

TRANSPORTATION IN SMART COMMUNITIES

A look at how ITE with the engineering community can define a Smart Community and methods by which they can support agencies in developing Smart Communities

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*LITE SMART
Team Project
Report*

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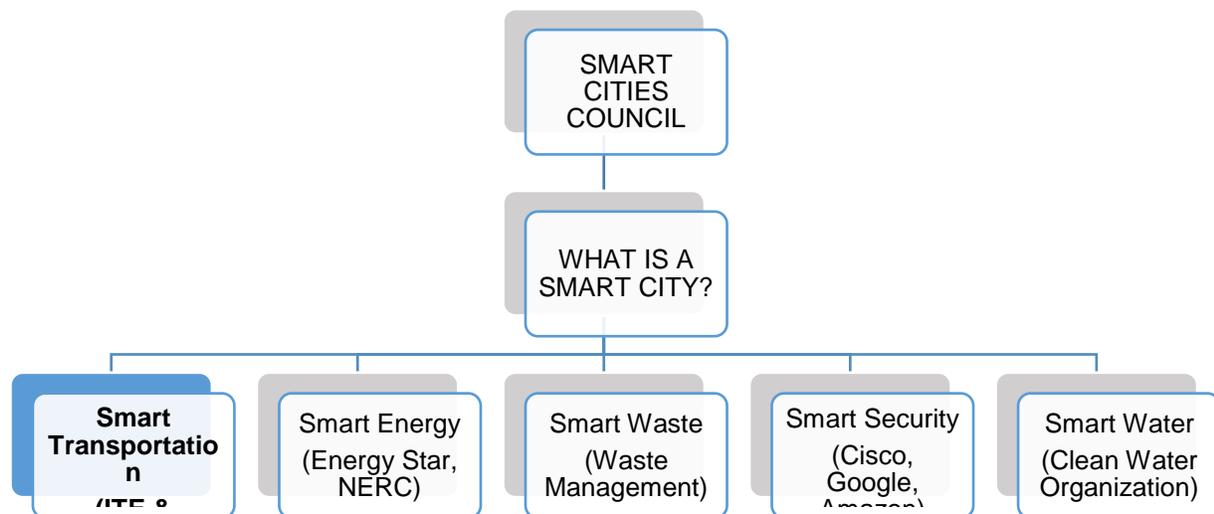
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Executive Summary

In an effort to keep ITE at the forefront of the transportation discipline, this project aims to provide options for ITE to become the “go-to” place for resources on transportation within Smart Communities. Through partnerships with organizations in other disciplines, ITE can be a major player in the advancement of smart communities throughout the world. The primary goal of the project is to create a framework to define transportation within Smart Communities and provide communities the tools to work towards becoming connected. This framework would give communities the resources they need to plan for smart communities in the long term and opportunities to apply for Smart Community grants for major smart initiatives or small projects that build smart communities time.

The S.M.A.R.T. Team recognizes the growing trend of implementing Smart Communities as a means of providing more efficient public service operations while improving the lives of citizens. While the trend is emerging, there is a need to define a Smart Community and establish paths to make a community smarter over time.

The team’s overall vision is that an existing external council, the Smart Cities Council (SCC), with a vested interest in developing Smart Communities would create a framework for developing Smart Communities with each partner focusing on their discipline. A separate group within the council could be created to oversee the framework and proposed action. The team’s vision is that ITE (and potentially other partners, such as TSM&O) would provide the transportation components of a Smart Community. While transportation is a key component of a Smart Community, it is not only component. The team believes that the SCC will be the overarching organization that will define a Smart Community with specific requirements. Potential partners are shown in the diagram below.



These suggested partnerships provide opportunities for a more robust framework and a larger network for assisting communities with the process. A holistic approach will help communities with the planning process while industry specialists will have the project-level knowledge required for implementation. The below list outlines potential partners the SCC could consider to be included in the Smart Community program.

Category	Partner (s)
Smart Transportation	ITE, TSM&O, ITSA, FHWA
Smart Security	Cisco, Google
Smart Power	Energy Star, NECA, American Public Power Association, NERC
Smart Sewers	WASDA, NASSCO
Smart Businesses	NFIB, NBEA, NCBA
Smart Parks	NRPA
Smart Mail	US Postal Service, UPS, FedEx
Smart Broadcasting	FAA, NPR, PBS, PRI, APT, APM, PRX, CPB
Smart Libraries	Public Library Association
Smart Public Safety	FEMA
Smart Telecommunications	AT&T, Verizon, Google, etc
Smart Waste Management	Waste Management, Inc.
Smart Water Supply	Clean Water Organization, Miya, Columbia Water Center, WaterisLife
Smart Airports	National Business Aviation Association (NBAA), Airports Council International (ACI)
Smart Education	Education for All, American Federation of Teachers, Association for Supervision of Curriculum Development
Smart Environment	LEED, NEPA
Smart Health care	Institute for Healthcare Improvement

The framework will be a tool for communities of all sizes to determine what steps are required to become a Smart Community. The framework will lay out goals and requirements for cities to follow when planning and completing Smart Community projects.

After a Smart Community has been defined, the team suggests that ITE, in collaboration with the SCC, use the framework and other components to take any of three actions (or a combination thereof):

1. Provide a web-based Transportation in Smart Communities resource hub for agencies on how best to achieve a Smart Community
2. Produce an annual Smart Community report card
3. Develop a Smart Community certification program

The three options for utilizing the framework are investigated with an understanding that the Institute of Transportation Engineers does not have a very large staff and relies largely on volunteer hours for its many initiatives. This project aims to lay out the goals, commitment levels, and potential outcomes of the three options. ITE will then decide what level of

commitment is realistic, and which option achieves the goals laid out by the International Board of Directors (IBOD). Inspiration for each of the actions was drawn from existing resources/frameworks: the certification program would be similar to the Leadership in Energy and Environmental Design (LEED) program for buildings or the Bike Friendly Communities program; whereas the annual Report Card would be similar to ASCE's Infrastructure Report Card or the Traffic Signal Report Card that ITE is currently revamping. The resource pool was envisioned as a way for ITE to become the primary resource for transportation within Smart Communities by pulling existing resources and providing a reliable, unbiased, one-stop resource for communities without a sales pitch.

This paper outlines the transportation aspect of the Smart Community in which ITE would serve as the overall champion. Outlined herein is a starting point for a Smart Transportation framework, and creating a resource hub, an annual report card, or a certification program. Additionally, the paper will outline the process that brought the team to its final recommendations.

Smart Community Definition

The team used the following definition for Smart Communities from the ITE Smart Communities Task Force 6/23/17 meeting:

Smart Community Definition v1.0: *ITE identifies a Smart Community as a city, county, town, neighborhood, or any other collection of people whose lives are enriched by technology and the gathering, processing, analyzation, and use of secure data.*

ITE Mission Statement v1.0: *ITE's role is to support, educate, promote, and assist the membership towards the mobility components of a Smart Community.*

The team recognizes that the definition will evolve over time, and the first version of the definition and the mission statement should only be used as general guidance to develop the framework, which will also be a living document.

Smart Communities Framework

The Transportation framework was created with the goals of smart transportation and the greater Smart Community in mind. All of the transportation guidelines laid out by this project will adhere to, and support, the overall goals of a Smart Community, based on ITE Journal, Feb 2017 article by Egan Smith:

- Urban Automation
- Connected vehicles
- Intelligent, Sensor-Based Infrastructure
- Urban Analytics
- User-Focused Mobility Services and Choices
- Urban Delivery and Logistics
- Strategic business Models and Partnering opportunities
- Smart Grid, Roadway Electrification, and Electric Vehicles
- Connected, Involved Citizens, including business & industry leaders, agencies, and providers
- Architecture and Standards

- Low-Cost, Efficient, Secure, and Resilient Information and Communications Technology
- Smart land Use

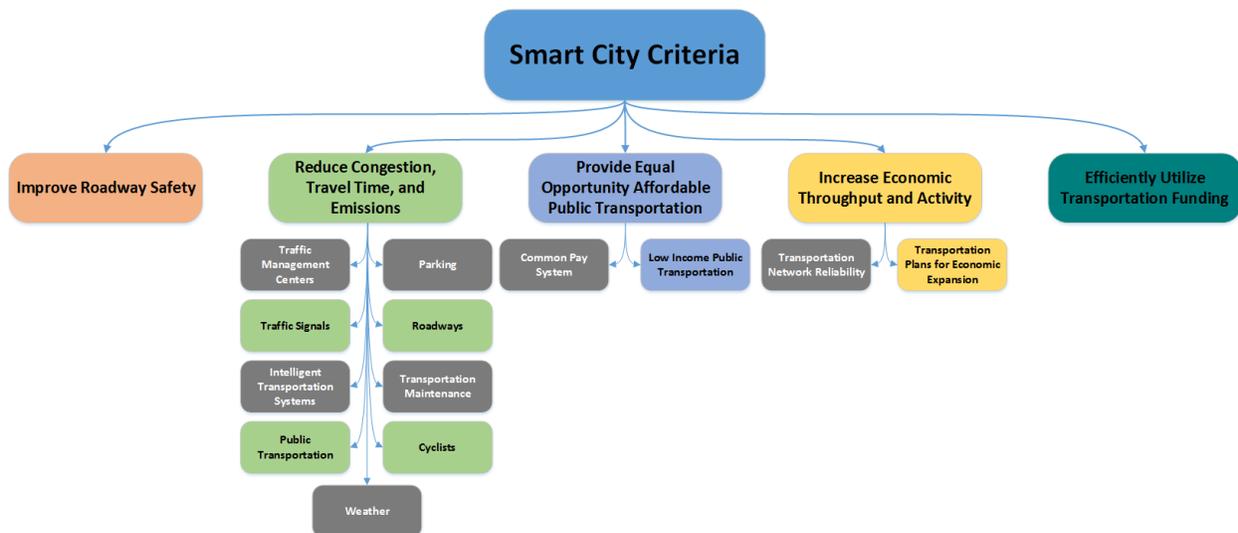
In addition to the goals provided ITE, the following requirements for Smart Communities, which are applicable to all disciplines, are laid out by this project:

- All City agencies coordinate and share information
- Stakeholder engagement occurs at every level of project development
- Projects adhere to City protocols and guidelines
- Networks are resilient and redundant
- Existing infrastructure is used and re-purposed
- Flexible and responsive solutions are found for context-specific issues

To develop the transportation framework, the team identified five goals of transportation within Smart Communities that are the basis for individual objectives and requirements for a Community:

1. Improve roadway safety
2. Reduce traffic congestion in order to to reduce travel times
3. Provide equal opportunity, affordable public transportation
4. Increase economic throughput and activity
5. Efficiently utilize transportation funding

These transportation goals overlap significantly with each other, and could overlap with goals of partner-organization’s frameworks. Each of these goals has a corresponding set of measures that can be used to determine whether or not a community is truly “Smart”.



Potential ITE Actions

The following three options are listed in order from least to greatest level of effort. Each option could be pursued by ITE as an individual organization, but a more robust program could be created by working with other Smart Community partners and the SCC. For each option, the framework created as part of this project could be used to help communities determine how to become more connected and smarter.

Option 1 – Resource Webpage

Overview

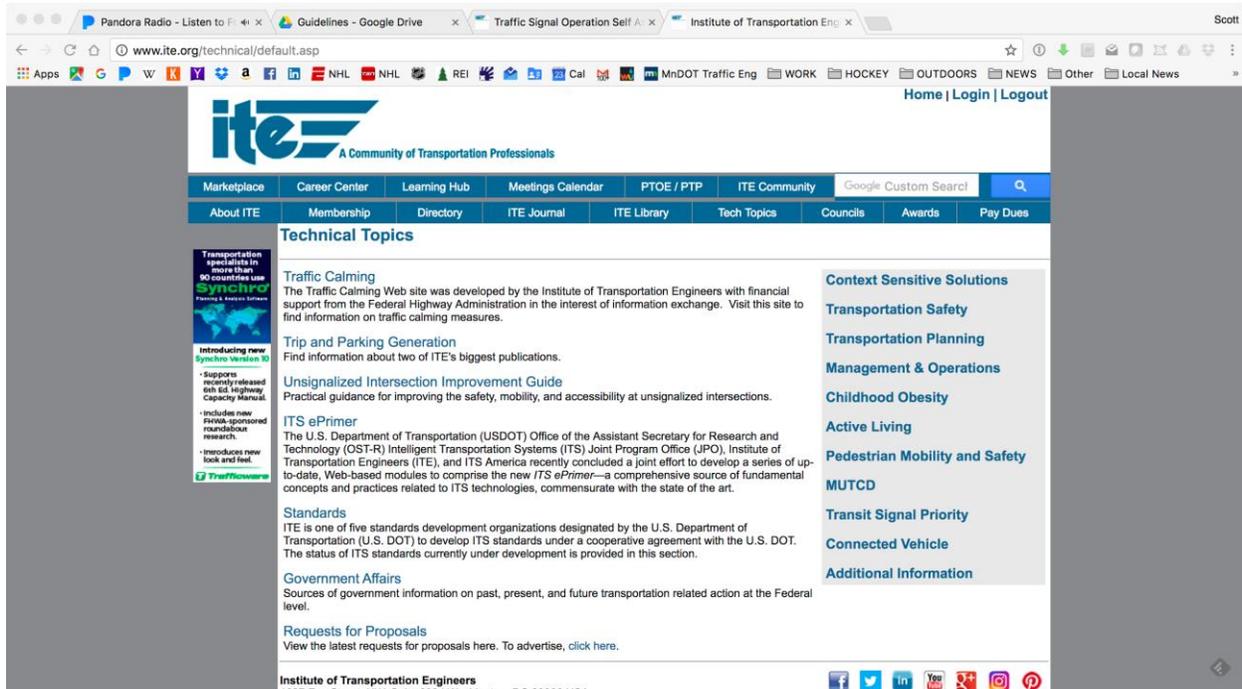
ITE has an opportunity to be a resource “hub” for technical resources and information related to traffic and transportation in Smart Communities. This can be achieved via the addition of a *Transportation in Smart Communities* resource webpage under the “Tech Topics” tab at ite.org. An example of this tab is shown in Figure 1.

The proposed *Transportation in Smart Communities* resource webpage would contain a wide variety of technical resources and information related to the traffic and transportation aspects of Smart Cities. First and foremost, the purpose of the page would be stated at the top and would contain information related to the latest ITE President and International Board of Direction (IBOD) Smart Community initiatives. A creative and appealing way to organize the page would be to use an infographic. There are many transportation infographic examples that could be referenced (e.g. MioVision’s My City Smarts survey). The webpage could include an embedded social media feed and specific hashtag (e.g. Twitter) that would enable the sharing of Smart Community news and latest developments, much in the same way ITE uses these tools to promote the ITE Annual Meeting. The webpage could be split into non-member and member sections, if necessary, to promote membership in the Institute. As webinars are developed on the subject, links could be provided to register for them or watch the recordings.

Some examples of *Transportation in Smart Communities* resources and materials to date are listed below:

- ITE IBOD 2017 Priority Initiative summary.
- Information regarding ITE’s smart community partnerships, such as with SCC, would be included. Links would be provided to each partner’s resources, such as the SCC Readiness Guide.
- TSM&O Council’s Smart Communities Task Force information and ITE Community page. A link to the TSM&O Council and ITE Community page would be included since ITE’s Smart Community involvement is being lead from the TSM&O Council.
- Kris Milster’s Smart Cities white paper presented to the IBOD in late 2016.
- Materials and feedback related to the Smart Communities Task Force’s efforts for Smart Community roundtable discussions at ITE district meetings in the spring of 2017.
- ITE Journal articles related to Smart Communities. This would include the February 2017 issue, which was dedicated to Transportation in Smart Communities, in addition to the July 2017 article.
- ITE Podcast series on Smart Communities.

- Potential list of *Transportation in Smart Communities* components and/or requirements, as described under the “Framework” section of this report.
- Information about a potential Transportation in Smart Communities Report Card. See associated description in Option 2.
- Information about a potential Transportation in Smart Communities Certification Program. See associated description in Option 3.
- SMART Team resources/bibliography resources.
- Deliverables from both 2017 Leadership ITE group projects. Deliverables include final paper and presentation materials.



In order to maximize the web traffic demand, the proposed *Transportation in Smart Communities* resource webpage itself must be accessible to anyone with an interest in Smart Communities and not require ITE membership to access the page. However, ITE could require paid membership to access some enhanced technical content or linked material as a way to promote membership in the Institute.

ITE could market and promote the page and partner with other organizations to link to it. An example of this would be the SCC, to which ITE established a partnership. The SCC contains a wealth of global Smart Community resources and includes a wide variety of industry partners and non-profit advisors. One of the most widely used SCC resource is the *Smart Cities Readiness Guide*. The *Smart Cities Readiness Guide* is the “world’s leading publication designed to help you create a vision for your city, build an action plan and measure your progress. Full of best practices and case studies, it is based on the experiences of cities like yours and the advice of the world’s foremost smart cities researchers and practitioners” (<http://na.smartcitiescouncil.com/article/resources>). This

guide would be an ideal place to link to the proposed ITE *Transportation in Smart Communities* resource webpage for additional Smart Community materials related to transportation.

Benefits

The ITE Transportation Systems Maintenance and Operations (TSM&O) Council conducted a Smart Communities survey in March 2017. When asked about Smart Communities and what role ITE can play, the second leading response was to “create a Smart Communities resource web page or portal” only behind “offer webinars on Smart Community subjects”. The primary benefit of developing the resource hub is providing the ITE membership with resources that they are looking for and may be unable to find elsewhere. ITE will have the opportunity to reach out to more partners and become a leader in Smart Communities through creating this resource hub. The secondary benefits include fewer required resources by ITE and the SCC partners, and it requires the least amount of lead time to provide information to the public/membership.

Anticipated Resources

The proposed *Transportation in Smart Communities* resource webpage, of the 3 options outlined as part of this project, is anticipated to require the least amount of ITE paid employee and volunteer resources. An estimate of resources on an annual basis is shown below. ITE would need a web designer to lay out the proposed webpage and ensure the current ITE site has adequate hosting capacity for additional material. This web designer would need to update the webpage with new materials from the TSM&O Council on a frequent basis, no less than once a month. The ITE TSM&O Council could be tasked with taking the lead in providing the technical content, and could include the list of resources in the previous section. This technical content would need to be provided when the webpage was set up, as well as on a monthly basis when the webpage would get updated. Finally, the ITE IBOD would need to provide updated goals and a vision for *Transportation in Smart Communities*.

Task	Sub-Task	Employee Category	Frequency of task	Approx. hrs. per frequency	Total FTE (annually)	Paid or Volunteer
Website	Initial Setup	Web designer	Once	40 hours	1.9% (40 hrs)	Paid
Website	Initial Setup	Technical	Once	60 hours	2.9% (60 hrs)	Volunteer
Website	Maintain Website	Web designer	Monthly	4 hours	2.3% (48 hrs)	Paid
Website	Maintain Website	Technical	Monthly	6 hours	3.5% (72 hrs)	Volunteer
ITE Goals/Vision		Technical	Yearly	16 hours	0.7% (16 hrs)	Volunteer
TOTAL PAID ITE FTE					~105%	Paid
TOTAL ANNUAL TIME PER VOLUNTEER (Estimated 10 volunteers. May be paid subcontractors)					~16.5% (344 hrs/yr)	Volunteer or Sub contractor

The success of the *Transportation in Smart Communities* resource webpage depends on keeping the material up-to-date and spreading the word to both ITE members and the SCC about the new resource. ITE has several methods to notify its members about the new resource including: Spotlight email newsletter, ITE Journal, and the All Member Forum on the ITE Community. An announcement could be sent to all ITE Districts and Sections to relay to members at the local level. Additionally, social media posts and the ITE.org homepage could have a link to the page when it is launched, much like how the ITE Annual Meeting is promoted. A specific hashtag could be created and a live social media feed could be provided on the webpage much like how the ITE Annual Meeting is promoted.

Option 2 – Smart Community Report Card

Overview

Another type of assessment that ITE could produce for cities is an annual Smart Cities Transportation report card. Unlike the certification program or resource page, this would not require a city to initiate contact with ITE or formally submit an application for Smart Community Transportation certification. Essentially, ITE will utilize staff and council/committee resources to develop a methodology and then on an annual basis apply the evaluation criteria to each major city (or limit it to the 50 or 100 largest cities) to determine a grade on a scale A through F in various categories or as a whole.

Several other peer organizations have launched similar annual report card programs (see the references section for links to their results and methodology):

- *American Society of Civil Engineers (ASCE) Infrastructure Report Card* – rates each U.S. state on an A through F scale for individual types of infrastructure (e.g., bridges, water, energy, parks, levees, waste, etc.).
- *Institute of Transportation Engineers (ITE) and National Operations Center of Excellence (NOCoE) (formally the National Transportation Operations Coalition) Traffic Signal Report Card* – rates the nation as a whole on an A through F scale for multiple categories (e.g., management, signal operations, timing practices, maintenance, and data collection). This report card is not issued every year but typically every 3 to 5 years.
- *Texas Transportation Institute Urban Mobility Scorecard* – measures total annual hours of delay, delay per commuter, total congestion costs, and congestion cost per auto commuter then ranks the 370 largest U.S. cities based on these metrics.
- *League of American Bicyclists Bicycle Friendly State Rankings* – rates each U.S. state on a point system 0 through 100 for multiple categories (e.g., legislation & enforcement, policies & programs, infrastructure & funding, education & encouragement, evaluation & planning).

Benefits

The report card has the benefit of creating more excitement about Smart Communities as communities work to get better grades each year. This could create more Smart Communities over time, and is a way to create enough interest in Smart Communities to make them a larger

priority for local and state governments. This option also provides a better means for agencies to request funding applications, and assists them in setting benchmarks and goals for the city while giving them opportunities for branding and press releases.

Anticipated Resources

One of the existing ITE Councils (and associated subcommittees, councils, or task forces) could be used for Smart Community Transportation evaluation or a new one could be created. The Transportation Systems Management and Operations (TSM&O) Council is already working in the Smart Cities arena and would be a good candidate home for this effort, depending on workload.

After Smart Community Transportation evaluation categories and criteria are developed, data will need to be obtained and vetted annually for each city to determine its ranking. The committee or council will rely on publicly available data and policies for each city, which can typically be found on the city's website. The final product each year could be an overall letter grade for each city and/or each category with a press announcement of the rankings of each city for that year, a page in the ITE Journal dedicated to the announcement, and a presentation of the top ranked city at the ITE Annual Meeting.

Each of the above report card programs use a unique set of evaluation criteria and reports its findings in a different way. ITE could consider following the model already being implemented for the *Traffic Signal Report Card* which would require delegating the majority of the workload to an advisory committee or technical council. ITE would have to choose a headquarters staff member (or two) to kick-off, lead, and monitor this effort throughout the year. Since the heavy lifting will be done by the group of volunteers, it is anticipated that approximately two ½ FTEs (or some other combination of staff and subcontractor time totaling one FTE) would need to be dedicated to overseeing this program, with additional impacts to other staff's time for website design, social media, publication, promotion, webinar training, and administration. ITE headquarters staff estimates that for development of the 2017 report card, 2,572 staff and subcontractor hours (1.23 FTE) were utilized. In 2010, 2,809 hours (1.35 FTE) were spent on the report card. ITE headquarters staff did not have an estimate for the number of volunteer hours spent by the advisory committee.

Task	Sub-Task	Employee Category	Frequency of task	Approx. hrs. per frequency	Total FTE (annually)	Paid or Volunteer
Website	Initial Setup	Web designer	Once	40 hours	1.9% (40 hrs)	Paid
Website	Initial Setup	Technical	Once	60 hours	2.9% (60 hrs)	Volunteer
Website	Maintain Website	Web designer	Monthly	4 hours	2.3% (48 hrs)	Paid
Website	Maintain Website	Technical	Monthly	6 hours	3.5% (72 hrs)	Volunteer
ITE Goals/Vision	Revisit Goals / Program adjustment	Technical	Yearly	16 hours	0.7% (16 hrs)	Volunteer
Oversight	Reviewing submissions, Program direction, publishing results	Technical	Weekly	40 hours	100.00% (2080 Hours)	Paid
TOTAL PAID ITE FTE					~105%	Paid
TOTAL ANNUAL TIME PER VOLUNTEER (Estimated 10 volunteers. May be paid subcontractors)					~16.5% (344 hrs/yr)	Volunteer or Sub contractor

Option 3 – Smart Community Certification

Overview

Under this option, ITE would take the “requirements for Transportation in Smart Communities” and use them to provide a Smart Community Certification to applying agencies.

There are several assumptions that are made for this proposed program. It is envisioned that a multidisciplinary Smart Cities Council will be the overall hub for the certification process. This is something that does not currently exist but is assumed ITE and partners would work with Smart Cities Council to develop. They will provide the overall certification and partners will only be responsible for approving the requirements for their section of the smart community as shown above. As such, in order for us to implement a certification program, it would be necessary for all partners and the Smart Cities Council to also be on board with the program. The Smart Cities Council should consist of one representative from each member organization. We are assuming that Smarty city certification applications are processed, evaluated, and awarded, semi-annually and would be awarded once based on meeting the requirements but requires renewals every 5 years to maintain certification status. The certification renewal could be based on changing

requirements (if any) that are based on changes in technology. It would be suggested that the Smart Cities Council have a quarterly board meeting for 2-days for all partners to collaborate.

Benefits

The Smart Community Certification program is one that requires extensive resources and will not be successful if it does not provide equivalent benefits to those that use it. Some of the anticipated benefits are shown below:

- **Cost savings for Agencies:** Agencies spend endless resources developing and maintaining their technologies, often unsure of what the technologies are. The certification program will guide agencies on what to establish, ensuring no wasted deployments, and provide them with guidelines on how to most efficiently maintain that system.
- **Funding requests:** It is anticipated that a Smart Community Certification program will lead to grant programs and federal funding. This may be something agencies can receive to achieve a Smart Community, because they are on the road to receiving certification and need more help, or because they have already achieved certification and may want funds to take next steps.
- **Enhanced productivity:** Smart Cities as a whole improve productivity. Agencies that are Smart Community certified will experience this enhancement in their transportation operations and maintenance programs.
- **The benefit to ITE,** once the certification is established, is being on the leading edge of changes and updates to Smart Communities in addition to being the premier resource for Smart Communities on an international level.

Anticipated Resources

It is expected that for ITE to manage the smart transportation section of the Smart Community Certification based on the assumptions above, the following activities annually will be required. It is estimated that some of the work will be done by a paid ITE employee, or volunteers / sub-contractors. The sub-contractors could constitute additional costs for ITE. Overall, it is anticipated that over one full time equivalent (approximately 1.25 FTE) would be required, with about 350 hours per year per volunteer in volunteer hours with an estimated need of 10 volunteers (some of which may have to be paid if it is subcontracted out).

- **Website development:** A one-time up-front resource will be required for development of the Website. It is anticipated that this will require coordination with partnering agencies and take 4 weeks of active time.
- **Maintain website:** Quarterly review of the website and all materials. Review will include adding resources for new technologies, posting articles about new methods used around the nation, adjusting requirements as-needed.

- Update requirements: Requirements to be updated every year based on new technologies and new strategies. A board will meet annually to review new technologies and determine whether they should be included in the next update. Completing the update will require a 5-day review meeting each year of all materials with both the ITE employee and the volunteer board. A paid employee will coordinate the meeting and collect information from the volunteer board for discussion. The board should consist of at least 10 people and have a mix of public and private members with technical expertise in the field. It is recommended that TSM&O Council be part of the board.
- Review applications: Applications will be accepted semi-annually (Applications due February and August). A paid employee will be required to do the initial review of all applications from agencies to ensure they meet the requirements. This is estimated to take 6 full-time weeks. From there, applications will be sent to the board to review. They will fill out a standard application based on the review that will be scored with all other board reviews. All passing scores will be submitted to the Smart Cities Council as approved for certification. Smart Cities Council submits certifications to agencies based on what other milestones have been achieved.
- Smart Cities Council Coordination: It would be necessary for regular correspondence with the Smart Cities Council and all partners to ensure consistency of the vision. It is expected a quarterly meeting will be necessary with the ITE paid member as a required attendee on behalf of the Board members mentioned previously.

Task	Sub-Task	Employee Category	Frequency of task	Approx. hrs. per frequency	Total FTE (annually)	Paid or Volunteer
Develop Website	Create website	Web Master	One-time	160 hours	N/A	Paid
Maintain Website	Maintain Website	Web Master	Quarterly	80 hours	14.14% (320 hrs)	Paid
Updating requirements	Collect and organize proposed changes to requirements and organize meeting with board	½ Technical ½ Admin	Yearly	80 hours	3.8% (80 hrs)	Paid
	Board meeting + organizing, finalizing, etc.	½ Technical ½ Admin	Yearly	120 hours	5.7% (120 hrs)	Paid

	Board meeting		Yearly	40 hours (ea.)	10+ board members	Volunteer / sub contractor
Certification Reviews	Initial application review	Technical	Semi-annually	240 hours	23.08% (480 hrs)	Paid
	Full application reviews		Semi-annually	120 hours (ea.)	10+ board members	Volunteer / sub contractor
	Final Scoring / consolidation of board reviews	$\frac{3}{4}$ Technical $\frac{1}{4}$ Admin	Semi-annually	160 hours	15.3% (320 hrs)	Paid
Smart Cities Council Coordination	Board reach-out for information, consolidate information, prepare meeting topics	$\frac{1}{4}$ Admin $\frac{3}{4}$ Technical	Quarterly	80 hours	14.14% (320 hrs)	Paid
	Smart Cities Council Meeting	Technical	Quarterly	40 hours	7.7% (160 hrs)	Paid
	Reporting to the board	Technical	Quarterly	24 hours	4.6% (96 hrs)	Paid
	Board information gathering, meeting reviews, etc.		Quarterly	16 hours (ea.)	10+ board members	Volunteer / sub contractor
Misc. Work	Miscellaneous work unaccounted for	$\frac{1}{4}$ Web Master $\frac{1}{4}$ Admin $\frac{1}{2}$ Technical	Weekly	8 hours	20% (416 hrs)	Paid
TOTAL PAID ITE FTE					~109%	Paid
TOTAL ANNUAL TIME PER VOLUNTEER (Estimated 10 volunteers. May be paid subcontractors)					~16.5% (344 hrs/yr)	Volunteer or Sub contractor

Marketing and Outreach

The deliverable for this project is a usable framework for communities to help them develop smart community programs and plan projects to work towards creating a smart community. Knowing that many stakeholders are not engineers, one of the goals of the program is to create materials that are easily understood by a range of audiences and helps get, and keep, communities engaged. Effective outreach materials need to constantly evolve with technology: videos, podcasts, infographics, handouts/pamphlets, and social media outreach may be used to engage communities in the process of building a smart community.

Most infographics depicting smart cities don't explain much about inter-connected systems and how cities could use the internet-of-things to save money and create a more efficient city. Most graphics show a city skyline and small bubbles with different aspects of a Smart Community, which aren't helpful in outreach or community engagement. While it is difficult to create graphics explaining complex, technical, ideas to a wide range of stakeholders, there are a number of other outreach tools that can help explain the concepts in easily-understood ways.

Creating outreach tools for specific audiences - elected officials, city department commissioners, city planners/engineers, business leaders, the general public, etc. - will help to keep different groups engaged in the process. This level of engagement will take time and shouldn't be the sole responsibility of ITE, but it should be a long term goal of a partnership with other groups and cities. Specific topics covered by outreach materials could include

- Potential cost savings
- Project implementation strategies
- Implementation costs and return on investment
- Importance of multidisciplinary teams for planning and implementation
- Case studies of successful projects

These topics will not be easily shown in infographics and won't be effectively conveyed in extensive reports. A creative mix of materials will be required to provide information and engage the community. An opportunity exists to further engage the student chapters of ITE using a competition to create outreach materials that are catered to a specific audience. An example competition would include a Smart Community topic and material types (video, infographic, pamphlet, etc.), and allow the students to use their creativity to create materials for the website. Winning submissions could be rewarded with grants for attending the Section Meetings or Annual ITE Meeting.

Recommendations and Conclusions

As technology and knowledge progress, the team expects the Smart Communities initiative to transform over time. The buzzwords and current trends may change slightly over time, but the general goals will likely remain the same. Similar to safety initiatives that transformed from Context Sensitive Solutions, to Complete Streets, to Vision Zero, the general goals have remained the same, but the trends change frequently.

The certification program requires a lot of time and resources. Additionally, other organizations have been pursuing similar certification programs (refer to the references sections for more information) ITE's resources would be better spent looking to the future and staying ahead of the changes in Smart Communities. To keep ITE at the forefront of the discipline, acting in a

proactive instead of reactive manner, the SCC should focus on upcoming changes that relate to Smart Communities instead of spending the time to build a certification program that could quickly become obsolete. The certification program is more of a reactive option that requires such extensive resources that our team recommends against this option at this time. However, it may be one worth pursuing down the road as Smart Communities become more common practice.

The report card requires fewer resources than the certification program but would still require significant volunteer hours. The return on investment would come in the form of name recognition outside of the transportation community if the results of the report cards were readily available and published in a timely manner. The report card option should be revisited once the resource page is functional and based on lessons learned from the re-launch of the Traffic Signals report card.

The resource hub was well-received by members of ITE that participated in the survey on Smart Communities earlier this year. The team recommends that ITE work with the Smart Cities Council and partners to pursue the resource hub option as soon as possible. Since the three options are not mutually exclusive, once the resource hub is active, ITE IBOD can revisit their goals for the future and potentially pursue the other options.

References/Resources

- Washington, DC and Leading US Cities Partner on Guidelines for Smart Cities
 - <http://octo.dc.gov/release/washington-dc-and-leading-us-cities-partner-guidelines-smart-cities>
- Important: Smart Community Scheme Guidelines - Board of Investment
 - <http://www.investmauritus.com/media/300689/smart-city-scheme-guidelines.pdf>
 - Key word: smart cities branding
- Four Critical Elements in Smart Community Branding Strategy
 - <http://www.smartresilient.com/four-critical-elements-smart-city-branding-strategy>
- American Society of Civil Engineers (ASCE) Infrastructure Report Card
 - Results – <http://www.infrastructurereportcard.org/americas-grades/>
 - Methodology – <https://www.infrastructurereportcard.org/2009/methodology-development-report-card-grades.html>
- National Operations Center of Excellence (NOCoE) Traffic Signal Report Card
 - Results and Methodology – <http://www.ite.org/reportcard/>
 - Self-Assessment Form – <http://www.ite.org/selfassessment/2007/default.asp>
- Texas Transportation Institute Urban Mobility Scorecard
 - Results – <https://mobility.tamu.edu/ums/>
 - Methodology – <http://static.tti.tamu.edu/tti.tamu.edu/documents/mobility-scorecard-2015-appx-a.pdf>
- League of American Bicyclists Bicycle Friendly State Rankings
 - Results – <http://bikeleague.org/content/ranking>
 - Methodology – <http://bikeleague.org/content/bicycle-friendly-state-categories-and-maps>
- ITE IBOD 2017 Priority Initiative summary.
- Information regarding ITE's smart community partnerships, such as with SCC, would be included. Links would be provided to each partner's resources, such as the SCC Readiness Guide.
- TSM&O Council's Smart Communities Task Force information and ITE Community page. A link to the TSM&O Council and ITE Community page would be included since ITE's Smart Community involvement is being lead from the TSM&O Council.
- Kris Milster's Smart Cities white paper presented to the IBOD in late 2016.
- Materials and feedback related to the Smart Communities Task Force's efforts for Smart Community roundtable discussions at ITE district meetings in the spring of 2017.
- ITE Journal articles related to Smart Communities. This would include the February 2017 issue, which was dedicated to Transportation in Smart Communities, in addition to the July 2017 article.
- ITE Podcast series on Smart Communities.
- Potential list of *Transportation in Smart Communities* components and/or requirements, as described under the "Framework" section of this report.
- Information about a potential Transportation in Smart Communities Report Card. See associated description in Option 2.
- Information about a potential Transportation in Smart Communities Certification

- Program. See associated description in Option 3.
- SMART Team resources/bibliography resources.
 - Deliverables from both 2017 Leadership ITE group projects. Deliverables include final paper and presentation materials.
 - The What Works Cities Standard
 - <https://whatworkscities.bloomberg.org/certification/>

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"ITE Smart Communities Survey". Institute of Transportation Engineers Transportation Systems Management and Operations Council. <https://www.surveymonkey.com/r/ITESmartCommunities>. Accessed 4 May 2017.

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Appendices

Appendix A: Transportation in Smart Communities Framework

Improve Roadway Safety			
Major Requirements	#	Requirement Specifics	Requirement Measurement
Roadway Safety Improvement Requirements:	1	Users should be notified of incidents, and be provided with an alternative route to circumvent the incident	Measured by implementation
	2	A HERO (Highway Emergency Response Operator) program should be implemented to assist at risk and stranded motorists	Measured by implementation
	3	Intersections and roadways should have smart lighting	Measured by percent of smart lit roadways
	4	Dynamic speed limits should be implemented where warranted	Measured by percent of speed limits that are dynamic in applicable areas
	5	Road construction workers should have appropriate safety measures, and be alerted to threats	Measured by implementation
	6	Live crash prediction should be used on freeways, and based on the results traffic flow should be managed to minimize risk	Measured by percent of miles being monitored
	7	Vehicles should be connected, and intersections should be equipped with connected vehicle transponders	Measured by percent of connected intersections, and percent of vehicles that are connected
	8	Dynamic Pavement Markings should be implemented where applicable	Measured by percent of applicable roadways with dynamic markings
	9	Safe bicyclist routes should be suggested to users via an app and a website	Measured by implementation
	10	Users should be warned in real time of lane blockages	Measured by implementation
	11	Pedestrian crosswalks should be signalized	Measured by percent of pedestrian crosswalks that are signalized
Reduce Congestion, Travel Time, and Emissions			
TMC (Traffic Management Center) Requirements:	1	The TMC must be staffed daily	Measured by number of staff per TMC, per day
	2	Data with no private details, such as traffic counts or AADT, should be publicly accessible	Measured by number of publicly available databases
	3	Assets (such as first responders or HERO units) should be deployed automatically after incidents occur	Measured by implementation
Traffic Signal Requirements:	1	Traffic signals should have actuated control when recommended through use of standards (MUTCD)	Measured by percent of applicable intersections with actuated control implemented
	2	Traffic signals should have the ability to be managed remotely	Measured by percent of remotely accessible traffic signals
	3	Traffic signals should be coordinated	The type of coordination used should best match the area's AADT (Annual Average Daily Traffic)
	4	Traffic signals should be retimed when determined to be inefficient by changes in delay or volume	Measured by percent of efficient traffic signals
	5	Traffic signals should be capable of transmitting SpAT (Signal Phase and Timing) data	Measured by percent of SpAT traffic signals
ITS (Intelligent Transportation System) Requirements:	6	Traffic signals should use TSP (Transit Signal Priority) when applicable	Measured by percent of signals on transit routes equipped with TSP
	1	DMS (Dynamic Message Signs) should be in place	Measured by number of DMS per applicable corridor. Frequency and applicability is determined by AADT
	2	PTZ (Pan-Tilt-Zoom) cameras should be in place	Measured by number of PTZ cameras per applicable corridor. Frequency and applicability is determined by AADT
Public Transportation Requirements:	3	Wireless and Bluetooth sniffers should be used	Measured by number of sniffers per applicable corridor. Frequency and applicability is determined by AADT
	4	ILCS (Intelligent Lane Control Signals) should be installed	Measured by number of ILCS per applicable corridor. Frequency and applicability is determined by AADT
Parking Requirements:	1	Users should be notified of transit delays and estimated arrival times via a free app	Measured by implementation
	2	Transit vehicles should have a GPS for ETA estimates and location reporting	Measured by percent of GPS capable transit vehicles
Roadway Requirements:	1	Users should be able to see live parking availability notifications for high turnover parking lots and on-street parking	Measured by percent of live parking spaces out of total applicable parking
	2	Parking lots and on-street parking in congested areas should have dynamic pricing	Measured by percent of dynamically priced parking spaces in congested areas
	1	Roadways should have HOV or HOT (High Occupancy Toll) lanes where suggested by HCM methods	Measured by percent of applicable roadways with HOV or HOT lanes
	2	Toll and HOT lanes should be dynamic, and tolls should be adjusted based on time of day to encourage driving outside of peak hours	Measured by implementation
Transportation Maintenance Requirements:	3	Roadways should have system or traffic flow detection in place	Measured by number of miles per detector
	4	Roadways should have automated contraflow lanes where applicable	Measured by percent of applicable roadways equipped with contraflow lanes
Cyclist requirements:	1	The public and third parties should be notified of road work, closures, and detours via an app and the DOT website	Measured by implementation
	1	A bikeshare system should be in place in dense or congested urban areas, and users should be able to see live bicycle availability. Studies should be conducted to determine the number of bicycles that should be kept available.	Measured by implementation
Weather Reporting Requirements:	2	Roadways should be equipped with cyclist lanes, or dedicated cyclist roads should be in place	Measured by percent of bike-friendly roads
	1	Users should be made aware of driving and parking conditions via an app and the DOT website	Measured by implementation
Provide Equal Opportunity Affordable Public Transportation			
Common Pay System Requirements:	1	A mobile app and website should be made available to pay public transportation fares, as well as see applicable information and instructions	Measured by implementation, The app should list transportation hub locations, and users should be able to input a desired destination, and compare the options and costs of public transportation to get there. They should then be able to purchase that route, and be directed on how to take the route
	2	Public transportation hubs should have kiosks for users without mobile phones	Measured by percent of transportation hubs with kiosks
	3	A dynamic discount system should be implemented to encourage the use of public transportation during the heavily congested times of day	Measured by implementation
Low Income Public Transportation Requirements:	1	Vouchers for public transportation should be made available to low income members of society	Measured by implementation
	2	The public should be able to self-enroll in the low income public transportation program via website by providing their income, which can be verified by their employer	Measured by implementation
3	Public transportation should have access points in low income neighborhoods	Measured by percent of low income neighborhoods with a public transportation access point within 2 blocks	
Increase Economic Throughput and Activity			
Transportation Network Reliability, Resiliency, and Redundancy Requirements:	1	The transit network should completely and efficiently connect the public to businesses, points of interest, their workplace, and their homes.	Measured by survey results
	2	Travel time variability must be within an acceptable range	Measured by percent of the time that travel time is acceptable
	3	The transportation network should have the ability to be dynamically adjusted	Measured by implementation
Requirements for Transportation Plans for Economic Expansion:	4	The transportation network should be prepared for emergencies, and be able to continue functioning even when some modes of travel are unavailable	Measured by implementation
	1	An in-fill development plan should be in place to connect existing transportation networks	Measured by implementation
	2	An efficient freight network must be in place	Measured by implementation
	3	A plan for the effects on infrastructure caused by an increase or decrease in population must be developed	Measured by implementation
	4	Transportation should be equally available to all levels of society	Measured by survey results
	5	Incentives should be offered to businesses that follow TDM (Transportation Demand Management) strategies	Measured by implementation
6	Economic expansion should be tracked before and after infrastructure investments	Measured by implementation	
Efficiently Utilize Transportation Funding			
Transportation Funding Utilization Efficiency Requirements:	1	Money from the city budget should be specifically dedicated for ITS related technologies	Measured by percent of budget dedicated to ITS
	2	A bikeshare program should be funded completely	Measured by implementation
	3	Congestion maps should be used to identify which areas most need attention, and funds should be allocated accordingly	Measured by implementation