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Mobile-Based Sidewalk Inventory App for Smart Communities, Health, and Safety

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1.1 INTRODUCTION

The sidewalk infrastructures are a critical element of urban transportation networks, providing support and connectivity to other modes of transportation. Cities have as many sidewalks as they have streets, but most municipalities find it difficult to devote the same amount of resources to the management and maintenance of sidewalks as they do to streets. In this paper we introduce *MySidewalk™* (Research 2015), a cost-effective crowdsource-based approach to data collection for sidewalk inventory and condition. *MySidewalk™* is a mobile application platform that allows local, state, and federal entities to collect and maintain accurate geospatial data about the sidewalks in their jurisdictions, enabling informed decisions regarding the sidewalk maintenance, enhancement, and new construction.

The work reported in this paper is a result of the Small Business Innovation Research (SBIR) project funded by the Federal Highway Administration (FHWA) within the US Department of Transportation (DOT). *MySidewalk™* was developed in collaboration with Texas Transportation Institute (TTI) and is being piloted in collaboration with City of College Station, TX and the American Association of Retired Persons (AARP). Our results with preliminary deployment of *MySidewalk™* suggest that, if carefully deployed, crowdsourcing of sidewalk inventory data collection can be cost effective and can improve public understanding of policy issues involving pedestrians and sidewalk infrastructure. Figure 1 shows snapshots from *MySidewalk™* app showing sidewalk issue reporting and data collection.
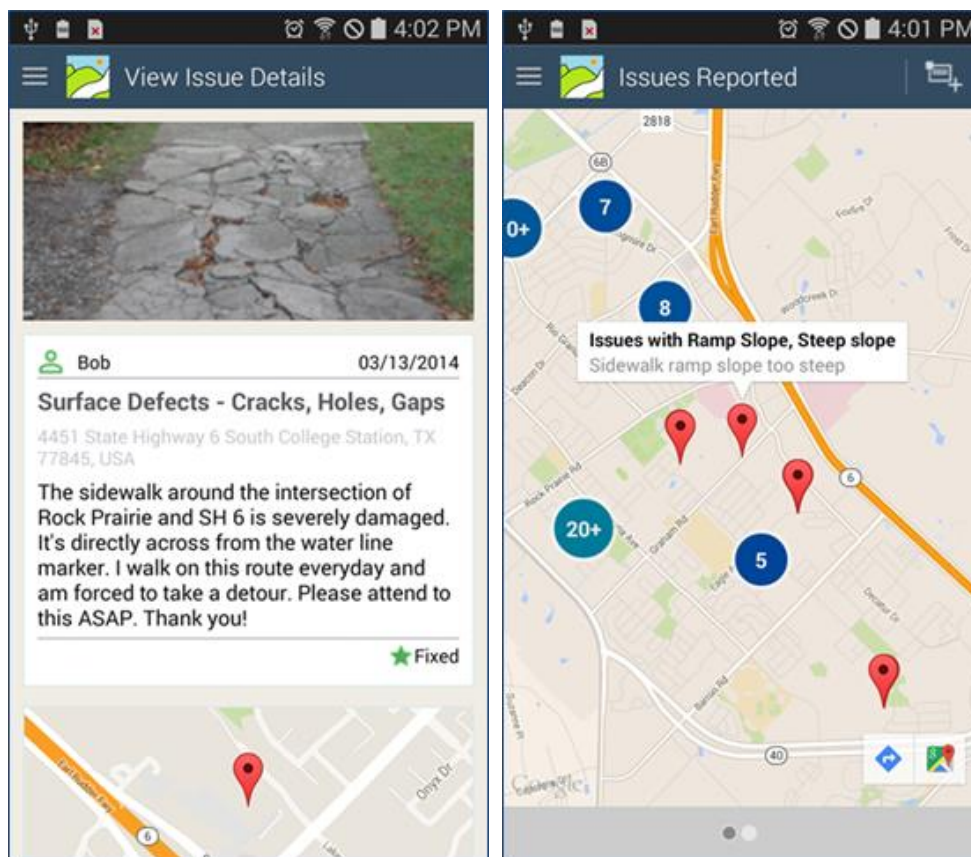
FIGURE 1: SIDEWALK GIS DATA COLLECTION IN *MYSIDEWALK™*

It is well recognized that the sidewalks are a key constituent of the public infrastructure and will help improve new norms of health, safety, social-economic condition, while shaping beneficence for the public in all land use settings (Sparling et al. 2000). Growing awareness towards healthy life-style choices and recognition of the need to reduce fuel-based transportation, have led to increased support for walking, running, and biking activities as a means for transportation, recreation, and physical fitness. Government agencies and public communities are recognizing the need to improve sidewalk infrastructure to moderate inert lifestyles and to promote an active physical lifestyle to increase walkability. Consequently, increased community consciousness concerning health, environment, and long-term sustainability has encouraged policy makers to develop sidewalk infrastructure.

In a 2017 publication authors concluded, "There is increased awareness about the serious consequences of obesity, but there is still a lack of understanding about the reasons and best treatment modalities for the disease"

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(Rosenthal et al. 2017). One reason for increased obesity was contributed to decline in physical activity among young people (Ewing and Greene 2003). A research in 2004 concluded that increased walkability led to a 12.2 percent reduction in the likelihood of obesity. They concluded that every kilometer walked per day reduces obesity by 4.8 percent (Frank et al. 2004). A study by Brown, identified a direct relationship between neighborhood walkability and a person's body mass index (BMI). That study concluded that moderate-to-vigorous physical activity (MVPA) is a viable solution to improve BMI via reduction in weight. That study also concluded that workers in neighborhoods that were highly walkable had lower body weight and a higher MVPA (Brown et al. 2012).

In a 2015 survey, the CDC concluded that 36 percent of adults and 17 percent of youth in the US were obese, with a positive trend from 1999-2014 (NCHS 2015). As a possible solution to alleviate the obesity epidemic in the US, the American Journal of Public Health (2003) made the case for integrating the sidewalks in our communities to promote active lifestyles (Lavizzo-Mourey and McGinnis, 2003). Subsequently, Leyden (2003) concluded that sidewalks have a direct positive effect on physical and mental health of neighborhoods. Several other studies, in addition to above literature led public health investigators to endorse building more sidewalks to encourage physical activity and to promote regular activity, (Ramirez et al. 2006). For example, the city of Moses Lake, Washington, has implemented a policy to improve accessibility of sidewalks and cycling lanes in a direct response to a 127 percent increase in the adult obesity rate (DOT 2016).

The sidewalk infrastructures are ubiquitous, acting as arteries & veins for our communities and allow the circulation of public activities; yet, they are low-tech and often lack effective vocal advocates due to various restraints e.g. time, money, resources, awareness etc. Several extant research works has established that adverse behavioral health has significant influence on economic independence, morbidity, and mortality and that building the sidewalks is one key to connecting neighborhoods (Hale and Viner 2012). Exercise and physical actvities have shown to help in improve mental health and has positive effects on anxiety, depression, negative mood, self-esteem and cognitive function (Sharma et al. 2006). American Academy of Social Work and Social Welfare (AASWSW) - led a social initiative that focused on solving behavioral problems by way of innovative prevention methods (Speaks 2015). It is apt and necessary to conclude that a walkable/bikeable sidewalk infrastructure holds promise towards innovative solution for solving behavioral problems. For example. Beck et al. (2007) concluded that targeted,

preventive measures to localized pedestrian settings will increase the safety of pedestrians . In another research study, authors discovered that distance and safety are the major reasons that children do not walk to school. Effectively built environment interventions (e.g. sidewalks) can reduce traffic and promote walking to school (Beck and Greenspan 2008). Another key study, showed use of Geographic Information System (GIS) tools to estimate the number of children who walk to school and suggested that high street connectivity can increase potential walkers (Falb et al. 2007).

Our review of literature related to sidewalk infrastructures underlined additional constructs for the development of sidewalks that lead to desired effects on a target population for an overall well-being. For e.g. a good infrastructure has both a social and a distributive role; however, most infrastructures lack distributive *equity* (Ferro and Lentini 2008). Researchers defined equity as redistribution to reduce inequalities of income or wealth, recommends choosing the equity-efficiency balance to facilitate concurrent growth of income equity (Baldassarri and Piga 1996). It is acknowledged that incorporating social equity metrics into the policy process is challenging. Social equity is an intangible construct and is subjected to low priority in a list with more tangible measures such as congestion, emissions, safety, coverage, use of public transit, cycling access, and walking scores (Manaugh, Badami, and El-Geneidy 2015). Infrastructure plays a social and distributive role by reducing fatal accidents for the most susceptible i.e. the low income population (Ferro and Lentini 2008). Safe Routes to School (SR2S) program in California concluded pioneering Safe Routes to School (SR2S) program in California concluded that building sidewalks is the most critical part of the engineering development in promoting children to walk to school (Boarnet et al. 2005). US DOT's directive on Pedestrian Safety Guide and Countermeasure Selection System propagated idea to transporation agencies to allocate funds for sidewalk to improve the safety and mobility of all citizens (Zeeger, Nabors, and Lagerwey 2013). Similarly Robert Wood Johnson Foundation's (RWJF) has advocated the importance of transforming preventive medicine by emphasizing on active living by design and the potential to institutionalize healthy environments via sustained local community participation, with special attention to the barriers faced by low-income, ethnic populations, neighborhoods (Woolf et al. 2013).

Policy makers have begun to consider tangible constructs (e.g. safety) and intangible constructs in evaluating infrastructure needs. A lack of guidance on how to collect data on constructs discussed above for planning and to build the desired infrastructure has hampered that process. One paper,

titled "Emerging Research Agendas in Planning," stresses the need for understanding the walkable infrastructure and highlights the importance of accurately collecting data (ADA 2010) to model the behavior of pedestrian and other users (Blanco et al. 2009). Consequently, we explored past and current literature to shed light on the planning and execution part of the infrastructure development. For example, a 2012 meta-analysis concluded that mobile technology is an effective intervention to motivate individuals to engage and to increase healthy physical activity (Fanning, Mullen, and McAuley 2012). PEW's 2011 research found that about 85 percent of adults and about 95 percent of young adults (18-24 yrs.) possess mobile phones (Fanning, Mullen, and McAuley 2012). Ubiquitous Mobile technology is now being studied as a means to manage health behavior interventions by collection of real time feedback, interactivity, immersive, individualized content, and to deliver just-in-time decision support to manage favorable physical activity behavior (Riley et al. 2011). For example, the Pokémon Go® interactive game has increased players physical walking activity. Jawbone UP® users who commented on Pokémon are walking 62.5 percent more than usual on average. Cardiogram® has noted that the percentage of their users who walk more than 30 minutes per day has increased from 45 percent to 53 percent since the launch of Pokémon Go® (Riley et al. 2011).

It is clear from our study above that we need the sidewalk infrastructure and mobile technology will help tremendously in implementing the plans. Yet it was unclear whether population at large will buy into the program at the onset of the execution, a key question, needed answer for final step. In this effort crowdsourcing has opened creative doors for the collaboration among private and public organizations and communities, drawing on the creativity and intelligence of communities in an open, but controlled structured process (Brabham et al. 2008). Research on crowdsourcing community engagement demonstrates that crowdsourcing can offer solutions to complicated problems that may perplex scientific experts (Israel and Parker 2005). Crowdsourcing solution will lead to highly relevant results for the intended audience due to direct engagement of the target audience in ideation and solution (Brabham 2009).

The sensing capabilities of smart phones have proven to be effective for collecting geospatial information. Sometimes referred to as "participatory sensing," smart phone users' act as a distributed sensor network to gather, analyzes, and share information (Rice et al. 2012). One of the early results was the development of crowdsourced geospatial data resources. *OpenStreetMap* (2016) is the first, successful, large-scale crowdsource-based geospatial framework for creating open-access maps of the world. Geospatial

community users around the world creates and maintains these maps (Rice et al. 2012). *OpenStreetMap* facilitates development of roads, streets maps from the GPX data contributed by user community. Wikimapia (2012) is another example where community efforts manages and updates the geospatial data.

An ecosystem of applications for participatory sensing is emerging. *OpenStreetMap* and Wikimapia collect geospatial data. Wikimapia focuses on structures (e.g. buildings) rather than infrastructure (e.g. roads and streets) (Rice et al 2012). SeeClickFix (2017) is a web-based public problem-reporting application that is used to report non-emergency related issues anywhere in the world, and to bring those issues to the attention of local municipal authorities (Mergel 2012). City officials can subscribe and receive issues reported for targeted regions. In addition, there is substantial evidence that mobile applications can have a positive effect on lifestyle and health choices. For example, Step-up-life (Rajanna et al. 2014) is a mobile application-based health assistant that helps to adopt a healthy life style using soft nudges.

In response to this background, KBSI designed and developed an integrated platform that would facilitate the crowd-sourced collection of sidewalk inventory and condition assessment data. An anticipated benefit from the participatory sensing approach to sidewalk data collection is the opportunity to effect lifestyle and health-choice decision of the target population. Participation of a broad spectrum of users will be a key factor in the ultimate success of this endeavor. Refer to Figure 2 showing roles of contribution of crowdsourcing in planning using *MySidewalk™*

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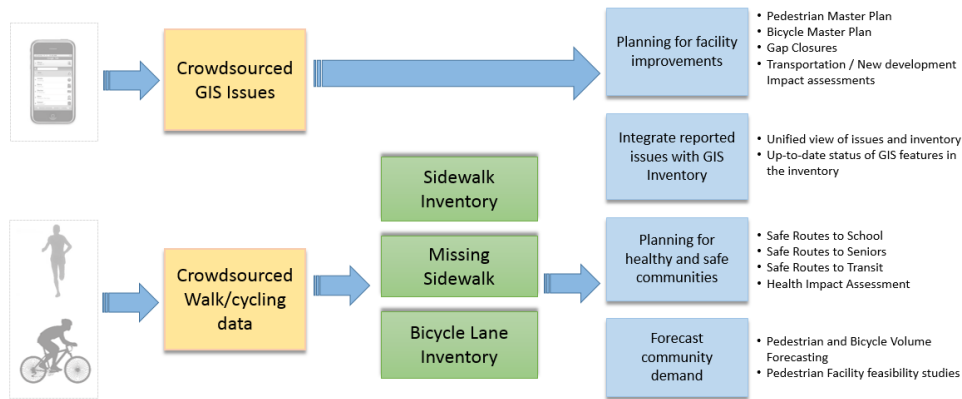
FIGURE 2: ROLE OF CROWDSOURCING AND *MYSIDEWALK*™ IN PLANNING

Age demographics are one of the key factors that affect online community participation (Chung et al. 2010). Various research in motivational psychology has found that there are two types of motivations: (i) intrinsic motivation (i.e., personal satisfaction), and (ii) extrinsic motivation (i.e., receiving something from others) (Ryan and Deci, 2000; Soliman and Tuunainen, 2015). Other factors relevant to motivating an individual to participate include: (i) altruism; (ii) intellectual curiosity and enjoyment; (iii) self-marketing; (iv) social motives; and (v) direct compensation (Rouse, 2010; Maslow, 1943). Please refer to summary of study (Table 1) to understand motivation required for supporting crowdsourcing applications.

TABLE 1: STUDY ON MOTIVATIONS BEHIND VARIOUS CROWDSOURCING APPLICATIONS

STUDY	EMPIRICAL CONTEXT	MOTIVATIONS	
		INTRINSIC	**EXTRINSIC**
(Brabham D. C., 2009)	• iStockPhoto	• Creativity and fun	• Monetary reward
(Ebner, Leimeister, & Krcmar,, 2009)	• Sapiens Idea Competition	• Creative challenge	• Carrier Improvement • Monetary reward
(Antikainen, Màkipàà, & Ahonen, 2010)	• CrowdSpirit • FellowFoce • Owela	• Entertainment • Collective creativity	• Monetary reward • Learning new ideas
(Brabham D. C., 2010)	• Threadless	• Love and addiction towards thread less community	• Monetary reward • Learning new ideas • Carrier Improvement
(Zheng, Li, & Hou, 2011)	• Taskcn	• Enjoyment of the contest	• Gain publicity
(Väätäjä, 2012)	• Sanoma Newspaper	• Fun • Sharing news	• Monetary reward
(SBIR, 2015)	• MySidewalk	• Self-satisfaction through public work	• Monetary reward • Gain publicity through social media

OpenStreetMap, for example, exploits the altruistic nature and social motives of its users. Similarly, SeeClickFix reinforces the social and altruistic motivation of taking personal effort to fix the problems on the street some crowdsourcing applications reward users by encouraging them to share achievements on social media platforms. Applications, such as FotoQuest (Bayas et al. 2016), have used gamification similar to Pokémon Go® to collect in-situ data for Geo-Wiki environments.

MySidewalk™ allows local, state, and federal entities to collect and maintain accurate geospatial data about the sidewalks in their jurisdictions. Data are collected through a crowdsourcing (that is, participatory sensor) model, and include: (i) sidewalk condition, (ii) accessibility issues, (iii) connectedness of different transportation networks, and (iv) gaps in the sidewalk network. This enables informed decisions regarding sidewalk maintenance, enhancement, and new construction. Data collection and analysis were conducted from January 2016 through July 2016. KBSI has researched, design and implemented the *MySidewalk™* is currently in large-scale evaluation with the city of College Station, Texas and other organizations.

2.1 TECHNOLOGY: FORM, FIT, AND FUNCTION

The *MySidewalk™* app extends several innovative functions via engaged-design that facilitates and integrates collaborative design implementation, and validation. *MySidewalk™* smartphone app has a graphical user interface (GUI) that provides utility for the user and proactively engages public users to report sidewalk maintenance issues in real time. *MySidewalk™* also collects the following technical attributes of a sidewalk; (i) width of sidewalk; (ii) distance from the main road—that is, sidewalk buffer width; (ii) type of sidewalk—pedestrian or multipurpose (pedestrian and bike path); (iv) sidewalk material type (concrete, asphalt, other); (v) street name associated with sidewalk; (vi) closest cross section or street to the sidewalk; and (vii) maintain right-of-way.

MySidewalk™ platform is designed to appeal to a wide spectrum of user. For example, sidewalk inventory data indicates accessible sidewalks appropriate for people with disability. Data on pedestrian walking patterns can help identify optimal locations for advertising. Data can help public policy makers with decisions on: (i) route planning; (ii) placement of sidewalks; (iii) prioritizing infrastructure projects; (iv) identification of high traffic routes; (v) condition of sidewalks; and (vi) maintenance of sidewalks. Public and private agencies can use *MySidewalk™* data for: (i) planning of sidewalk

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maintenance; (ii) analyzing sidewalk usage patterns; (iii) understanding policy issues involving pedestrians; (iv) accessibility of sidewalks; and (v) effects of infrastructure development on pedestrian demand.

Advance capabilities of *MySidewalk™* are designed to help clean, facilitate, and manage sidewalk inventory data. Collection and integration of spot-specific issues, more accurate data availability through GIS layers, and GIS-based inputs for planning, are some of the advanced features. Traditionally, issues reported through existing reporting systems, such as SeeClickFix, must by shared as reports that can then be read into more general management systems like ArcGIS (Mergel, 2012), with considerable extra effort. *MySidewalk™* is designed to share data through a variety of export formats and comprehensive data integration APIs, such that sidewalk and issue data can be ingested into other GIS applications with minimal effort.

In *MySidewalk™* all crowdsourced GIS data and data derived through inferencing processes are stored in a GIS database as separate geospatial entities. This allows the data to be used for various applications in a seamless fashion. For example, the raw walk data contributed by end users can be aggregated with the time of collection, to show pedestrian traffic patterns in a specific location. Similarly, the issues reported by users can be displayed through a navigation interface to alert a user about issues that could affect their walking route.

These features and functions resulted from a requirement analysis exercise conducted by KBSI and stakeholders engaged in comprehensive discussions. Requirement analysis assimilated a list of key features and functions for development of the *MySidewalk™* app. Additional feedback from various stakeholders like DOT helped to simplify and align the features and functions, particularly focusing on consistency with public rights of way accessibility guidelines (PROWAG) (Standards Sidewalks Guidelines Rights-of-Way 2015). Sidewalk condition issues and categories resulting from requirement analysis were discussed extensively with stakeholders and the final list that satisfies the data collection requirements and ease of public understanding (Table 2). Subsequent technology research enhanced the innovation quotient of *MySidewalk™* concept by adding the following functionalities 1) Inferring sidewalk from walk data by snapping the walk to nearest road and use conflation algorithms to increase the spatial accuracy of inferred sidewalk data, 2) Integrate inferred sidewalk data with City's existing sidewalk (GIS) data.

TABLE 2: *MYSIDEWALK*™ APP SIDEWALK CONDITION, ISSUES, CATEGORIES

CROSS RAMP, CROSSING, CROSS WALK	SIDEWALK	TRANSIT STOPS	CURB RELATED
No safe place for pedestrian to stop midway while crossing the street (no pedestrian refuge islands)	Temporary Obstructions (Vehicles, Trash, Furniture)	Missing or defective transition warning surfaces (Domes and Colors)	Curb Damage
Missing or defective transition warning surfaces (Domes and Colors)	Obstructions - Utility Poles, Mailbox, Signs, etc.	Boarding area and platform not connected to sidewalks	Curb missing
Tripping hazard at cross ramp due to uneven or steep segments	Water accumulated on the sidewalk (Ponding)	Gap between platform and bus is too wide	Sidewalk above curb
Uneven transitions between the streets, gutters, and ramps	Cracks, holes, or gaps in sidewalk surface	Gap between platform and bus is too high	Other (Please specify in the description)
Not enough level space after entering the ramp	Vegetation growing in or on sidewalk	Steep slope in the boarding area	
Not enough space to access the signal button	Tripping hazard; surface is uneven	Not enough boarding area	
No ramp for sidewalk access	Sidewalk slopes from side to side	Other (Please specify in the description)	
No signal button at crosswalk	Not enough clearance overhead		
Ramp slope is too steep	Sidewalk is not wide enough		
Not enough space to turn	Sidewalk slope is too steep		
Signal times out early	Missing section of sidewalk		
No crosswalk	Other (Please specify in the description)		
Other (Please specify in the description)			

The *MySidewalk*™ platform incorporates two modes of presentation for an integrated experience: a mobile (smartphone) presentation and a web-platform presentation. The *MySidewalk*™ mobile app is designed for the end user, supporting walk tracking; data upload, and issue reporting. The *MySidewalk*™ web portal is designed to support the day-to-day activities of policy makers and inventory managers. A number of functions are built into the web portal: (i) view and edit walk data; (ii) view and edit reported issues; (iii) manage sidewalk generation; and (iv) Transportation Improvement Programs (TIP)/Statewide Transportation Improvement Program (STIP) evaluation.

Two types of data are crowdsourced using the *MySidewalk*™ mobile app: (i) walk data; and (ii) sidewalk issue data. Walk data is the walk trail recorded by the *MySidewalk*™ app that will be uploaded to the *MySidewalk*™ cloud server at periodic intervals. The end user can edit the walk route and the

metadata associated with it before uploading it to the *MySidewalk*™ cloud server. While reporting the data, the user can identify: (i) missing sidewalks; or (ii) key locations for new sidewalk. The data uploaded to the *MySidewalk*™ cloud server can only be edited by an authorized system administrator. At pre-defined interval of time, sidewalk inference engine is executed to extract sidewalk information from crowdsourced walk data. The inferred sidewalk data can be published by a data manager in standard GIS formats like SHP, KML, etc.

When a city municipality implements *MySidewalk*™ inventory collection, it is recommended to install the *MySidewalk*™ system with available legacy inventory data. *MySidewalk*™ can be bootstrapped by ingesting pre-existing sidewalk inventory data that is available in standard GIS data formats. In cases where there is no pre-existing sidewalk inventory data available, *MySidewalk*™ is designed to bootstrap baseline inventory data from open-source geospatial data platforms such as *OpenStreetMap*. As the crowdsourced data starts to grow, *MySidewalk*™ will infer sidewalk placement from the walking paths contributed by the app users. Municipalities with no or partial inventory data to maintain up-to-date inventory data can use this feature. To implement the above feature, KBSI developed a proprietary sidewalk inference algorithm that extracts sidewalk inventory data from the walk data contributed by the *MySidewalk*™ users. A focus group of 15 people from Texas Transportation Institute, KBSI, and the City of College Station was formed during the evaluation process to collect walk data around College Station. The data collected was used to infer sidewalks and evaluated against the sidewalk data provided by the City of College Station. Sidewalk inventory data provided by the City of College Station was used to validate the sidewalk-inference feature.

The walk data contributed by users can also be used to evaluate the sidewalk demand in a given region; information that can be valuable in the justification of TIP. Many municipalities would like to improve their transportation infrastructures, including pedestrian and bicycle paths. With little or no requirement analysis support, city officials and policy makers across the country struggle to prioritize infrastructure projects. *MySidewalk*™ can make significant contributions to requirement analysis for capital infrastructure planning programs such as Transportation Improvement Programs (TIP), the Statewide Transportation Improvement Program (STIP). Collaboration with other agencies and coordination with other projects can be significantly improved. Researchers, data aggregators, and mediators, such as Metropolitan Planning Organization (MPO) who perform road audits and ADA compliance checks can leverage *MySidewalk*™ inventory data to better

understand the effects of infrastructure development on pedestrian demand and to create new innovative applications. Evaluation of TIP and STIP functionality is built into the web portal part of the *MySidewalk*™ platform and it is available only to the power users of the *MySidewalk*™ web application.

TIP/STIP evaluation interface of *MySidewalk*™ web portal shows (Figure 3) recently reported issues within a 500-foot or one-mile radius, a feature that could be used to update the scope of a TIP to include unresolved issues.
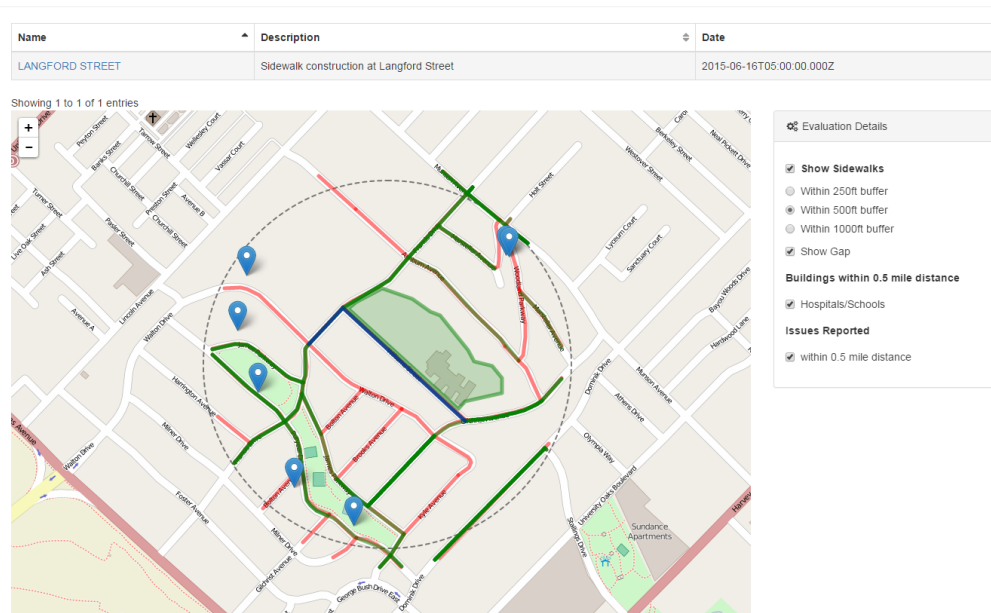
FIGURE 3: TIP/ STIP EVALUATION

MySidewalk™ data can include additional sidewalk attributes such as width of the sidewalk, sidewalk location (right, left, or both sides of the street), type of sidewalk material, and buffer width. Any attribute that is missing in the user data is substituted with default values that is set at region level by the sidewalk inventory manager. Sidewalk attributes can be assigned at segment level or for the entire walk route.

3.1 IMPLEMENTATION OF *MYSIDEWALK*™ PLATFORM

The GUIs for the mobile app and web presentations are important components of the *MySidewalk*™ platform. Functionalities were designed to

support crowdsourcing applications and allow user participation to be easy and seamless. GIS maps are used extensively throughout the app to present the data in a simple intuitive fashion. The *MySidewalk*™ GUI pinpoints roads that have no sidewalks by displaying them in a distinct color. An intuitive cloud-server based *MySidewalk*™ facilitates crowd adoption for data capture in real-time (Figure 1). A *Track My Walk* (Figure 3) feature assists users tracking their activity; captures sidewalk attributes (width, coordinates, sidewalk material etc.), displays the traced path on the screen, and can recall the history of traced paths.

The geo-coordinates that are captured by the smartphones GPS are recorded at pre-defined time intervals as walk routes. Walk data is then filtered based on the walk speed, the time of capture for each of the data points, and the geo-coordinates of the walk. GPS-based latitude-longitudes are converted to municipal addresses using reverse geocoding (OpenSteetMap, 2016) so that routes can be tagged with relevant address details.
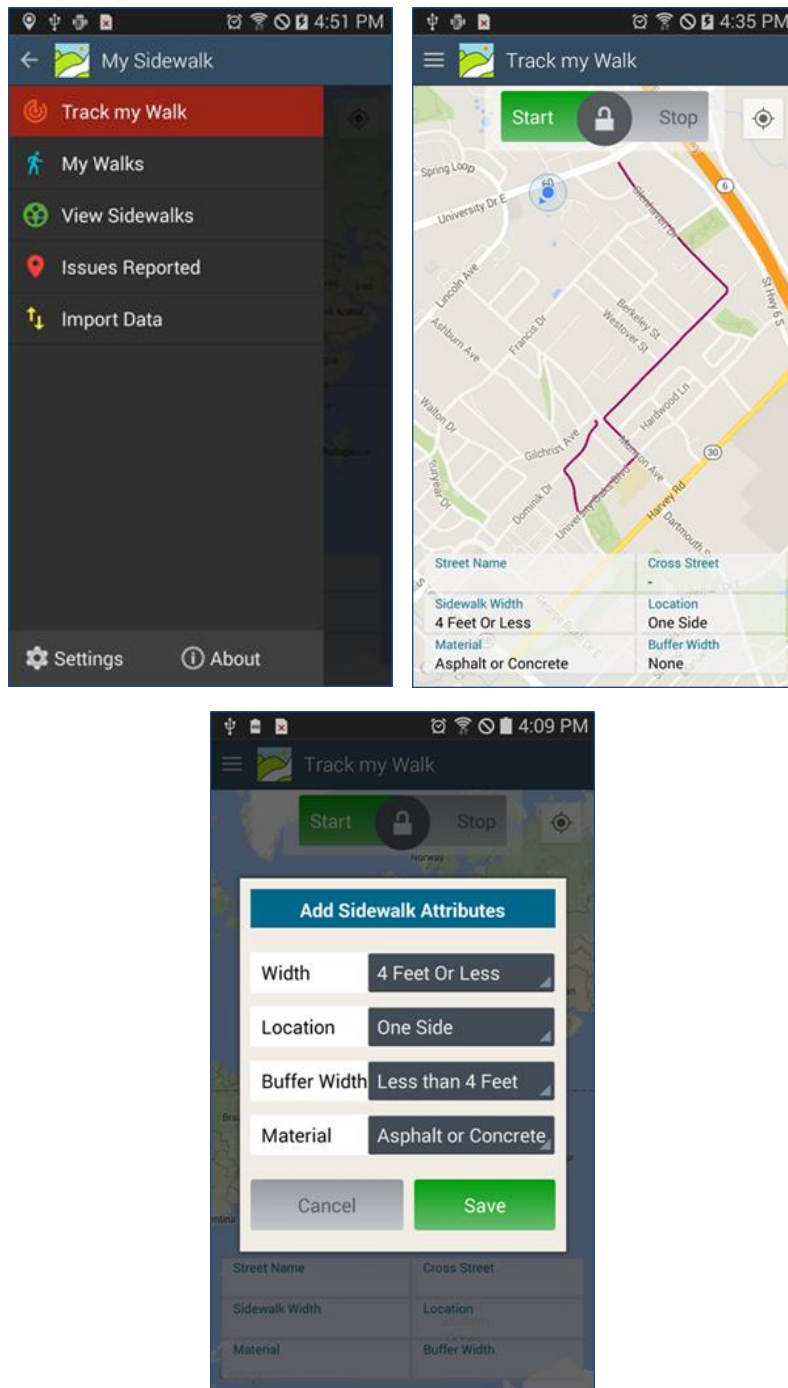
FIGURE 4: SIDEWALK CONDITION ASSESSMENT, ISSUE REPORTING IN
MYSIDEWALK™

Usability of the application is one of the key factors that determine the success of crowdsourcing application; extensive usability analysis was carried out during the design and development stages of *MySidewalk*™ mobile application to make the GUI intuitive and more adaptable. For example to enhance reporting and utility of sidewalk conditions and accessibility (Figure 4), the *MySidewalk*™ GUI was developed to highlight segments that have reported issues with unique color combinations. Import and export features support various formats for data exchange with external applications. Map views support switching between different map tiles—normal satellite view, terrain view, and hybrid view. Collected data is fused across multiple users and with existing sidewalk data maintained by the city. Consequently, the *MySidewalk*™ web platform GUI allows easy to use feature for new, enriched crowdsourced data is verified against an existing dataset, and is uploaded to the cloud after approval by the sidewalk inventory manager. *MySidewalk*'s flexible data integration interfaces and export formats enable stakeholders to focus on augmenting real-time solutions like infrastructure planning with ease.

MySidewalk™ allows uploading details of a capital infrastructure project (road, school, etc.) to evaluate sidewalk augmentation in the neighborhood that will enhance the project. *MySidewalk*™ features for the policy and municipal users include: (i) GIS map details of the project; (ii) pedestrian network connectivity; (iii) pedestrian network in selected area (250-foot, 500-foot, or 1,000-foot scales) from the proposed plan; (iv) gaps in the pedestrian network; (v) key landmarks (schools, hospitals, etc.); and (vi) unresolved sidewalk issues within a specified distance (250, 500, or 1,000 feet). The user interface for the inventory manager or data user is shown in Figure 5.

FIGURE 5: *MYSIDEWALK*™ **POWER USERS DASHBOARD**

4.1 SUMMARY AND CONCLUSION

Building connected, accessible sidewalks and their nonstop use is an important aspect of city planning. A good pedestrian infrastructure can promote physical activity and a healthy lifestyle in a community. The *MySidewalk*™ platform contributes naturally to solving many infrastructure challenges currently faced by city planners and policy makers. The

comprehensive GIS-based data inventory will expedite infrastructure planning and capital improvement initiatives. *MySidewalk™* will greatly enhance process for planning authorities (city, state and/or federal) in evaluation of sidewalk network gaps, transportation networks & connectedness, prepare project plans, reduce respective issues and optimize funds to launch a federally funded improvement plans e.g. Capital Improvement Plan (CIP), Metropolitan Planning Organization (MPO) funded Total Improvement Plan (TIP), or a state funded State Total Improvement Plan (STIP). In addition, authorities can use the curated data for valuable insights to improve CIP, TIP, and STIP plans e.g. review of pedestrian network infrastructure to optimize infrastructure, budget, and time.

This paper highlights the research, design, and development of the *MySidewalk™* platform. The implemented participatory sensing technology infrastructure is used to collect crowdsourced data on location, condition, and gaps in sidewalks. Results of the project have been shared with MPOs, pedestrian infrastructure planning organizations of BCSMPO, H-GAC, and the City of College Station. Reviewers have concluded that the *MySidewalk™* platform will be useful to communities for planning and maintaining sidewalks, promoting physical activity, and wellbeing. All stakeholders have agreed to participate, support the *MySidewalk™* pilot deployment, which will validate the collection of crowdsourced walk data, inference of the sidewalk data, inventorying of infrastructure, and planning sidewalk improvements. The next step is to roll out the *MySidewalk™* platform to selected metropolitan locations and to promote adaption of the technology by local planning organizations and authorities.

5.1 ACKNOWLEDGEMENT

6.1 FUNDING

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