry. High level resumes for each of the project research participants can be found in Appendix A of this document.

The team is complemented by the expertise of the APTA EIT committee, whose membership in the workgroup on Senior/Disabled Assistive Technologies is listed in Appendix B.

The research team and the Committee Workgroup Members have unparalleled experience in the public transportation industry and in both conducting research and implementing the results of research into industry practice. Additionally, the workgroup members include several participants who either operate Access Services, liaise with the senior/disabled community, or are engaged in advocacy activities for the senior/disabled community.

Research Facilities

The IDEA project team possesses significant resources to accomplish the research, including the MTA's stations and kiosks, the Control Group's innovation labs, and Sachs Insights customer research lab. The team brings a variety of research tools, including the capability to video user experiences either in the lab setting or onsite, and the use of Google Glass as a tool for understanding how the users move through the space from the first person perspective.

The existing in station kiosks also house video devices capable of capturing additional video for analysis.

The team will perform focus group analysis both within a lab setting and within the live station setting to provide detailed analysis of the viability and usability of the technology.

Cost Sharing, In-House Contributions, and Joint Ventures

The IDEA project includes significant in-kind project contributions from all sponsors of the project. The Sachs Insights team is involved in complementary research related to

aging, senior use of mobile technologies, and medical devices, which will contribute to the research project. The Control Group will bring complementary in-kind hours from projects related to the existing kiosk development platform and projects for retail customers that will inform the use of beacons in the public spaces. New York MTA will provide facilities and access to spaces and internal resources as in-kind contributions to the project. And Cubic Transportations Systems is providing in-kind project resources for project sponsorship, liaison to the APTA EIT Subcommittee, hosting meetings, developing project documentation, and technology and development assistance on the program. Finally, the APTA EIT committee will provide peer review of the project at all stages of its development and analysis.

Value of the IDEA Project Proposal for the Industry

The project team believes that this IDEA Project Proposal represents tremendous potential value to the public transportation industry, and can positively impact ridership, security, and safety for agencies.

High Priority Focus Area: Increasing Transit Ridership

The intent of the project is to affect ridership in two ways: drive a higher percentage of public transportation customers who currently depend on high-cost paratransit or demand services to use fixed route bus and rail services, and provide a means to reduce barriers for customers with aging, visual acuity, or language issues for using transit services. For the market segment targeted in this study, comfort and confidence in their ability to successfully navigate environments leads to a higher adoption of the standardized service and a greater level of independence.

High Priority Focus Area: Safety and Security

The intent of the project is to affect safety by providing assistive technology that helps those with visual acuity, aging, and language challenges to successfully navigate station spaces. Often navigation issues can lead to safety and security problems in public spaces, from people entering hazardous spaces inappropriately, confusion in navigation interrupting the flow of large crowds in public spaces, to accidental access of secured spaces.

Sustainability

The MTA has a strong commitment to sustainability within the organization and has placed a significant emphasis on achieving sustainability goals. While the sustainability focus within the public transportation industry has been on environmental goals – such

as emissions reductions, energy independence, and transit-oriented development – this project contributes to the social pillar of the sustainability plan.

MTA has a corporate mission to provide customer choice while equitably serving all and places tremendous focus on sustainability as an imperative for the organization.

By extending technology and services to social strata that traditionally have special needs and requirements not met by traditional approaches to public transportation wayfinding and information distribution, the agency and the industry will benefit from improvements in efficiency and in customer engagement.

Commercialization of the Completed Product

The team intends for two approaches to commercialization of the product. The first is to build upon the existing tools that have been deployed for MTA to offer the technology as additional modules and options for agencies to choose if acquiring the overall kiosk platform for their operations. The second approach to commercialization of the product is to publish results and code in open source platforms for easy adoption by agencies and other private entities. Because the innovation depends on both commercial-off-the-shelf tools and open development environments, the team believes the costs to adopt the technology will be more in the configuration of the information and the user interface and less on the acquisition cost of devices.

The team also believes that because the cost of wearable technology continues to decrease, that public transportation customers may have a higher adoption of the technology once made commercially available.

Conclusion

Our team is pleased to have the opportunity to present an IDEA project to TRB for funding an innovative technology concept that is both supported by MTA and by the APTA Emerging and Innovative Technology Subcommittee. This project proposal provides a cost-effective approach to assessing the viability and usability of a particular set of use cases for wearables and beacons in the public transportation space. The research methodology present provides a practical and usable analysis for the industry in answering the question of whether emerging wearable technology can improve the experience for public transportation customers with aging, visual acuity, and language issues.

Appendix A: *Research Team Experience*

Jeff Maki, Product Development Manager and Strategist, Control Group – Principal Researcher

Jeff helps public and private organizations deliver better services to customers. He is especially interested in cross-sector partnerships, capacity building and design-minded thinking. Past clients include MTA/New York City Transit, NASA's Ames Research Center, The Transportation Research Board, The White House Office of Science and Technology Policy, The Commonwealth of Pennsylvania, The City of Pittsburgh and others.

Before joining Control Group, Jeff was a Director at the non-profit OpenPlans where he led a team of designers and developers consulting on transformative technology for the public sector. Prior to that, Jeff worked as a Solutions Architect at Schematic, part of the WPP Group, and was the co-founder of a design and technology startup focused on spatial data infrastructure for community-driven neighborhood development. He was also a research fellow in the Art and Design departments at Carnegie Mellon University.

Experience

Product Development Manager, Control Group, April 2013 - Present

Business development, strategy, and senior project leadership for teams of designers and technologists consulting with the public and private sectors. Clients include numerous public agencies, city and state governments, educational institutions, and Fortune 50 corporations.

Director, OpenPlans, July 2010 - April 2013

Senior product and project leadership for a group of designers and developers consulting on transformative technology for the public sector. Clients include The New York Metropolitan Transportation Authority, The White House Office of Science and Technology Policy, The Transportation Research Board, The World Bank, Cambridge Systematics, Portland TriMet and others.

Solutions Architect, Schematic, March 2008 - May 2010

Consultant, University of Pittsburgh, July 2006 - November 2007

Research and development of a web-based collaborative tool to build and foster a community of practice among geographically-distributed informal educators. An academic research project funded by the National Science Foundation.

Co-Founder, DeepLocal, July 2006 - August 2007

Technical leadership at a University spin-off focused on building a collaborative, wiki-like geographic information system (GIS) to make sense of complex spatial datasets and loosely-structured, "hyperlocal" information.

Research Fellow, Carnegie Mellon University, March 2004 - June 2007

Research and development of new media/art projects including an educational game that used the city as a gameboard, a high-resolution imaging technology for NASA Ames.

Education

Carnegie Mellon University - H.J. Heinz III School of Public Policy and Management
MISM, Information Systems Management

Carnegie Mellon University, BS, Information Systems

Adina Daar, Research Consultant, Sachs Insights – Project Researcher

Adina Daar is a Research Consultant at Sachs Insights, where she has worked on projects informing digital ticketing, mobile application development, UX design, and information products for public transportation agencies. Prior to her time at Sachs Insights, Adina conducted extensive research for Transport for London (TFL) across a wide range of transit modes (Tube, Bus, Driving, Walking), which included a focus to understand key issues and opportunities to improve transport tools and information for aging passengers and passengers with accessibility difficulties.

Adina specializes in ethnographic and in-situ research methodologies, including approaches utilizing Google Glass as a research tool to better capture customer experiences from a first-person perspective. Her work using Google Glass has been featured as part of the upcoming 2014 Market Research in the Mobile World Conference in Chicago.

Experience

Research Consultant, Sachs Insights, June 2013 – present

Researcher combining traditional qualitative methodologies with the latest tools and technology (e.g touch screen prototyping, and Google Glass) to support clients initiatives to develop products and services for mobile, digital, and static channels, as well as informing brand communications and long-term strategy with the consumer voice at the heart.

Research Manager, FACE, May 2012 – May 2013

Research through a combined approach of qualitative, social media data, and co-creation methodologies. Oversaw projects from beginning to end, with a focus on client facing communication and planning, through to objective-led workshops and reporting of several multi-phase and multi-methodology (online and face-to-face) projects.

Senior Research Executive, 2CV, September 2009 – May 2012

Research for clients including Transport for London, Nokia, and PZ Cussons. International research within UK, China, India, UAE, and USA.

Education

University of North Florida, B.A, Sociology, Education

Neysa Pranger, Director Strategy Consulting, Control Group – Researcher

Ms. Pranger is a management consultant specializing in commercial and public sector strategy, working to create citizen-centric models of service delivery, streamline operations and maintain public services in the wake of historic declines in state and local revenues. In her previous role with IBM she specialized in assessing transportation network maturity for state and local clients..

Prior to consulting, Ms. Pranger served as Director of Public Affairs for Regional Plan Association, the nation's oldest independent planning firm. She specialized in needs assessments, benchmarking, stakeholder engagement, mapping techniques, revenue options analysis and public and decision-maker outreach. Ms. Pranger has expertise on capital investments for public transportation including high-speed rail, airport improvements, open space projects, seaport development, municipal and regional sustainability initiatives, zoning proposals and neighborhood redevelopment efforts.

Prior to entering urban planning, Ms. Pranger worked for the Straphangers Campaign, New York City's leading independent transportation research and advocacy group.

Ms. Pranger serves on a board of directors for a non-profit transportation organization, has received several awards in recognition of her professional work and has written extensive commentary on the state of transportation investment.

Experience

Director Strategy Consulting, Control Group, 2013-present

Managing Consultant, IBM Global Services, August 2011 – July 2013

Director of Public Affairs, Regional Plan Association, August 2007 – July 2011

Campaign Coordinator, Straphangers Campaign, September 1999 – July 2007

Managed campaign activities for New York City's leading transit advocacy organization, including city-wide rider advocacy campaigns, media outreach efforts, coalition building and campaign research.

Education

Calvin College, BS in Biology

New York University, Leonard N. Stern School of Business, MBA in Corporate Finance and Strategy

Ernest Tollerson, Director, New York Metropolitan Transportation Authority – Project Sponsor

Experience

Director, Environmental Sustainability & Compliance, The Metropolitan Transportation Authority, September 2010 – Present

Trustee, The Hudson River Foundation, 2008 – Present

Trustee, New-York Historical Society, 2002 – Present

Trustee, Nathan Cummings Foundation, 2003 – April 2013

SVP, Policy and Research, The Partnership for New York City, 2001 – 2007

National Correspondent; Editorial Board member, The New York Times, 1995 – 1999

Education

Columbia University, MS of Journalism
Princeton University, AB, Cultural Anthropology

Scott Anderson, Partner, Control Group – Project Sponsor

Scott Anderson serves as a Partner and Chief Strategy Officer at Control Group, focusing on building relationships to develop business, and helping organizations use technology for transformational change, product development, and social good. He has experience working with some of the most respected cultural, media, broadcast, graphic design, architecture, publishing firms in both San Francisco and New York City. He oversees many civic, non-profit, and public-related engagements, particularly around the usage of technology in the physical space in service of information, education, and entertainment. Particularly interested in creating relationships and projects that have shared mutual interest between public and private sector, for public good and for profit.

He served on the Board of Open House New York, a non-profit organization that promotes New York City architecture and design by encouraging public access to famous buildings and spaces in the New York City area, producing the largest architectural event in the world.

Experience

Partner, Co-Founder, Control Group, 2001 – Present

Board of Directors, Downtown-Lower Manhattan Association, April 2013 – Present

Director, Music and Board Member, The Wassaic Project, 2010 – Present

Advisory Board, City Poly, December 2012 – June 2013

Education

University of Massachusetts, Amherst, MS Sustainable Agriculture
Providence College, BA Economics and Philosophy

Tamara Sachs, CEO and Founder, Sachs Insights – Project Sponsor

Sachs Insights is an eclectic 30 person community of researchers, ethnographers and documentarians passionate about uncovering people’s experiences. Platforms cross channels: web, mobile web, apps, games, kiosks and integrated signage and digital platforms that engage and direct audiences within a particular environment. .

Tammy and her team use a variety of qualitative and quantitative methods to engage stakeholders and key audiences in the development process. Key entry points of our work – benchmarking existing websites and mobile apps. ethnographic immersion to identify unmet needs, co-creation focus groups to engage consumers and stakeholders in solutions to their needs and iterative rounds of user experience research to optimize experience design.

Experience

CEO, Founder, Sachs Insights, September 1988 – Present

Instructor, Rutgers University, March 2011 – Present

Assistant Vice President, Citicorp Development Division, February 1984 – June 1987

Research and Planning Supervisor, Ogilvy & Mather, February 1982 – January 1984

Education

New York University - Leonard N. Stern School of Business, MBA, Marketing
Wesleyan University, BA, Psychology and Theater

Angela K. Miller, Program Director, Cubic Transportation Systems – Project Sponsor

Angela Miller is the current chair of the APTA Emerging and Innovative Technology Subcommittee and serves as a Program Director implementing innovative transportation technologies at Cubic Transportation Systems. Previously she was the Chief Technology Officer/Chief Sustainability Officer for one of San Diego’s public transportation agencies, the North County Transit District. She brings a unique combination of public transit operations, technology, innovation project, and sustainability focus to the project team.



Experience

Program Director, Cubic Transportation Systems, November 2012 – Present

Chair, Emerging and Innovative Technology Subcommittee, APTA, October 2010-present

Chief Technology Officer/Chief Sustainability Officer, NCTD, October 2007 – October

Education

University of Texas, School of Public Health, MS, Environmental Science
Rice University, BA, English/Economics

Appendix B: *APTA Emerging and Innovative Technology Subcommittee, Workgroup Participants on Senior/Disabled Assistive Technologies*

The following individuals are the participants in the APTA EIT Subcommittee Workgroup on Senior/Disabled Technology. The workgroup will review the research proposed under the IDEA project, and will provide feedback and oversight on the appropriate design of the interfaces for the proposed target users.

Todd Allen, **RouteMatch**

Sean Barbeau, **University of South Florida**

David Brandauer, **BLIC**

Flora Castillo, **New Jersey Transit**

Gricelda Cespedes, **New York City Transit**

Steve Chang, **Los Angeles Access Services**

Buddy Coleman, **CleverDevices**

Inez Evans, **Southern Ohio Regional Transit Authority**

Susan Hafner, **Multimodal Solutions**

Brendon Hemily, **ITS America**

Christian Kent, **Washington Area Metropolitan Transit Authority**

Tim McCormick, **Santa Monica Big Blue Bus**

Angela Miller, **Cubic Transportation Systems**

Santosh Mishra, **TranSystems Corp**

Nat Parker, **GlobeSherpa**

Jeff Popevich, **American Public Transportation Association**

Ramond Robinson, **Chatham Area Transit**

Roland Staib, **INIT**

Mary Stearns, **VOLPE Center**

Alex Wiggins, **Transit Safety & Security Solutions. Inc.**

External Invitees

Barry Eising, **Cisco**

Jon McDonald, **Atkins Global**

Karen Philbrick, **San Jose State University**