E-PARTICIPATION IN TRANSPORTATION PLANNING: T-LINK CALCULATOR CASE STUDY

BY

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ABSTRACT

Throughout the world, people travel from point A to point B every day via one or multiples modes of transportation and for a variety of reasons. Even though transportation is vital, most people seem to take it for granted. A recent survey conducted by the Mineta Transportation Institute titled "What Do Americans Think about Federal Transportation Tax Options?" found that a majority of Americans are not in favor of any particular tax option for transportation, and the three options that performed fairly well in the survey were only supported by approximately 40% of the surveyed individuals (Weinstein Agrawal & Nixon, 2010). Do average citizens recognize the importance of transportation in their daily lives, and do they not realize its true costs? Thus, transportation agencies are faced with the dilemma on how do we engage and educate the public on how much transportation costs.

Some Departments of Transportation, like the Kansas Department of Transportation (KDOT) are trying to remedy this with electronic engagement and educative outreach. For example, KDOT tried e-engagement with its T-Link Calculator, which was an online tool for allowing the public to try their hands at making transportation budgetary decisions. However, we currently have no way of knowing what works and why. To address this shortcoming, this study creates and evaluates the T-Link Calculator using a model called the E2DG Model of E-Participant Engagement based on three successful components of e-engagement: e-policymaking, e-learning and digital game-based learning. Since the tool in question, the T-Link Calculator has attributes of all three tools it was impossible to classify it as one type. Then a case study was conducted applying the model to the T-Link Calculator. Twenty Kansans were interviewed on their level of engagement/educative experience with the T-Link Calculator using the E2DG Model. The

model emphasizes the importance of engaging users on the following criteria: Accessible/Fair, Delivery/Story, Cognitive/Challenge, Relevance/Achievements, Collaboration/Feedback, Reflection, Promotion, Time and Privacy/Security. From the interviews and using this criterion, it was determined that the T-Link Calculator succeeds in some areas of engagement and fails in others. The positives were ease of usability, simplicity of the layout, instant results provided by "sliders" and graphs, the "Learn More" features, the different levels with "Basic" and "Advanced Mode," and the short amount of time required to interact with the site. However, the downsides for several individuals included not understanding the interactive graphs, the T-Link's Adobe Flash platform not being compatible with certain applications or devices, and the terminology used. Some of the modifications that people suggested were providing instant feedback on individual results, expanding the introduction, providing a clear purpose for the exercise, and providing more definitive information on the actual budget numbers. If these modifications were made, this would help KDOT take the T-Link Calculator to the next level of engagement while providing a platform that would be more enticing to citizens for learning about the high costs of transportation.

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CHAPTER ONE – INTRODUCTION

Background

Throughout the world, people travel from point A to point B every day via one or multiple modes of transportation and for many reasons. Even though transportation is vital, most people seem to take it for granted. A recent survey conducted by the Mineta Transportation Institute, "What Do Americans Think about Federal Transportation Tax Options?" (Weinstein Agrawal & Nixon, 2010), found that a majority of Americans are not in favor of any particular tax option for transportation, and the three options that performed fairly well in the survey were only supported by approximately 40% of the surveyed individuals. "The most popular were the 0.5¢ sales tax (43% support) and the 10¢ gas tax increase with revenue to be dedicated to projects that would reduce the transportation system's impact on global warming (42% support). Close behind was support for a 10¢ gas tax increase spread over five years; this option received support from 39% of respondents" (Weinstein Agrawal & Nixon, 2010,7). Do average citizens recognize the importance of transportation in their daily lives, and do they not realize its true costs?

Transportation systems in general are easily taken for granted, especially streets and roadways, because the surfaces themselves seem so permanent, and people use them every day until one day the roadway just fails. "Americans have rarely been forced to recognize, on a national scale, the mortality of our roads because we only began building them, on a national scale, in 1956" (Stoeltje, 2008, 42). Thus, Americans are only in the beginning stages of learning about what happens when aging transportation systems begin to stop working and the cost that would be associated with replacing the whole system. In the United States, often times, the costs

associated with new construction or roadway maintenance is hidden because citizens never see an itemized bill, but these are real costs that each citizen pays when they purchase gasoline or pay for vehicle registration. However, it is not too hard for citizens to see the personal cost in the form of increased car care due to traveling on ailing roads. "A 2008 report by TRIP, a Washington D.C. – based, national transportation research group, found that the average American motorist pays an additional US $413 annually for additional vehicle maintenance needs and increased fuel consumptions caused by driving on poorly maintained roads" (Stoeltje, 2008, 42).

On September 25, 2008, a public forum titled "Top Transportation Issues Facing the Nation" held at the Robert J. Dole Institute of Politics in Lawrence, Kansas featured several prominent transportation experts from across the country to address the question, "How do we encourage citizens to spend more on transportation infrastructure?" Deb Miller, Secretary of the Kansas Department of Transportation, stated that the transportation profession as a whole needs to do a better job in raising awareness about the importance of transportation finance. She mentioned that the average driver in Kansas is paying approximately $28 a month for the current system through fuel taxes whereas most Kansans pay substantially more for their monthly cable or cell phone bill. On September of 2009, Jack Basso, the COO of the American Association of State Highway and Transportation Officials, presented the following information at the annual conference of the Southeast Association of State Highway and Transportation Officials in Biloxi, Mississippi: "…the U.S. needs to spend between $225 billion and $340 billion per year for the next 40 years or so to catch up with its infrastructure deficit. It's spending around $90 billion now" (Bruns, 2009, np).

Communication Tools

The recent concern about transportation finance has raised this question: How do we effectively start a dialogue with citizens about the importance of funding to either maintain or improve the current system? Recently, several state Departments of Transportation (DOTs) are experimenting with different communication techniques to engage citizens on transportation issues (Schneweis, 2010). Kyle Schneweis, the Ex-Chief of Governmental Affairs for KDOT, says one reason spurring the recent interest is that transportation officials recognize the current apathy that exists among citizens and politicians in order to pass a new highway bill. Thus, DOTs see the need to educate citizens on various transportation initiatives to garner the necessary support to maintain current and future levels of mobility.

New communication applications such as e-mails, websites, blogs, Facebook, and Twitter are playing an increasingly significant role in citizen engagement. Most agencies use at least one form of technology to communicate with the general public, and the most common forms are Internet websites and emails (Russell & Herzer, 2003). These technologies greatly enhance the public's access to special projects. Yet, there is general confusion among agency administrators on the role that technologies play in communicating with the public. This is especially true for transportation agencies where research seldom delves into the integration of these technologies in an overall strategy (Russell & Herzer, 2003).

One experimental technique under trial by the Kansas Department of Transportation (KDOT) is the T-Link Calculator (Kansas Department of Transportation, 2008) (see Figure 1). Eric A. Morris, (2009) a writer with the New York Times, likens the T-Link Calculator to the popular city-building simulation game released in 1989 known as SimCity. The author was impressed by the game-like format due to its innovative method of obtaining feedback from citizens on transportation issues while educating citizens on the true costs of public services. Morris (2009, np) states, "The T-Link Calculator allow[ed] you to set [a] transportation policy in Kansas and see the fiscal results of your choices." Users of the tool can adjust revenue by altering the projected funding that would be received through taxes, raising or lowering different levies, user fees or transfer payments. Conversely, on the spending side, citizens have the option of financing new bike/pedestrian improvements, improving highway pavements, adding new lanes to existing highways, or increasing mass transit options. The main point of the tool is to educate citizens regarding the tradeoffs between financing one system versus another, and to be strategic especially considering the long-term financial and infrastructure impacts on the entire system. Furthermore, if the user has no prior knowledge of allocating various resources, each option

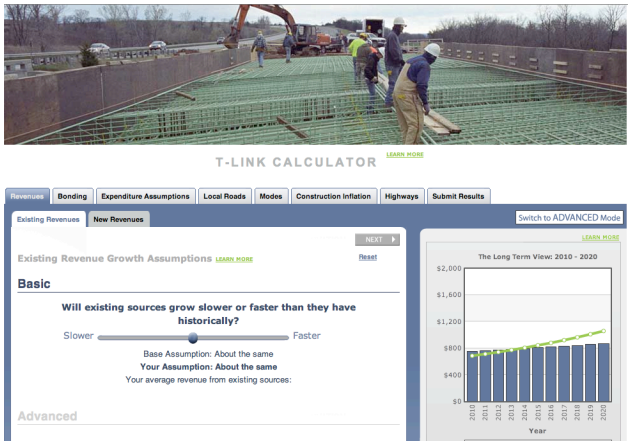

Figure 1. Front-page of the T-Link Calculator

Figure 2. Learn More Feature

offers a "Learn More" (see Figure 2) link that provides comparisons to other states' historical and inflation information.

KDOT Tools

Originally, the T-Link Calculator was created as an interactive tool that would be used by the T-Link (Transportation-Leveraging Investments in Kansas) task force assembled by KDOT Secretary Deb Miller in 2008. Affiliated T-Link members included transportation experts and influential community stakeholders throughout Kansas that would help guide a new strategic approach for transportation in the state. However, due to several delays in announcing the new task force, KDOT decided to introduce the interactive web-based T-Link Calculator to the general public.

Like other state DOTs, KDOT is experimenting with different communication tools to educate citizens about the costs associated with various transportation programs. Kansans currently have high expectations for what KDOT should be providing in transportation infrastructure and services, but have reservations about paying more in taxes (Schneweis, 2010). The pressures to provide high quality service and the increasing costs made it necessary for KDOT to engage the general public on transportation finance. In addition to the T-Link Calculator, KDOT recently released another interactive web-based tool called TWORKS to allow residents to see where and how their tax dollars are being spent around the State. The tool provides information on how transportation spending applies to Kansas in providing jobs, safety, and economic development. The TWORKS tool also allows residents to see firsthand the benefits of transportation spending in every Kansas County.

Both the TWORKS and T-Link Calculator are tools that the public can use to learn about transportation finance in the state. Furthermore, these types of programs create a level of transparency for where tax dollars are spent, and it helps to establish trust between KDOT and their constituents. James Surowiecki (2004), the author of "The Wisdom of Crowds," mentions that many Americans have always been in favor of keeping government small and taxes low. However, after the boom of corporate tax shelters in the 1990s, many Americans have become even more skeptical of the current tax system; thus, wondering about the fairness factor when a certain percentage of citizens were given a free ride (Surowiecki, 2004). To make matters worse, the media coverage of pork barrel projects and frivolous purchases raised awareness on wasteful government spending, which added to the public's distrust. Finally, most citizens have no interest in reading the state budget, whereas the T-Link Calculator provides a quick overview of the budgetary decisions that are made at the state level.

In 2010, Kyle Schneweis, stated that after increased popularity gains from briefings, feature stories, news websites, and media, the T-Link Calculator still failed to engage citizens. Most of the constituents that played with the program were from out-of-state, and not the target audience that KDOT was hoping for. The lack of success with the T-Link Calculator was ultimately attributed to the public's apathy for transportation issues. According to an interview with Julie Lorenz (2010), Director of the Public Affairs Department, she and Schneweis were both disappointed by the response to the T-Link Calculator from Kansans.

After interviewing Schneweis, several possibilities exist as to why the T-Link Calculator failed to gain interest. This study will concentrate on whether the T-Link Calculator tool has all the

necessary components to facilitate an effective engagement/educative experience, which requires defining what kind of electronic tool the T-Link Calculator actually is. There are different thoughts on what kind of tool the T-Link Calculator is. KDOT sees the T-Link Calculator as an *e-learning tool*, whereas, Morris (2009) describes the tool as an *e-policymaking game*. Due to its simulation game-like qualities, where the citizen plays the role of being the policymaker on the transportation budget, the T-Link could be categorized as a *digital game-based learning* tool as well. I contend that the T-Link Calculator crosses into all three of these categories and cannot be placed firmly into any one type. Thus, I will utilize components from the three models--e-policymaking, e-learning, and digital game-based learning--to evaluate the engagement and educative effectiveness of the T-Link Calculator. Before embarking on the assessment, a clear consensus needs to be reached on the evaluation criteria and a new model needs to be developed that incorporates the principles of engagement and education from what is considered most effective from the e-policymaking, e-learning, and digital game-based learning models.

Overview

The study has three main goals. The first goal is to create an "e-participant" engagement model incorporating e-policymaking, e-learning, and digital game-based learning design criteria. Ultimately, this combined model is called the "E2DG Model of E-Participant Engagement". The second goal is to evaluate the effectiveness of the T-Link Calculator using the E2DG Model. After the evaluation, the third goal is to assess lessons learned to determine what might improve future transportation e-engagement processes.

Information for this case study was obtained through semi-structured interviews with 20 Kansas residents. The analysis was based on a set of questions as to whether the T-Link Calculator is engaging based on engagement criteria associated with e-policymaking platform, e-learning tool, and digital game-based learning. Also, I asked participants to highlight any general knowledge that was obtained from using the T-Link Calculator.

Chapter 2 is a literature review related to electronic engagement and education tools focusing on the engagement criteria for the three models: e-policymaking, e-learning tool, and digital game-based learning. Chapter 3 is the methods section, which discusses creation of the model (E2DG Model of E-Participant Engagement) used in the evaluation of the T-Link Calculator and the interview process. After the methods section is Chapter 4 with the results of the evaluation of the T-Link Calculator. The final chapter is a discussion of the results and the lessons learned that are relevant for future e-engagement processes by departments of transportation.

CHAPTER 2 - REVIEW OF LITERATURE

Introduction

As a web-based tool, the T-Link Calculator is multi-faceted. Morris (2009), with the New York Times, saw the potential for the T-Link Calculator to serve as an e-policymaking platform by allowing ordinary citizens to actively interact with a web-based tool to make theoretical decisions on transportation finance in Kansas. "The T-Link Calculator allows you to set transportation policy in Kansas and see the fiscal results of your choices" (Morris, 2009, np). Furthermore, Morris went on to define the T-Link Calculator as an online game for citizens. He compared the T-Link Calculator to SimCity, a popular digital game-based learning (DGBL) software that has received attention nationally, and proceeded to nickname the T-Link Calculator as "SimBudget" (Morris, 2009, np). KDOT's original intent was to have the T-Link Calculator serve as a web-based e-learning tool to engage citizens on the topic of transportation finance. However, another potential role for the T-Link Calculator is to provide a platform for citizens to participate in policymaking electronically.

The literature review will look at the educative and engagement properties for e-policymaking, e-learning, and digital game-based learning. Due to different qualities that exist within the T-Link, it is hard to classify the tool as being one or another. Thus, we will look at each of these different applications to learn what makes these types of tools most effective in regards to engagement. This will provide the necessary criteria to properly evaluate the T-Link Calculator. From the fields of policy and education, the following is currently known on the subject of engagement for these types of applications.

E-Policymaking

The first engagement application is e-policymaking. The T-Link fits into the classification of an e-policymaking tool because it tries to engage citizens in the actual decision-making process by asking the citizen, "How much would you spend on this transportation mode versus another?" E-policymaking "is concerned with the use of information and communication technologies to engage citizens, support the democratic decision-making processes, and strengthen representative democracy" (Macintosh, 2004, 2). This section will cover the increased popularity of e-policymaking, its different levels, reasons for involving citizens, barriers to involvement, and design considerations.

Popularity of E-policymaking

Over the last decade there has been increasing interest in the development of new methods for public engagement that allow for larger audiences to participate in the policy debate (Macintosh & Smith, 2002). The two previous Presidential administrations, Clinton and G. W. Bush, both pushed for new tools that would allow citizens to be more actively involved in the development of policies and rules via the Internet (Scott, 2006). Shane (2005, 147-148) suggests that the new e-democracy initiatives at the federal level aim to "enlarge significantly a genuine public sphere in which individual citizens participate directly to help…make government decisions." The launch of Regulations.gov in 2003 by Mitch Daniels, Director of Office of Management and Budget (OMB), stated e-democracy "will democratize an often closed process and enable every interested citizen to participate in shaping the rules which affect us all" (Coglianese, 2006, 946).

Citizens themselves are also insisting that governments be more transparent and accountable while providing opportunities for public input on important policy issues (Scott, 2006). A

relatively new survey released by the Pew Internet and American Life Project found that over 70% of citizens have been to a government Website for one reason or another (Larsen & Rainee, 2002). The Internet reduces the intermediate hurdles that used to make it more challenging to share information with citizens (Ho, 2002). Robert O'Neill, Jr, (2001, 6) previous president of the National Academy of Public Administration, remarked that "as more information reaches the citizen, the greater the potential for them to influence and make informed choices regarding how government touches their lives. That potential gives new meaning to a 'government of the people, by the people and for the people.'"

Furthermore, public authorities especially at the local level are seeking more citizen involvement in order to improve outcomes on complex, controversial decisions that need to be made (Scott, 2006). Government websites provide a new forum for citizens to engage in local and public issues while deepening democracy by possibly allowing disengaged or disenchanted citizens the opportunity to reengage on government issues (Scott, 2006; Coleman & Gotze 2010; Hague & Loader 1999). This has led to a steady increase in the number of web-based pubic-involvement programs at all levels of government: national, state, and local (Scott, 2006).

Levels of E-policymaking

There are also different levels of e-policymaking. Citizens can engage in a one-way relationship where the government produces and delivers the information, two-way relationships that allow citizens to provide feedback to government, or a dynamic relationship where citizens are actively involved in defining the process and information for the policy (Macintosh, 2004). However, most public involvement initiatives to involve citizens in the policy-making process have tended to be more like public relations with one-way communications from the agency (Innes &

Booher, 2000). "While clearly education is an essential prerequisite to meaningful public participation, often the process stops with the education of the public and does not proceed to the education of the agency" (Innes & Booher, 2000, 9). Also, the Internet can be a hindrance to authentic dialogue that occurs with in-person discussions.

Citizen Involvement

There are three main reasons to involve citizens in the policy-making process:
(1) generate higher quality policies at the national level, (2) build trust along with gaining acceptance for the policy, and (3) share the responsibility of policy-making with public stakeholders (Macintosh & Smith, 2002). The e-democracy system needs to be designed with the following factors in mind:

1. Reach a wider audience to enable broader consultation,
2. Accessible and more understandable to the target audience,
3. Support deliberative debate,
4. Analyzing contributions to support the policy-makers and improve the policy, and
5. Provide relevant and appropriate feedback to citizens to ensure openness and transparency in the policy-making process (Macintosh & Smith, 2002).

Macintosh and Smith suggest that the process of designing e-democracy tools is complex due to the multifaceted nature of governance. "For example, democratic needs for openness and transparency may conflict with needs for ease of use and simplicity of access" (Macintosh & Smith, 2002, 259). Furthermore, citizens' knowledge of technology and communicative capabilities are unequal making it necessary to design a system that is easy to use and understand by a diversity of users.

Barriers to Citizen Involvement

Coglianese (2006) states that there are three barriers that can negatively impact citizen involvement: motivation, information, and cognition. The chief barrier is cognitive. Developing policy requires citizens to have a minimum understanding about specific agencies and the new rules that are being proposed. Often times, agency officials have no formal training or background in how to educate the public (Coglianese, 2006). As a result, the agency tends to overwhelm citizens with the sheer volume of information posted on the website making it cumbersome for civic involvement (Shenk, 1997). Furthermore, even locating the information on the important policy decision can require sophistication from the user (Coglianese, 2006). For example, a dozen students from Harvard's Kennedy School of Government participated in a 2004 study "to see how easy it would be for reasonably knowledgeable citizens to find information about rules proposed by federal agencies" (Coglianese, 2006, 965). Surprisingly, the students were only able to find about half of the dockets that they were instructed to find even though all students were adept at using the Internet and interested in regulations. A third consideration is the motivational barriers. If the policy issue is viewed as having little effect on the citizen's life, this will impact the citizen's overall motivation to become involved. Also, collective action by citizens may not even occur even when a well-known problem exists. True, the Internet does decrease the cost of citizen participation; however, it also decreases the cost of other activities that compete for citizens' attention, such as playing video games, communicating with family and friends, reading the news, or tracking sports (Coglianese, 2006).

Other Design Considerations

For creating policy-making tools, designers need to account for other important considerations. Macintosh (2004) outlines six aspects to consider during the design process. First, the type of

technology that is used to engage the citizen; how will the citizen interact with the information; and what type of technology is used to support the participation. The second consideration is the rules of engagement. What information is required or collected from the participant and defining what is allowed and not allowed during the e-participation process. Third, the amount of time that is required from the citizen to participate. Fourth, the accessibility for the citizen, and how easy is it for the citizen to access the information. A fifth consideration is the promotion of the e-democracy tool. Traditional methods of promotion can be used such as press releases and news broadcasts, but newer methods should also be considered like an e-postcard that says, "Tell a friend." With an easy click of a button, a citizen can submit an electronic postcard through email to another interested party such as a friend or relative. A sixth consideration for engagement is protecting personal information so participants do not have to worry about their information being compromised. Thus, security needs to be addressed with online platforms, and openly documented in the form of a security statement (Coleman & Gotze, 2010). Finally, it is important to evaluate the overall results and see if improvements can be made in the policy-making process (Macintosh, 2004). Agencies using e-democracy tools need to develop a better understanding of when it is appropriate to use certain tools and how to combine different tools to increase the level of engagement (Macintosh & Whyte, 2006).

New advancements in information technology that make the T-Link Calculator possible are definitely making it easier for citizens to participate. Some contend that the Internet is making it more practical for citizens to establish and maintain the necessary ties needed for civic engagement (Scott, 2006; Castells 2002; Lin 2001; Resnick 2004). However, there is some question as to whether e-rulemaking, for example, will increase citizen participation in creating

policy. Much of the available evidence is saying "no" (Coglianese, 2006, 949). The overall response from citizens to Regulations.gov has been mediocre. Macintosh and Whyte (2006) believe that the main barriers to citizens making effective use of the tools include the multitude of organizational resources needed to support the e-policymaking provision and the societal ones of citizens being motivated to use them. Even if you develop usable and accessible e-democracy tools, this is not enough to ensure e-participation (Macintosh & Whyte, 2006). Current e-policymaking examples do not have good track records in terms of motivation (why should citizens take the time), information (two much information), and cognition (government employees are not necessarily trained educators). Perhaps the e-learning literature can shed some light here.

E-learning

Another important aspect of the T-Link Calculator is its e-learning properties, which was the original intention by KDOT. E-learning is important to examine in terms of the T-Link because the application allows for learning within an electronic environment. This section looks at the engagement criterion that is necessary for e-learning applications along with the implementation and ARCS (attention, relevance, confidence, and satisfaction) Model.

Engagement Criteria

Keller (1997), a popular author on e-learning has defined it as learning environments that involve an electronic tool, such as a computer, which are used as components in an instructional delivery system. The instructional delivery system can include email, print-based materials, World Wide Web or any combination of technologies that enhance the e-learning experience (Keller & Suzuki, 2004, 230). The main attraction for corporations using e-learning is that it reduces the

overall cost of training. E-learning provides other advantages such as delivering a standardized format, allowing students to control the pace, being convenient, and offering a variety of options to show content (Strother, 2002).

Much of the conversation on e-learning has been concerned about the implementation of technology, whereas, others like Driscoll (2001) have said that equal attention should be paid to the human factor as well. "Many instructors consider the motivation levels of learners [to be] the most important factor in successful instruction" (Dick & Carey, 1996, 92). "Motivation is not only important because it is a necessary causal factor of learning, but because it mediates learning and is a consequence of learning as well" (Wlodkowski, 1985, 4). Thus, people who have an incentive or are motivated to learn tend to be more open to the whole learning process (Hodges, 2004).

One recent concern with e-learning technologies is overcoming the motivational challenges (Keller & Suzuki, 2004). Moore and Kearsley (1996) noted that the dropout rates for e-learning environments were higher compared to face-to-face settings because learners preferred the interactive experience in face-to-face settings. The high attrition rates have also been attributed to learners either not being engaged or the initial motivation is unsustainable throughout the course (Hodges, 2004). Furthermore, some learners have complained about feeling isolated from other learners (Moore & Kearsley, 1996).

The other concern with e-learning applications is that educators "focused too much on the 'e'– making content electronic – and not enough on the learning – creating technology enhanced

experiences designed to change future understandings and performance" (Squire, 2005, 5). E-learning as a tool has suffered in part because current educators are duplicating traditional formats and placing the content on the World Wide Web instead of redesigning formats for the Internet. This has lead to numerous technology critics to speculate as to whether or not meaningful learning can happen online (Squire, 2005). Other experts like Elliott Maise say that, "the 'e' in e-learning should stand for the user's experience" (Prensky, 2001, 70-71) making it easy and engaging. The challenge with e-learning applications is to create an effective design to maximize the learning experience in order for the user to make sense of the content and to create an experience that is meaningful to the user as well as useful for future action (Squire, 2005).

Reasons for Motivation

Nevertheless, several theories exist on how and why students are motivated in learning environments. Sometimes these motivational theories have trapped educators or trainers into believing that if they incorporate particular strategies into their lesson plans it will help motivate students to learn. However, Weiner (1992, 864) notes that, "motivational research has been hindered because of an unrealistic expectation that a cookbook can be provided telling educators how to motivate their students." Furthermore, overcoming the challenges associated with motivation can be difficult due to the complexity of human behavior and the shear volume of theories and concepts on motivation (Keller & Suzuki, 2004). Brown and Voltz (2005) theorize that six different areas–activity, scenario, feedback, delivery, context, and influence–are important considerations when designing highly motivating e-learning environments, which are directly or indirectly covered by Keller's (1987) ARCS (attention, relevance, confidence, and satisfaction) model. The ARCS model is well recognized in the literature on the motivational design for e-learning environments (Hodge, 2004).

ARCS Model

The ARCS model aims to improve the engagement process or the motivational appeal of educational materials (Keller, 1987). The basic premise of the ARCS model is engaging learners by making them feel successful, and the individual will benefit from learning the information (Hodge, 2004). As such, the ARCS model operates within the boundaries of the "Expectancy-Value Theory" of learning. "The general notion of Expectancy-Value Theory is that learners expect certain outcomes from behaviors and the more valued the outcomes, the more likely someone is to perform the necessary behavior" (Hodge, 2004, 2). This theory relies heavily on perception and what the learner expects to accomplish by engaging in the task.

Keller (1987) developed the ARCS model based on a comprehensive review of the literature on major motivational theories and concepts. The four categories are based on the primary areas of influence "…gaining learner attention, establishing the relevance of the instruction to learner goals and learning styles, building confidence with regard to realistic expectations and personal responsibility for outcomes, and making the instruction satisfying by managing learners' intrinsic and extrinsic outcomes" (Keller & Suzuki, 2004, 230).

Goals of the ARCS Model

The first goal that Keller sees as important is gaining and sustaining the learner's attention. Delivery is very important in an e-learning design when trying to maintain the attention of the learner in order for the e-learning environment to reach its full potential (Brown & Voltz, 2005). Research by Berlyne (1965) and Kopp (1982) emphasize the importance of using a variety of tactics in order to promote curiosity and arousal by using a combination of graphics or animations that stimulate interest and introduce the learner to unease or conflict. This can be

done by arousing curiosity with a mystery, unresolved problems, or using other methods that promote a sense of inquiry by the learner (Keller & Suzuki, 2004). Thus, the activity itself is an essential consideration when developing an effective e-learning environment. This involves developing a task for the learner that will create a new understanding on a particular topic through the interactive experience. This experience will allow the learner to select from different options and avoids directing the learner down a prescribed pathway. As such, the activity allows the learner to make choices while engaging in the activity. Furthermore, the activity needs to provide challenges so that the student will continue to be engaged (Brown & Voltz, 2005), and it is important that these tactics change over time; otherwise, the learner will lose interest (Keller, 1987).

The second design goal is building relevance. This step is seen as essential for enhancing motivation along with the learning process (Means, Jonassen & Dwyer, 1997). Another consideration in designing e-learning platforms is creating a memorable activity that will provide meaningful value within a particular context (Brown & Voltz, 2005). To enhance the activity, an interesting scenario will use "humor, imagination, reward, anticipation, or drama" while the topics and themes need to be relevant and interesting to its audience (Brown & Voltz, 2005, np). Thus, the learner needs to perceive that learning the information is consistent with their own goals, matches their learning style and connects with past information or experiences (Keller & Suzuki, 2004). The most important part of this step is having clear goals for the learner and appropriate context for the e-learning experience. This requires selecting an appropriate setting or situation for the final design of an e-learning platform that positively influences the engagement of the e-learning experience (Brown & Voltz, 2005). Other motivational concepts

that Keller and Suzuki (2004) see as essential for developing relevance is the need for achievement, affiliation, power (McClelland, 1984), competence, (White, 1959) and flow (Csikszentmihalyi, 1990).

A third condition that is necessary for helping to develop motivation is confidence (Keller, 1987). Weiner (1974) said this could be accomplished by helping students establish positive expectancies for success. This can be achieved by creating an experience where the student attributes their own success to their personal abilities and efforts rather than attributing it to luck or the task being too easy. This step can be tricky because unconfident learners will attribute their success to luck, which does nothing to build the learner's confidence (Keller, 1987). Furthermore, to build confidence, it is central that the learner receives timely and appropriate criticism; thereby, allowing for reflection by the learner (Brown & Voltz, 2005). This enhances the knowledge gained from the experience and increases the level of knowledge and skill obtained from the experience. Also, the feedback should be timely in order to increase the motivation and engagement process of the student (Brown & Voltz, 2005).

The fourth design goal is to incorporate satisfaction into the learning process (Keller, 1987). This helps the learner feel good about their achievements. To achieve satisfaction, the reinforcement theory emphasizes that individuals would be more motivated if there are defined rewards given on an appropriate schedule that reinforces the behavior. Furthermore, in learning situations, there are appropriate ways to offer extrinsic rewards and recognition that stimulates intrinsic motivation. The challenge in this step is to "provide appropriate contingencies without over controlling, and to encourage the development of intrinsic satisfaction" (Keller, 1987, 6)

while influencing the learner's self-esteem and other psychological states (Raskin, 2000). An important consideration with satisfaction is how the learning experience benefits the user (Brown & Voltz, 2005). This requires the designer to be cognizant of social influences including cultural appropriateness of the material, the extent to which the design makes demands on others working with or supervising the learner, the way that it may influence cultural capital in the educational setting, and the ethical values implicit in the design or content (Brennan, 2003; Ehn, 1992). Finally, it is important that the learner feels a sense of equity or fairness and that the amount of work is appropriate for the objective (Keller & Suzuki, 2004).

Digital Game-Based Learning

Gaming is a third property present in the T-Link Calculator. The T-Link creates a real life simulation challenging the citizen to balance the transportation budget as if they were the decision maker. Digital game-based learning has its own criteria for educative and engagement properties that need to be considered for these types of applications, such as, "Flow Theory." Also, this section looks at digital game-based learning's increasing popularity, effectiveness, and additional gaming factors.

Increasing Popularity

Many organizations including the National Science Foundation see the potential for e-learning games to educate on serious subjects while providing a fun environment. The advantage of using e-learning tools is that these instruments can be extraordinarily engaging. Hundreds of millions of people play digital game-based learning (DGBL), games every day and are motivated for the following reasons: (1) enjoyment and pleasure, (2) intense and passionate involvement, (3) structure, (4) motivation, (5) doing, (6) flow, (7) learning, (8) ego gratification, (9) adrenaline,

(10) creativity, (11) social groups, and (12) emotions (Prensky, 2001, 144). Furthermore, Marilyn Ault (2010), a professor with the University of Kansas Center for Research on Learning says DGBL are not only appealing to the younger generation, but also to the older generation as well; one such popular game is "Farmville."

There is no clear consensus as to why people engage in digital game play. A survey conducted by ESA 2001 provided four main reasons for playing games (Kirriemuir & McFarlane, 2004). First, 87% of computer and video gamers said their main motivation for playing is because it is fun. Second, 72% of the respondents said the games were challenging. Third, 42% said the games provide an interactive social experience that can be shared with others such as family and friends. Finally, 36% of participants believed that digital games provide a lot of entertainment for the money.

Many organizations are moving toward the use of e-learning games for training to make these programs more engaging instead of boring. Currently, many training courses offered on the intranet or Internet have less than ideal completion rates with sometimes less than 50% of students finishing the courses (Prensky, 2001). "A writer in Training Development magazine says that the thing that keeps him awake at night is how to get people to stick with Web-based training long enough to learn something" (Prensky, 2001, 13). The consensus is that many workers and students will no longer accept boring training courses or websites. Thus, companies, schools and the military (Microsoft, H&R Block, MIT, and U.S. Army) have already turned to DGBL to teach or improve basic skills while injecting fun into the process (Prensky,

2001). The use of online applications and distance learning is growing with estimates of 80% annually (Prensky, 2001).

Defining Digital Games

In determining the effectiveness of the T-Link Calculator as a digital game, we first need to define what a digital game is. However, this is tricky because most of the literature available does not provide a clear definition. Despite many decades of research, there is also no universally accepted framework or theory on what makes the DGBL environment engaging or how games improve the learning process (Kiili, 2005). Rouse (2001), Rollings and Morris (2000) mention this problem that unfortunately game design theory is far behind in comparison to theories developed for other computer-based applications. As a result, there are many different thoughts or theories as to what types of characteristics create engaging DGBL environments (Pivec, Dziabenko, Schinnerl, 2003). For example, Thorton and psychologists, assert that interactivity is the most vital factor for gaming (Pivec, Dziabenko, Schinnerl, 2003). However, others assert that "dynamic visuals, rules, goals and interaction" are the important factors for engaging gamers (Pivec, Dziabenko, Schinnerl, 2003, 3). Another group of researchers take a different approach and claim that "challenge and risk" are the key characteristics (Pivec, Dziabenko, Schinnerl, 2003, 3), while others claim that the fact that the games have no real-world consequences is key (Garris, Ahlers, & Driskell, 2002). Malone, on the other hand, has stated that the following three factors are essential in the development of engaging games: "fantasy, curiosity, and challenge" (1981, 266).

Flow Theory

Prensky (2001) used Malone's characteristics as inspiration for developing his own criteria for what constitutes an engaging game that leads to learning. Prensky (2001) states that DGBL

needs to have the following characteristics: (1) rules, (2) goals or objectives, (3) outcomes and feedback, (4) conflict/competition/challenge/opposition, (5) interaction, and (6) representation or story. One major theory that takes into account Prensky's characteristics of engagement and learning is known as "Flow Theory."

Csikszentmihalyi, a well-respected researcher on positive psychology, developed the Flow Theory in 1975. Csikszentmihalyi describes the Flow Theory as the sensation of reaching optimum experience. The experience can be felt when "…instead of being buffeted by anonymous forces, we do feel in control of our actions, masters of our own fate. …we feel a sense of exhilaration, a deep sense of enjoyment" (Csikszentmihalyi, 1991, 3). To reach this optimum experience, one must have a "…goal in a symbolic domain; there have to be rules, a goal, and a way of obtaining feedback" (Csikszentmihalyi, 1991, 118). Furthermore, the individual "must be able to concentrate and interact with the opportunities at a level commensurate with one's skills" (Csikszentmihalyi, 1991, 118). Most often people experience flow during a physical activity when they develop the necessary understanding to meet the requirements of the game. For others, the flow experience can occur when they enjoy or excel at a particular activity or when they are competing in an environment that is suitable for their level of skill (Jones, 1998).

Malone's (1980) interpretation of Csikszentimihalyi's Flow Theory is that certain conditions need to be in place to induce the flow state. The game needs to allow for players to increase or decrease the level of challenge in order to facilitate an exact match between the gamer's skill level and required action. Another condition that is important is the ability to isolate the activity

from either external or internal stimuli that could interfere with involvement. A third condition is that the player should be able to evaluate their performance as to whether they are doing well or poorly by the criteria established by the game. Furthermore, the activities taking place in the game should provide concrete feedback as to whether the player is meeting the performance criteria. Finally, the activity should have a broad range of challenges so that the player may obtain increasingly complex amounts of information about the different aspects of the learning exercise.

Past research conducted by Webster, Trevino, and Ryan (1993) agree that flow state is not only important for engagement, but also creates an environment ripe for learning. Thus, they emphasize that Flow Theory should be considered during the design phase in order for the gamer to achieve the optimal learning experience (Kiili, 2004). Paras and Bizzocchi (2005, 2) agree that flow state can have positive implications for engagement and learning. "While in flow state, the learner is completely motivated to push their skills to the limit. In an instructional context, this is a highly desirable state". Furthermore, Houser and De Loach (1998) have detected a strong correlation between the characteristics of strong flow-like experience and the factors needed for effective learning environments. Houser and De Loach based their research on Donald Norman's work. Norman (1993) identified 7 key requirements for learning environments:

1. Provide the user a high intensity of feedback and interaction;
2. Have specific goals and establish procedures for application;
3. Motivate the user;
4. Provide a continued feeling of challenge that is neither too difficult; thus, creating a sense of hopelessness and frustration, nor too easy causing the user to become bored;

5. Provide a sense of direct engagement, thereby producing the feeling so the learner is directly experiencing the environment while working on the task;
6. Provide appropriate tools that fit the user and task so well that they aid in the learning process and do not distract;
7. Avoid distractions and disruptions that may intervene or destroy the learning experience.

From Norman's requirements on learning environments, Houser and De Loach (1998) conclude that games must be acknowledged as another form of learning. "Games make learning look so much like fun that they mask the large amount of learning required to play them successfully" (Paras & Bizzocchi, 2005, np).

Other Gaming Factors

Some other gaming factors that might be useful in the evaluation of the T-Link Calculator are reflection, stories, and collaboration. All of these elements are believed to aid in the learner's engagement while helping in the retention of new information. One of the downsides or difficulties with flow experience that can limit learning for players is that the game does not allow for reflection (Paras & Bizzocchi, 2005). Reflection is considered important because this is where students actively participate in the learning process and spend time thinking about what they have learned, thereby creating their own learning experience. Reflection is often overlooked due to game designers being more concerned about creating a state of flow that focuses on concrete goals. Knowledge may be gained without reflection, but this step is important to maximizing the learning experience. One possible solution to this problem is incorporating reflection into the goal attainment process (Paras & Bizzocchi, 2005).

Oblinger (2006, np) mentions, “Digital games have the potential to bring play back to the learning experience,” and that incorporating reflection and experience into the learning environment is essential. Dede (2009) and Oblinger both agree that an ideal learning environment “allows us to alternate between being “inside” an environment (fostering situated learning) and being an outsider looking in (fostering insight gained from perspective)” (Oblinger, 2006, np). Digital games provide frequent opportunities for reflection that can provide a broader spectrum of learning (Oblinger, 2006). Studies have shown that digital games provide immersion to enhance the learning process by providing multiple perspectives, situated learning and transfer of knowledge (Dede, 2009). However, Dede did suggest that further research is needed on the interplay between immersion and learning with digital games.

Additional components of digital game-based learning include the use of stories and collaborative learning. Stories help put information into a meaningful context in order to facilitate learning, understanding and overall retention of information (McLellan, 1996). Generally, most games have some sort of story that incorporates the challenge or problem that needs to be addressed (Seagram & Amory, 2004). “Most researchers agree that an important role in current learning structures is played by ‘collaborative learning,’ which allows participants to exchange information as well as to produce ideas, simplify problems, and resolve the tasks” (Pivec, Dziabenko, Schinnerl, & 2003, 221) while giving the new information meaning through stories and collaboration.

The different elements, which make up successful e-policymaking, e-learning, and digital gaming, are used to create the model of evaluation for the T-Link Calculator. This model is described further in the Methods Chapter.

CHAPTER 3 – METHODOLOGY

Introduction

If people like Eric A. Morris are playing the T-Link Calculator because of its e-policymaking and game like qualities, how does the overall design of the T-Link Calculator fulfill the engagement criteria necessary for these types of formats? KDOT introduced the T-Link Calculator as an online e-learning instrument, and sees it as a tool to educate citizens. Whether the T-Link Calculator is considered an e-policymaking platform, e-learning tool, or game, how effective is it at engaging Kansans on transportation issues? KDOT created the T-Link Calculator to provide data on the costs associated with existing infrastructure along with providing a perspective on what funding would be required to make system improvements. Recently, politicians and citizens have had unrealistic expectations that KDOT can "do more with less." In some cases, this has lead to cutbacks on existing projects or deferment of new projects, and KDOT saw a need to educate the key stakeholders in the state on the limits of this philosophy.

This case study will focus on the interplay between e-policymaking, e-learning, and digital game-based learning theories and thoughts on creating effective engagement/educative pieces that appeal to the public. Due to the newness of e-policymaking, there are no concrete theories on engagement; however, the literature provides some guidance on design elements. Whereas much has been written about e-learning and DGBL formats, and there are two popular theories in the literature that focus specifically on motivational design. One is Csikszentmihalyi's Flow Theory for DGBL, and the other is Keller's ARCS Model for e-learning. Using the motivational

design guidelines and theories provided by the three different platforms allows us to determine whether the T-Link Calculator is effective at facilitating participant engagement. If not, then the point of the T-Link Calculator is lost.

As stated previously, there are three main goals for this research. The first goal is to create an "e-participant" engagement model incorporating e-policymaking, e-learning, and digital game-based learning design criteria. This combined model is called the "E2DG Model of E-Participant Engagement". The second goal is to evaluate the effectiveness of the T-Link Calculator using the new E2DG Model. After the evaluation, the third goal is to assess lessons learned to determine what might improve future transportation e-engagement processes.

E2DG Model of E-Participant Engagement

This model was developed by combining the design criteria and theories listed for all three tools---e-policymaking, e-learning tools and digital game-based learning---necessary for engagement and learning into one single model. Because of the different qualities present within the T-Link, it may be difficult to classify the tool as one or another. Thus, the E2DG Model of E-Participant Engagement provides the necessary criteria to properly evaluate the T-Link Calculator. The "E2" stands for e-policymaking and e-learning while the "DG" represents "digital gaming," thereby representing all the engagement/educative aspects that need to be considered when developing an application similar to the T-Link. The E2DG Model uses the following criteria: Accessible/Fair, Delivery/Story, Cognitive/Challenge, Relevance/Achievements, Collaboration/Feedback, Reflection, Promotion, Time, and Privacy/Security to assess engagement and learning. The different aspects involved in engagement/educative experiences

are highlighted in Table 1 for the E2DG Model, and it offers insight on the theory used for the criteria.

Table 1. E2DG Model of E-Participant Engagement

TOOL	ENGAGEMENT CRITERIA	THEORY
E-Policymaking & E-learning	**Accessible/Fair**	The accessibility for the citizen and how easy it was for the citizen to access the information (Macintosh, 2004). It is important that the learner feels a sense of equity or fairness and is respectful of people's time/efficient (Keller & Suzuki, 2004).
E-learning	**Delivery/Story**	The delivery is essential in gaining the user's attention (Brown & Voltz, 2005) and can be achieved using a variety of tactics to promote curiosity and arousal with graphics or animations to stimulate interest (Keller & Suzuki, 2004). The story requires selecting an appropriate setting or situation for maximizing the user's learning and engagement process (Brown & Voltz, 2005) while helping with retention of information (McLellan, 1996).
E-Policymaking, E-learning & Digital Game-Based Learning	**Cognitive/Challenge**	The information should be comprehensible (Coglianese, 2006) while using an effective design that can help the user make sense of the content (Squire, 2005). The activity needs to provide challenges so that the user will continue to be engaged (Brown & Voltz, 2005) and it is important that the level of challenge matches the user's skill level (Malone, 1980). The tactics need to change to maintain the user's interest (Keller, 1987).
E-learning	**Relevance/Achievements**	Create an experience that is meaningful to the user as well as useful for future action (Squire, 2005). Incentives act to build confidence, help the user achieve satisfaction, and reinforce the desired behavior when provided on an appropriate schedule (Keller, 1987).

Table 1. E2DG Model of E-Participant Engagement (cont.)

E-Policymaking, E-learning & Digital Game-Based Learning	**Collaboration/Feedback**	Social interactions are important for online engagement (Prensky, 2001) and collaborative environments allow participants to exchange information as well as provide opportunities for mutual learning, creation of new ideas, simplification of problems, and finding resolutions (Pivec, Dziabenko, Schinnerl, 2003). Provides relevant and appropriate feedback to ensure openness and transparency (Macintosh & Smith, 2002), along with, being timely (Brown & Voltz, 2005), and it allows user to elevate performance (Malone, 1980).
Digital Game-Based Learning	**Reflection**	Reflection is considered important because this is where the user actually spends time thinking about the overall experience on what they learned (Paras & Bizzocchi, 2005).
E-Policymaking	**Promotion**	Traditional methods of promotion can be used such as press releases and news broadcasts, but newer methods should also be considered like an e-postcard that says, "Tell a friend" (Macintosh, 2004).
	Time	The amount of time that is required to participate (Macintosh, 2004).
	Privacy/Security	Important to be upfront on the level of privacy that the user can expect in regards to what information will be required and collected (Macintosh, 2004). Security is another issue that should be addressed with online platforms and openly documented in the form of a security statement (Coleman & Gotze, 2010).

Research Design

Once the model for a successful e-participant engagement tool was established, the data collection method was designed. There are several aspects that have to be considered during this phase such as the technique used to collect the data, selection of participants, how data was analyzed, and the limitations of the study.

Interview Technique

Information for this case study was obtained by conducting semi-structured interviews on whether the T-Link Calculator is an effective tool that engages citizens on the subject of transportation finance. Semi-structured interviews are particularly useful for developing a deeper understanding behind the participant's overall experience with the T-Link Calculator. Furthermore, Strauss and Corbin (1990) claim semi-structured interviews along with other qualitative techniques can enhance current knowledge about a new phenomenon. Due to the relative novelty of the T-Link Calculator, it was considered important to utilize a qualitative approach in order to provide more in-depth, dynamic analysis of this new tool in comparison to using more conventional quantitative methods. This format allows for differing viewpoints to be expressed on the T-Link Calculator in addition to offering a richer data set for general comparisons between the different participants.

Other Advantages of Semi-structured Interviews

The semi-structured interview technique was chosen for this study because it allowed for a higher response rate on participants' engagement/educative experience with the T-Link Calculator while giving myself flexibility to ask additional questions when needed. This was one of the major advantages of conducting face-to-face semi-structured interviews as the response rates tend to be higher compared to using other types of interview or survey methods.

"The response rate for face-to-face interviews is approximately 80% to 85%, whereas for telephone interviews, it is approximately 60%" (Persaud, 2010, 635). Another advantage of semi-structured interviews is that it tends to reduce the number of "do not know" responses because the person conducting the interview can probe the participant for a more in-depth answer. A third benefit of this type of interview style is the ability to clarify questions that might be confusing. Finally, conducting face-to-face interviews allows the interviewer to collect other useful information such as the respondent's body language or overall reaction (Persaud, 2010).

Research Limitations

There are some limitations to this research strategy for determining participants' level of engagement and learning with the T-Link Calculator. Some of the limitations with conducting face-to-face semi-structured interviews is the expectation for respondents to give real-time answers to the interview questions, whereas, the responses may differ if participants are given more time for reflection on the subject matter (Persaud, 2010). In order to reduce the impact of this limitation, the interview questions were sent in advance to the participants in order to allow for more accurate responses at the time of the interview. A second limitation with face-to-face interviews is that it requires the interviewer to gain cooperation and trust from the respondents. This can be particularly challenging with a cross-section of individuals coming from diverse backgrounds. I tried to build a rapport with the individuals prior to the interview by asking questions for example on how long they had lived in their house. A third problem that can occur is measurement error due to improper administration or other interviewer characteristics that may influence the final outcome. I tried to reduce this by showing the participants a picture of the front page of the T-Link to ensure that they had indeed visited the same site. Also, I checked the T-Link to make sure it was working properly. A fourth problem with face-to-face interviews is

the cost, and this was not an issue for me due to the small sample size. A fifth limitation that can occur with this format is asking biased or assumption-based questions, which can have a negative impact on the results along with asking two-part questions or confusing questions that are wordy. All the interview questions were tested in advance on five individuals who had briefly interacted with the T-Link Calculator in order to try to mitigate the fifth limitation. Furthermore, it is important to have questions that relate to the research that are non-threatening and flow logically. Again, the research questions were tested in advance to ensure that none of the questions would be perceived as threatening while maintaining a logical flow that corresponded with the E2DG Model.

Strategies for Successful Interviews

In conducting semi-structured interviews, Persaud (2010) outlined five strategies to help ensure success. The first consideration is to find participants that would be willing to interact with the T-Link Calculator and be interviewed about their experience. Twenty willing individuals were identified and interviewed regarding their overall engagement/educative experience with the T-Link Calculator. The second consideration is to ensure that all participants have interacted with the T-Link Calculator prior to being interviewed and to select a setting that is the least distracting for each participant. I contacted the interviewees prior to the interview to ensure that they had either interacted with the T-Link or had plans to interact with the website prior to the interview. Also, most of the interviews were conducted in a quiet setting either at a library or home to avoid possible distractions. The third consideration is to provide background information on the purpose of the interview to each participant. All of the interviewees received an email (Appendix A) two weeks prior to the interview with a link to T-Link Calculator along with background information and the general purpose of the interviews. The fourth consideration is

to address any concerns. I let all the interviewees know prior, during, and post interview to contact me if any concerns developed during the process. Moreover, it was important to let each participant know the expected length of time for the interview, and inform them that they can stop the interview at any time for whatever reason. All the interviewees were told in advance that the interview would be a maximum of an hour, and they were informed that they could stop the interview at anytime. Finally, I provided contact information to the interviewee, and this allowed them the opportunity to provide any doubts regarding the interview.

Selection of Participants

I interviewed twenty participants about their experience with the T-Link Calculator to ensure enough opinions were provided in order to identify commonalities from the T-Link Calculator participants. Selected participants for the guided interviews were a cross-section of Kansas residents representing a sample population of various ages/races of men and women from rural/urban areas. I gained referrals through known associates who provided potential interviewees. Initially, I received 49 recommendations meeting the specified target audience mentioned, but only 23 individuals were willing to participate in the study. The final count interviewed ended up being 20 due to logistical issues of meeting some of the individuals. Due to the limitations of unwilling participants, I was not able to attract a proportionate number of the different demographic groups. Although, all participants were at least 18 years of age because KDOT's original target audience consisted of potential voters. The selected participants for interviews were obtained using a referral sample technique of convenience and not a random sample. The downside with using a nonprobability sample is that the final results may not be fully representative of the viewpoints that would be expressed by the general Kansas population on the T-Link Calculator. However, due to the limited amount of time and resources available for this project, this was one of the few feasible options.

Data Analysis

The final recordings obtained from each interview were transcribed in order to utilize a qualitative form of content analysis by systematically arranging and decoding information using categories, themes, and motifs that identify patterns and relationships. After the data was collected, defined segments were extracted from the text and marked with special codes for each individual question (Strauss & Corbin, 1990). Then codes were grouped based on themes in order to make them more workable. From these themes, categories were grouped based on whether the T-Link Calculator met the criteria for engagement set forth in the E2DG Model of E-Participant Engagement (Strauss & Corbin, 1990).

Other Research Considerations & Limitations

One important consideration in a case study is having internal validity. One limitation of interview research is making sure the measures are valid. To ensure validity, which is to ensure that the measures used represent the concepts of interest in the study, the interview questions were written with the E2DG Model concepts in mind. The interview questions are connected to the model, as seen in Table 2.

There are other potential limitations that may act to bias participants' engagement/educative experiences with the T-Link Calculator. One, testing respondent's use of the T-Link Calculator could prime the respondents to take more interest in transportation finance; thus, leading to more positive feedback on the overall use of the program. Second outside factors that could impact the results of face-to-face interviews could be the level of education of the respondents, demographics of the group, prior knowledge on transportation issues, or past experiences, and not necessarily the T-Link Calculator itself. Another threat is the difference in time between the

use of the T-Link Calculator and when the interview actually occurs, thereby potentially impacting the final results. This is partially due to the participants' memory of the use of the T-Link Calculator and other variables that may influence the research as they are constantly changing such as funding, transportation policies, political support, communication technologies, advancements in transportation, and citizen support. The fourth threat to the final research results is if KDOT decides to alter the T-Link Calculator while in the midst of testing, which would cause different responses. Fortunately, this did not occur during the testing of the T-Link Calculator. Furthermore, the questions asked during the interviews may not have identified the right causal factors as to why the T-Link Calculator was ineffective.

Another limitation of this study is the ability to make generalizations to a larger population (external validity). External validity relates to the ability to generalize the use of the T-Link Calculator beyond the groups or context being studied. The best method of obtaining external validity is using a representative sample that is randomly selected from the general population. Selecting participants randomly for face-to-face interviews is not possible due to the limited amount of time and resources available for this case study. A non-random sample does reduce the study's external validity and makes it impossible to infer that the findings represent the general population beyond the case study. Moreover, it introduces the possibility of sample bias due to unequal balance between certain portions of population being over represented versus other portions being unrepresented in the sample. However, this study is exploratory in nature and is one of few such studies to evaluate the effectiveness of an e-engagement tool.

Interview Questions

During the face-to-face interviews, participants were interviewed in order to determine their overall level of engagement with the T-Link Calculator based on the E2DG Model of E-Participant Engagement. Interview questions were based off of the E2DG Model criteria. Furthermore, interviewees were informed about the interview protocol (Appendix B) along with receiving a formal introduction as to the purpose of the study (Appendix C). The participants were asked general demographic information such as occupation, birth year, length of residency in Kansas, and ethnic background. Furthermore, the participants were also asked questions about the amount of time spent on the Internet, favorite websites and why, whether they visited government websites and why, and when did they first use the T-Link Calculator. All this information was collected to determine if any patterns could be found between demographic/website usage and their engagement/educative experience with the T-Link Calculator.

Table 2. E2DG Model and Interview Questions

E2DG ENGAGEMENT CRITERIA	INTERVIEW QUESTIONS
Accessible/Fair	*Was the T-Link Calculator easy to use? Why or why not?* *Do you think the level of work required to interact with the T-Link Calculator is appropriate? Why or Why not?*
Delivery/Story	*What do you think about the design of the program in keeping your interest? If not, what changes would you suggest to capture your attention?* *How effective was the storyline on the tradeoffs that have to be made when financing one transportation system versus another? Would you recommend any modifications?*
Cognitive/Challenge	*Was the T-Link Calculator understandable? Why or Why not? What do you think the T-Link explained well? What was the first thing you learned?* *Did the T-Link Calculator challenge you like a good crossword puzzle or story problem? Would you be open to interacting with the tool again? Why or Why not?*
Relevance/Achievements	*How relevant is the information that was presented by the T-Link Calculator to you?* *Do you feel like you achieved anything by using the T-Link Calculator? Why or why not?*
Collaboration/Feedback	*How satisfied were you with the level of interaction when using the T-Link Calculator? Would a more activate dialogue or input be more appealing to you like what you would find with Facebook?* *How was the feedback you received from the T-Link Calculator? What sort of feedback would you prefer?*

Table 2. E2DG Model and Interview Questions (cont.)

Reflection	*After a reasonable amount of time using the T-Link Calculator, did you find yourself thinking about what you did and what you got out of it? Did you talk to anyone else about what you got out of the T-Link Calculator? If so, what did you tell them?*
Promotion	*Prior to being involved in this study, did you know about the T-Link Calculator?* *How would you promote the T-Link Calculator to the general population if you were the Kansas Department of Transportation?*
Time	*Do you feel the amount of time required was appropriate? Why or Why not?* *What would be an ideal length of time for a tool like the T-Link Calculator?*
Privacy/Security	*How comfortable were you with the level of privacy provided by the T-Link Calculator when providing your information? Please elaborate.* *As a user, were you at all concerned about the lack of a security statement when using the program (this is where the website uses certain technology methods to ensure the security of your information)? Why or why not?*

In addition to questions measuring specific aspects of the T-Link Calculator using the E2DG Model, interviewees were asked whether they gained any general knowledge and if they had any suggestions for improving the T-Link. After spending two months interviewing 20 people, the interviews were transcribed. The results of these interviews can be found in Chapter 4.

CHAPTER FOUR – RESULTS

Introduction

Twenty face-to-face interviews were conducted in order to determine the effectiveness of the T-Link Calculator at engaging individuals based on the E2DG Model of E-Participant Engagement. This model was developed by combining the design criteria and theories listed for all three e-engagement tools---e-policymaking, e-learning tools and digital game-based learning---into one model. The E2DG Model of E-Participant Engagement uses the following criteria: Accessible/Fair, Delivery/Story, Cognitive/Challenge, Relevance/Achievements, Collaboration/Feedback, Reflection, Promotion, Time, and Privacy/Security. The framework for the interview questions was developed using the E2DG Model of E-Participant Engagement along with a few introductory questions to obtain demographic information.

Again, there are three main goals for this study. The first goal is to create an "e-participant" engagement model incorporating e-policymaking, e-learning, and digital game-based learning design criteria. This combined model is called the "E2DG Model of E-Participant Engagement." The second goal is to evaluate the effectiveness of the T-Link Calculator using the new E2DG Model. After the evaluation, the third goal is to assess lessons learned to determine what might improve future transportation e-engagement processes.

Demographics

The interviewees were asked general demographic information such as occupation, birth year, length of residency in Kansas, and ethnic background; and here are the results to those questions.

Nine (or 45%) of the individuals were male, while the other 11 (or 55%) participants were female. This is close to being representative of the state population for Kansas; males are 49.4% of the population while females are 50.6% of the population (U.S. Census Bureau, 2000). Furthermore, the age range of the participants was 22 to 68 with the average age being 44. For the following ages here are the percentages of participants: 20-24, 15%; 25-34, 25%; 35-44, 15%; 45-54, 5%; 55-59, 30%; 60-64, 5%; 65-74, 5%; 75-84, 0%; and 85-over, 0%. The age ranges of 20-24, and 25-34, are between 5 and 7% points higher than the states' average, whereas, the age ranges for 35-44 and 45-54 are 7 to 10% points lower. The age range of 55-59 was over by approximately 20% points while the age ranges of 60-64 and 65-74 are slightly under between 1 to 4% points. Unfortunately, I was not able to find willing participants from the age ranges of 75-84 and 85-over so these ranges are under represented by between 2 and 6% points. On the question regarding length of residency in Kansas, all participants had lived in Kansas from between 5 to 59 years with the average being 32 years. Furthermore, 5 (or 25%) of the individuals were from more rural parts of eastern Kansas whereas the other 15 (or 75%) came from more urbanized locations within eastern Kansas. This is comparable to the state average for Kansas, with 28.5% of residents living in rural locations and 71.5% living in more urbanized areas. On the question of race or ethnic origin, the participants consisted of the following: 16 (or 80%) White, 1 (or 5%) Black or African American, and 1 (or 5%) American Indian. These numbers are comparable to the state average for Kansas with White being 86.1% and Black or African American being 5.7%. However, the number for American Indian is higher in the survey by 5% due to the small sample size. Finally, two participants (or 10%) identified themselves as being two races/ethnicities with 1 being White/American Indian and the other being Hispanic or Latino/ White. This number was also higher than the state average of 2.1%,

but again this is probably due to the small sample size. There were a variety of occupations, which have all been listed below in Table 3.

Table 3. Demographics of Interviewees

INTERVIEWEE	SEX	OCCUPATION	BIRTH YEAR	LENGTH OF TIME IN KANSAS (Yrs.)	CURRENT HOMETOWN IN KANSAS	RACE/ ETHNICITY
1	Male	Engineer	1987	24	Sabetha	White
2	Female	Bookkeeper	1960	47	Seneca	White
3	Female	Elementary School Teacher	1983	27	Lawrence	American Indian
4	Female	Accountant	1947	44	Coffeyville	White
5	Female	Computer Science Instructor	1978	32	Fredonia	White
6	Female	Non-profit Director	1981	30	Hutchinson	White
7	Female	Volunteer Coordinator	1955	52	Hutchinson	White /American Indian
8	Male	Software Developer	1969	42	Hutchinson	White
9	Female	Unemployed Marketer	1971	14	Wichita	White
10	Male	Graphic Artist	1955	23	Wichita	White
11	Female	Senior Executive Assistant	1952	25	Tecumseh	White
12	Female	Board Director	1943	55	Topeka	White
13	Male	Attorney	1952	59	Topeka	White
14	Male	Operations	1975	35	Topeka	Hispanic or Latino/ White
15	Female	Retired	1953	33	Salina	White
16	Male	Musician	1954	28	Lawrence	White
17	Male	Registered Nurse	1988	23	Kansas City	White
18	Female	Student	1989	22	Kansas City	White
19	Male	Airplane Builder	1978	24	Wichita	White
20	Male	University Employee	1978	5	Lawrence	Black or African American

Internet Usage

Amount of Time

There was a range of responses in regards to time spent on the Internet. The average approximate number of hours spent on the Internet was 18 hours per week with the lowest value at 2 and the highest being 76. In regards to time spent on the Internet, it was thought that more savvy Internet users might prefer the engagement/educative experience of the T-Link Calculator. Yet, there ended up being no difference found between light, moderate or heavy users of the Internet so usage did not have an effect on the participant's level of engagement/educative experience with the Internet. Also, no clear pattern was found between what types of websites were visited and having a preference for the experience provided by the T-Link Calculator.

Visits to Government Websites

The participants were asked if they had visited any government websites recently. Seventeen of the 20 participants had visited a government website to obtain information while 3 mentioned that they typically do not visit government sites. Initially, it was believed that a person's preference might impact the participants' level of engagement/educative experience with the T-Link Calculator; however, this was not the case. Even the types of government websites visited did not sway the participants either way in regards to engagement with the T-Link.

Use of T-Link Calculator

There were no differences in the level of engagement with the T-Link Calculator based on when the participant used the T-Link Calculator. Half of the respondents used the T-Link Calculator right after receiving the T-Link information from me while five participants waited to try the T-Link Calculator the morning of the interview. The other five participants either tried the T-Link Calculator one or two days prior to the interview. Originally, it was believed that if respondents

were more apt to interact with the T-Link right away that this may be indication of their overall interest and level of engagement with the site. This did not end up being the case because mostly it came down to when the participant had time for the activity.

Evaluation of T-Link Calculator using E2DG Model

Accessible

Accessibility is one area where the T-Link Calculator succeeded by engaging most of the interviewees with its simple and easy to read layout, with sequential "tabs" on top guiding the participants throughout the process. The question was posed to the participants as to whether or not the T-Link Calculator was easy to use. Fifty-five percent of the respondents mentioned that the layout made the site user-friendly, and one person commented, "Just the way it was all laid out having all the tabs up top where you could go to if you wanted to advance to the next page" (Interview 1). The interactive budget graphs, explanation of site features, and "sliders" (see Figure 4) used to make budget selections were also features that some felt made the site more accessible. Twenty-five percent of the interviewees thought the graphs made the T-Link Calculator easy to use. "Sliding the calculator and looking on the side and seeing the different numbers go up and down on the bar graph, it was easy…" (Interviewee 3). Another feature that made it easy for 20% of the interviewees was the "Learn More" pop-up boxes that provided further explanation and the sliding bars used to make

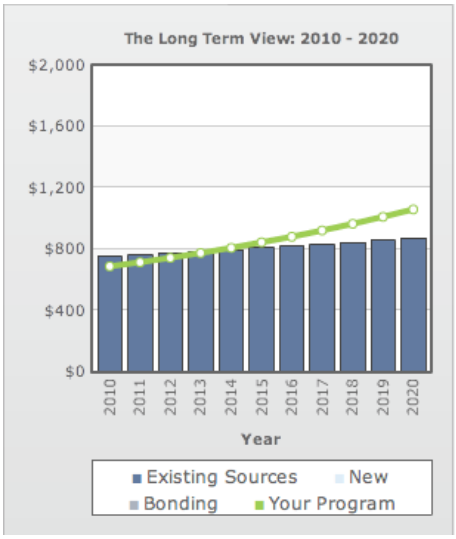

Figure 3. One of the Interactive Graphs

budget selections. Interviewee 7 said, "I like the extra pop-up boxes that were available if you wanted more information."

There were features that several respondents thought impeded accessibility. Macintosh (2004) said for accessibility purposes that it is important to consider how all citizens will interact with the site. Twenty percent of the interviewees found the site confusing at first and were uncertain as to what the mission or ultimate outcome was. Also, even though some respondents thought the interactive budget graphs were positive for accessibility, there were also several respondents that saw them as a negative. Interviewee 6 stated, "I really didn't understand the graphs on the side. I knew that they represented my spending and stuff, but I really didn't understand exactly how it was being measured." Furthermore, 30% of interviewees found the terminology used challenging. Interviewee 8 said, "I think there is a little expert barrier at first," while interviewee 12 mentioned, "The part not easy is the terminology for people not in the transportation area." Furthermore, 25% had trouble understanding the results produced by the interactive graphs. Another important consideration for accessibility is the type of technology used to support the interaction (Macintosh, 2004). The technology used was a problem for 15% of the participants. Interviewee 5 had trouble using the website using her smartphone or iPad, "when I use the sliders to see instant results it will not work." Apparently, this is due to the sliders running on Adobe Flash, which is not compatible with all platforms. However, 80% of users still found the T-Link overall accessible and easy to use for the most part.

Table 4. User Accessibility

USE	# OF INTERVIEWEE COMMENTS
Easy to use	16
Confusing at first	4
FEATURES THAT MADE IT EASY	
Layout	11
Interactive graphs	5
Explanation	4
Sliding bar	4
FEATURES THAT MADE IT CHALLENGING	
Terminology	6
Interactive graphs	5
Adobe Flash	3

Fair

Fairness was another area that was considered a plus for the T-Link Calculator.

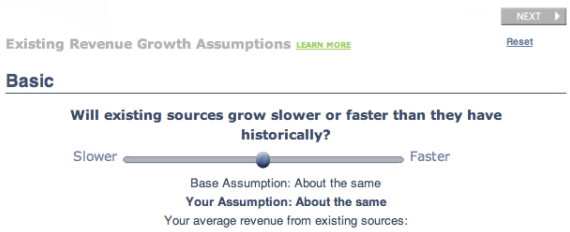

Figure 4. Slider Feature

Fairness is where the learner feels a sense of equity and that the task is respectful of people's time (Keller & Suzuki, 2004). Interviewees were asked if the level of work was appropriate. All participants thought the T-Link Calculator was efficient and that the level of work required was appropriate. Thus, they did not feel the task required was anymore taxing than what is asked at other websites visited on the Internet. Fifty-five percent of the participants said it did not require a lot of work, was easy to use, or required little in the way of time. "I didn't feel like there was a lot of work or overhead…" (Interviewee 9). Some participants specifically mentioned the sliders as being "no work" to adjust, and 2 other interviewees said the site required little of their time. "It really didn't take that much time to go from start to finish" (Interviewee 3).

There are certain areas where several of the participants thought could be improved in order to make the level of work more appropriate. Items that made the site less fair for some was the "Learn More" features used on the sites according to 20% of the participants. Three respondents did not like having to click on the "Learn More" features for further information: interviewee 1 because of the extra time requirement; interviewee 9 due to a fear of being kicked out of the site and having to start all over again. Norman (1993) warns about the use of such features that are viewed as disruptive by users and potentially seen as a barrier to the overall learning experience. Another hindrance to the level of work being appropriate was the terminology used on the T-Link and the site being too easy for some at 15% with these individuals wanting the option to provide more input. Interviewee 13 said, "It didn't require any actual thought and you really couldn't input down to the detail or bring in different suggestions from what was already there." As such, these individuals felt that if the T-Link Calculator allowed for more direct input, this would help improve the e-policymaking capabilities of the tool. Twenty percent of participants also thought the site was of no interest to them, "I'm not a political person and found the site boring" (Interviewee 4). Coglianese (2006) mentions if citizens see the policy issue as having no effect on them, they may have low motivation to get involved in the exercise of setting policy. Even with all the drawbacks, still 100% of the participants interviewed said the T-Link Calculator was fair and respectful of people's time.

Table 5. Fairness to User

APPROPRIATE	# OF INTERVIEWEE COMMENTS
Not a lot of work	6
Easy to use	3
Sliders	2
Little in way of time	2
LESS APPROPRIATE	
No interest in material	4
Too easy to use	3
More Input	3
Clicking on "Learn More" features	2
Terminology	2

Delivery

Delivery is essential to capturing the user's attention along with engagement (Brown & Voltz, 2005). The interviewees were asked if the design of the site worked in gaining their individual interests. The layout of the site mentioned earlier as a positive for usability was also considered a design plus for keeping people's interests with almost 75% of the respondents. "It was a good layout; it flows really nicely as far as going from one step to the next," (Interviewee 8), and interviewee 12 said, "It had the right amount of stuff on each screen." Also, three of the interviewees appreciated the color palate selected for the site. Interviewee 5 stated, "The colors were good and the tone was good." Also, the graphs were a design positive with 15% of the interviewees and promoted curiosity and arousal with some participants due to the animations, which is one way to stimulate interest and engagement (Keller & Suzuki, 2004). "I do like the interactivity of the instant graphs as I started sliding things around [and] I was seeing the different totals very quickly" (Interviewee 14). Finally, three participants thought the site was too text heavy while four participants thought the site looked boring, "I may have been interested in it, but once I got there I lost all interest" (Interviewee 1); thus, the general design for learning and engagement with the T-Link Calculator was neither a complete success nor failure.

Table 6. Delivery of T-Link Calculator

DESIGN POSITIVES	# OF INTERVIEWEE COMMENTS
Layout is good	14
Good use of colors	3
Graphs were interactive	3
DESIGN NEGATIVES	
Site is boring	4
Too text heavy	3

Part of the challenge in producing effective e-learning applications is producing a design that makes sense of the content while creating an experience that is meaningful to the user (Squire, 2005). All users did not achieve this with the T-Link Calculator and several participants suggested design modifications to make the content and message more appealing. Twenty-five percent of the participants specifically mentioned the need for more visuals on the site. "They need to add some graphics with where some of the major roads are and where the money is going," (Interviewee 4), and interviewee 9 said, "…need something visual on the landing page as to why this is important to me," thereby arousing the user's interest with graphics (Keller & Suzuki, 2004). Fifteen percent of participants had issues with the sliders either not always working or having trouble with accuracy. According to interviewee 7, "…it didn't seem like the incremental measurements were quite accurate or precise as I thought they should be." Other respondents had trouble locating the "Advanced Mode" feature on the website: "I hate to say if they just made it bigger that people will find it, but that was the only piece that I was unclear on…" (Interviewee 6). Furthermore, some respondents thought the graphs were confusing, "…I watched the graphs because it changed, but I didn't realize until so many questions in what it was actually doing and I wasn't meeting my goals" (Interviewee 16). Three interviewees suggested that KDOT add either a movie clip or a YouTube video to make the website more interactive,

which can increase understanding through an interactive experience (Brown & Voltz, 2005). Two respondents recommended using brighter colors to make the site less drab.

Table 7. Recommended Design Modifications

MODIFICATIONS	# OF INTERVIEWEE COMMENTS
Need to add more visuals	5
Sliders don't always work or not accurate	3
Hard to find "Advance Mode" feature	3
Graphs are hard to understand	3
Need to add interactive video	3
Colors are drab	2

Furthermore, in regards to design, it is imperative for KDOT to consider using different formats to cater to the different learning and engagement styles (Keller & Suzuki, 2004) in future versions of the T- Link Calculator. In the study, females were twice as likely to mention that they were visual learners and the site did not offer enough graphics, whereas men were evenly split in regards to text versus graphics. "They need to add some graphics with where some of the major roads are and where the money is going to [so] I can really understand it" (Interviewee 4). Several of the females further added that KDOT needs to be judicious in how they add the graphics for fear of making the site too cluttered, thereby losing the simplistic appeal of the layout.

Story

The T-Link Calculator failed with over 50% of the participants in regards to selecting an appropriate setting or situation for maximizing the user's learning and engagement process (Brown & Voltz, 2005). Participants were asked if the storyline of the different tradeoffs that have to be made financing one transportation system versus another was apparent. Many of the participants said it was not completely obvious to them. "Honestly, I didn't think there was

much of a story, but just some line items," (Interviewee 8). However at least 8 interviewees had a different opinion and thought KDOT did a good job in telling its story. Interviewee 9 said, "I would say very effective, I understood the storyline right away and it was easy to see what the trade-offs were."

Several of the participants recommended that some modifications be made in order to make the setting and storyline more effective and engaging. At least 45% suggested that KDOT needed to add more of an introduction or background information to the site because it was unclear at first what they were supposed to be doing. "I think there definitely could have been more of introduction because you just jump right into it" (Interviewee 12). Interviewee 13 said, "Not very effective, [storyline] kind of happened, but there wasn't a lot of appropriate discussion beforehand…" Seven of the participants said the storyline should be offered in audio and visual formats to cater to different preferences in obtaining information (Keller & Suzuki, 2004). "I prefer visual and audio formats as opposed to reading lots of text" (Interviewee 14). And 25% of the interviewees also mentioned that not enough information was given on the actual budget. "Because I really didn't understand the problem, I didn't really know the overall budget number that I should be aiming for" (Interviewee 6), which having a goal is considered essential during the learning process (Keller & Suzuki, 2004).

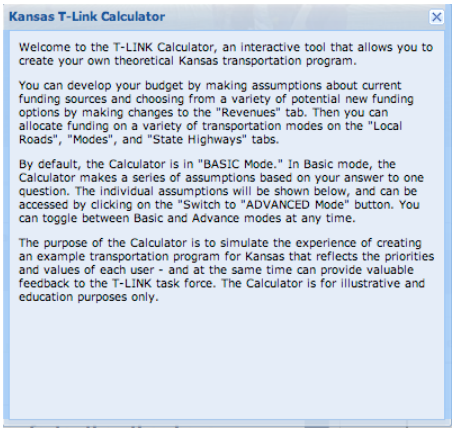

Figure 5. Introduction to the T-Link Calculator

Table 8. Effectiveness of the Storyline

EFFECTIVENESS	# OF INTERVIEWEE COMMENTS
Not obvious	11
Good	8
MODIFICATIONS	
Need more of introduction/background information	9
Add audio/visual type features	7
More information on actual budget figures	5

Cognitive

The cognitive criterion is concerned with the information being comprehensible (Coglianese, 2006) while using an effective design that helps the user make sense of the material (Squire, 2005). The participants in the study were asked if they found the T-Link understandable, and almost 70% of the users found the T-Link Calculator comprehensible. Only 30% of the participants either found the site confusing or not understandable.

Mostly, people found the site understandable for different reasons, but 20% of people mentioned the "Learn More" links as their reasoning for it being understandable. Interviewee 18 said, "Like the question on bonding, I didn't necessary understand what it meant at first, but the 'Learn More' made it understandable." Ten percent of the participants said the sliders made it understandable while other participants said it was the interactive graphs that aided in the engagement process. "I'm a visual learner so it was a good visual seeing the budget move from zero to the full amount" (Interviewee 12). However, feelings were mixed on the interactive budget graphs with 10% saying it helped understandability with another 10% saying that it did not help with the understandability. "They had a graph over on the side, to me it wasn't real self-explanatory on what they were actually measuring" (Interviewee 2). Four people also suggested

that the site was confusing due to the site lacking a clear introduction; thus, the participants had trouble understanding the established procedure necessary for engagement (Norman, 1993). "At first, I didn't really understand why I was sliding things" (Interviewee 3). In general, the T-Link succeeded in comprehension with most participants.

Table 9. T-Link Calculator Understandability

UNDERSTANDABILITY	# OF INTERVIEWEE COMMENTS
Yes	14
" Learn More"	4
Interactive graphs	2
Sliders	2
No	2
Interactive graphs	2
Confusing	4
Lacked a clear introduction	4

The second question posed to participants related to the cognitive aspect of the T-Link and what it explained well. There were many varied responses in regards to what the T-Link Calculator explained well, but the most popular response with 35% was the interactive graphs and sliders as being a valuable resource in explaining the budget changes. "The visual representation on the right hand side was very helpful in explaining the budget because you can see the variance as you move from one question to the next" (Interview 14); thus, aiding in the educative/engagement experience by providing immediate interaction and feedback to the user (Norman, 1993).

Two respondents thought the T-Link Calculator explained the sources of revenue and expenditures, whereas 2 other respondents felt the tool explained the pressures that come along with being the decision maker. "It explained well what a person has to think about when sitting

behind the big desk looking at the money they have and deciding how to disperse it to the different areas" (Interview 11).

Table 10. What the T-Link Explained Well

EXPLAINED WELL	# OF INTERVIEWEE COMMENTS
Interactive graphs/sliders showing instant budget adjustments.	7
Sources of revenue and expenditures	2
Pressures of being the decision maker	2

Third question that was asked that relates to the cognitive criterion: what is the first thing you learned from the T-Link Calculator? Again, the responses to this question were varied, but that was to be expected due the different interests and backgrounds of the people interviewed. Twenty percent of the participants said they learned about the costs associated with transportation. "At one point, I moved the bar really far and the amount of money didn't change very much because it was such a big amount of money so I didn't realize how much every small little thing costs" (Interview 3). Several people mentioned the challenges that come in balancing the transportation budget. Interviewee 13 stated, "You have to do a lot of finagling to get the income to meet what you want to spend." Also, some respondents were disappointed to learn that it would take a lot of money to make major improvements. "You learn that you are going to have to sacrifice some roads and that is disheartening because you don't see how you are going to be able to vastly improve the overall system" (Interviewee 12). However, 2 people mentioned that they did not learn anything from using the T-Link Calculator.

Table 11. First Thing Learned from the T-Link Calculator

FIRST THING LEARNED	# OF INTERVIEWEE COMMENTS
How much everything costs	4
Challenges in balancing the budget	3
Unable to make vast improvements in the system	2
Did not learn anything	2

Challenge

Challenge is another area of the E2DG Model that needs to be addressed when developing a tool like the T-Link Calculator. All the participants were asked if the T-Link Calculator challenged them like a good crossword puzzle or story problem. The majority of users did not find the T-Link Calculator challenging. For purposes of engagement, its essential that the activity provides challenges so that the user will continue to be engaged (Brown & Voltz, 2005), and it is important that the level of challenge matches the user's skill level (Malone, 1980). The responses to this question were evenly split between "Yes" and "No." Seven interviewees felt challenged when using the T-Link Calculator; however, the answers were different depending on the interviewee. Two out of the 7 said it was due to the terminology used, which required further learning on the site with the "Learn More" links. Three participants said "Maybe" while 40% said the site was not at all challenging. Five out of the 11 (no and maybe) participants attributed it to the site being too easy or not fully understanding the purpose behind the site. "Because at the end, I really didn't understand how much even my plan cost and I just saw the negative numbers on the side" (Interview 6). While Interviewee 19 said, "If I was in kindergarten, then the challenge would have been perfect." However, this may be due to KDOT intending the T-Link to be more of an informational tool that does not actively engage the citizen, which happens a lot with public involvement initiatives (Innes & Booher, 2000). Overall, a majority of the users where not challenged by the T-Link Calculator, thereby its ability to engage participants in

learning was mixed. The challenge provided by the site had more to do with interviewees being unsure on the expectations and information that was presented, and not from pushing the interviewee to learn something new (Norman, 1993). However, one of individuals complaining that it was too easy did have trouble locating the "Advanced Mode."

Table 12. T-Link Calculator Challenging

CHALLENGING	# OF INTERVIEWEE COMMENTS
Yes	7
Terminology	2
No	8
Maybe	3
Lacked a clear purpose	5
Too easy	3

A follow-up question to whether the T-Link Calculator was challenging is whether participants would be willing to interact with the tool again. Half of the interviewees said they would be open to interacting with the tool again. The answer to this question was surprising because typically if participants do not feel challenged by the experience, they will not repeat the activity (Malone, 1980), and more participants answered "Yes" to this question than the previous one. However, three participants said if KDOT actually listened to their input about the site, they would visit again in the future and that would be enough of an incentive to visit again. "Sure, if I thought they actually listened to what people said, I would go back…" (Interviewee 12). This touches on the Expectancy-Value Theory in that the more valued the outcome; the more likely the individual will perform the necessary activity (Hodges, 2004). Three other participants were motivated to interact with the T-Link again in order to share the resource with another person. "In fact, I would show it to other people and I found it interesting from the standpoint of having a realistic situation and the difficulties from a tax versus expense relationship" (Interviewee 8). However, 6 interviewees had no interest in going back to the site and 5 specifically mentioned

that they had no vested interest. Thus, these participants still were unable to fully appreciate the current transportation system even after engaging with the T-Link Calculator.

Table 13. Open to Future Interactions

INTERACTING	# OF INTERVIEWEE COMMENTS
Yes	10
If KDOT listens to input	3
Share the resource with others	3
No	6
No vested interest	*5*

Relevance

Relevance is critical for getting individuals engaged in the learning process and is achieved by creating an experience that is meaningful to the user as well as useful for future action (Squire, 2005). All the participants were asked if the information provided by the T-Link Calculator was relevant to them. A majority at 60% saw the information on the T-Link Calculator as relevant. "It showed where some of my taxes go to" (Interviewee 1) and interviewee 16 said, "Relevant in that I am a driver on the roads in the State of Kansas, and I am always interested in learning more about how things are done and budgeted." Twenty percent of respondents were undecided on relevancy even though they knew it impacted them being a taxpayer. Only 20% did not see any relevancy and seemed to be in agreement that it was somebody else's problem. "I know somebody needs to be paying attention to this stuff, but for me myself I would like not to be bothered with it" (Interviewee 2). One pattern noticed with these 4 individuals (or 20%) is that each of them did mention at some point during the interview having no interest in politics. Thus, it may be hard to engage individuals who would prefer to avoid what they deem as political types of activities even if tactics are used to increase engagement. Yet, the T-Link Calculator did succeeded in regards to relevancy with a majority of the users.

Table 14. Relevancy of the T-Link Calculator

RELEVANT	# OF INTERVIEWEE COMMENTS
Yes	12
Semi-relevant	4
A taxpayer	8
Driver on Kansas roads	4
Opportunity for citizen input	2
No	4
Somebody else's problem	4

Achievements

Achievements are another consideration that is essential during the engagement/educative experience. Incentives act to build confidence, help the user achieve satisfaction, and reinforce the desired behavior when provided on an appropriate schedule (Keller, 1987). Participants were asked if they achieved anything by using the T-Link Calculator. Over half of the interviewees felt that they achieved something in using the T-Link Calculator. The most popular response was knowledge by 30% participants. The second most common response was a better understanding of KDOT's expenses. "I achieved something by learning about all the different funding sources and expenditures" (Interviewee 13). Four out of the 5 undecided interviewees said it would all depend on whether or not KDOT took time to review and consider their budgets. "That really depends on who is going to see the input and what they do with the data" (Interviewee 6). Only 15% said they did not achieve anything when using the T-Link Calculator. Also, half of the participants were asked during the interviews if KDOT should offer some kind of financial incentive for people to interact with the T-Link Calculator. A 100% of the participants said "No" because they would like all their tax dollars designated for transportation to be spent building and maintaining current infrastructure. Overall, a majority of the users felt like they achieved something in using the T-Link Calculator.

Table 15. Achievements with T-Link Calculator

ACHIEVEMENTS	# OF INTERVIEWEE COMMENTS
Yes	12
Undecided	5
Knowledge	6
More informed on KDOT's revenues and expenditures	5
Depends on level of input	4
No	3

Collaboration

Collaboration or social interactions are also considered important for online engagement (Prensky, 2001) and collaborative environments allow participants to exchange information as well as provide opportunities for mutual learning, creation of new ideas, simplification of problems, and finding resolutions (Pivec, Dziabenko, Schinnerl, 2003). Participants were asked if they were satisfied with the level of interaction received from T-Link, and whether they would have liked to have seen more active dialogue such as what Facebook offers. Fifty percent of the respondents were unsatisfied and thought that KDOT should provide more active collaboration especially when it came to their budget selections. "I think I felt a little lost sometimes. I wasn't sure where I was going; it would be better with a more active dialogue," (Interviewee 4). Interviewee 11 stated, "When I slide the scale to the positive or if I decrease the amount of money it would be nice if something would pop-up asking [a question such as] do you really want to decrease this amount of money because you need this to maintain the roads at their current levels." However, at least 45% of the interviewees were satisfied with the level of interaction feeling that it was sufficient with the interactive budget graphs and selection sliders. Interviewee 7, "I think the way it is currently is fine. If you add too much it might be

overwhelming." Thus, a slight majority of the interviewees see active collaboration or interaction (Norman, 1993) being necessary for the educative/engagement experience.

Table 16. Satisfaction with Interaction Level

LEVEL OF INTERACTION	# OF INTERVIEWEE COMMENTS
Unsatisfactory	10
More active dialogue/feedback	9
Satisfactory	9
No changes suggested	7

Feedback

Feedback items need to be considered when making an online tool engaging for users to ensure openness and transparency (Macintosh & Smith, 2002) along with being timely (Brown & Voltz, 2005) while allowing users to elevate performance. All the participants were asked their opinion on the feedback they received from the T-Link Calculator and what sorts of feedback would they have preferred. Seventy-five percent of the participants either felt that the feedback received from T-Link Calculator was lacking in substance or had trouble remembering whether feedback had been received due to lack of transparency on what would happen with the information. "Was I suppose to get something back from them maybe I was missing something. I didn't see it. It just showed me the end results. I guess I expected more information to come back on what the information would be used for or maybe suggestions as to how I could have done better fiscal[ly]…" (Interviewee 8). This was another key area where a

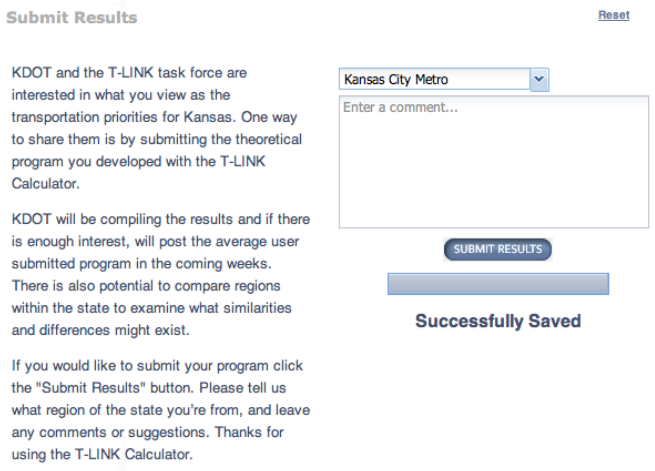

Figure 6. KDOT's Feedback Screen for Submitted Results

good portion of the participants thought that KDOT needed to consider making improvements in order to increase the level of engagement. "I didn't think the feedback at the end was good. It would be nice to see if your program is plausible…" (Interviewee 18). This was a common consensus with 45% of the interviewees. In comparison, 25% of the participants wanted feedback as to whether KDOT looked at the results. Generally, the bulk of participants were dissatisfied with the feedback received, and this alone can be detrimental for the educative/engagement process (Brown & Voltz, 2005).

Furthermore, several people mentioned that it would be nice to see responses from other participants using the T-Link Calculator. "I would have liked to have seen what percentage of people voted for what. It wouldn't change my mind, but it would be interesting to see just for further education" (Interviewee 15). Five interviewees wanted KDOT to address whether or not the information is considered for input, and 5 other interviewees were satisfied with the feedback received. Interviewee 7 said, "Yeah, I would say it was fine."

Table 17. T-Link Calculator Feedback

FEEDBACK	# OF INTERVIEWEE COMMENTS
Would like more feedback	9
Do not recall feedback	6
On results	9
See overall results from other participants	6
Want to know if KDOT looks at inputs	5
Satisfied with feedback received	5
What I had expected	2

Reflection

Reflection is considered important for learning and engagement because this is where the user actually spends time thinking about the overall experience and what they actually learned (Paras

& Bizzocchi, 2005). The participants were asked after a reasonable amount of time using the T-Link Calculator, "Did you find yourself thinking about what you did and what you got out of it?" A little over 75% interviewees reflected on their experience with the T-Link Calculator, and at least 9 respondents spent time thinking about budget adjustments that they would make if they were to interact with the T-Link Calculator again. This step is considered essential for maximizing the learning experience (Paras & Bizzocchi, 2005). Interviewee 11, "…I really went under budget so I wondered what changes I would make if repeating the exercise." Only 2 participants actually went back to make the adjustments one to two days later while four respondents did not think twice about the T-Link Calculator after their first interaction with the site. "No, I did not have a vested interest in the site" (Interviewee 3). As far as the responses received on reflection, the T-Link Calculator did succeed in getting most of the participants to reflect on their learning experience with the tool.

Table 18. Reflection on Usage

REFLECTION	# OF INTERVIEWEE COMMENTS
Yes	16
Thought about potential budget changes	9
Visited the site again	2
No	4

The second question that was asked regarding reflection was whether the participants talked to anybody else about their experience with the T-Link Calculator and what was disclosed. Seventy percent of the respondents did not refer others to the T-Link Calculator after interacting with the site. However, at least 25% of respondents did mention the site to their family, friends and colleagues. Interviewee 5, "I told some colleagues about the learning experience that I had with the T-Link Calculator and recommended that they check it out." In general, the majority of the participants may have reflected on their learning experience with the T-Link Calculator, but

did not feel compelled to reflect or share what they learned with others. One caveat to this is that at least five interviewees waited to interact with the T-Link Calculator the morning of the interview and may not have had much of an opportunity for reflection and sharing.

Promotion

Promotion is necessary in the engagement/educative process so that users know its available. Promotion is another important consideration in getting traction with citizens (Macintosh, 2004). Participants were asked if they knew that the T-Link Calculator existed prior to being involved in the study and all 20 participants were unanimous in answering "No" to this question. "Only knew about it after you sent me the link" (Interviewee 10), and interviewee 19 said, "I had never heard of it before." Thus, as far as this study, it appears that the T-Link Calculator was not properly promoted to the general public. Participants then were asked, "How they would promote the T-Link Calculator to the general population if you were KDOT?" Thirty percent of the participants recommended that KDOT have billboards advertising the T-Link Calculator. Interviewee 9, "As many cars that go down the major thoroughfares of Kansas on a normal day…that's like an advertisers' dream to have access to that many potential clients." While 20% of the participants suggested Facebook, KDOT's website, or a printed advertisement on turnpike receipts. "If they would advertise on the back of my ticket stub, I would pay attention to that and say something to whomever was in the car with me" (Interviewee 15). Fifteen percent recommended a television commercial, press article, or advertising on Kansas.gov website, and one participant responded by stating, "…Kansas.gov is a great website, and it is ranked 6th out of all of the states so that might be a good place to start" (Interviewee 5). Twitter and printed handouts about the T-Link were also mentioned as possible options.

Table 19. Promoting the T-Link Calculator

PROMOTIONAL OPPORTUNITES	# OF INTERVIEWEE COMMENTS
Billboards	6
Facebook	4
KDOT's website	4
Printed advertisements on turnpike receipts	4
TV commercial	3
Press article	3
Kansas.gov	3
Twitter	2
Handouts	2

Time

The amount of time that is required to participate (Macintosh, 2004) is a key aspect to consider in regards to engagement and learning for a tool like the T-Link Calculator. Participants were asked if they felt the amount of time required by the T-Link was appropriate. Eighty-five percent of the participants felt the time required to interact with the T-Link Calculator was appropriate. Most did not feel that the site required that much in the way of time, "Yeah, it didn't take me very long from start to finish…" (Interviewee 3). Several people mentioned that they liked being able to set their own pace (Strother, 2002), and 2 participants said the amount of time was appropriate as long as you had a vested interest in the content. "I think anyone that has an interest in it would be willing to spend that amount of time" (Interviewee 1). A couple of individuals felt that the site took too much of their time. "I'm not sure appropriate for what it is and I feel like you can waste a lot of time on it" (Interviewee 16). However, most of the participants were satisfied and thought the amount of time was appropriate for the experience.

Table 20. Amount of Time on T-Link Appropriate

AMOUNT OF TIME	# OF INTERVIEWEE COMMENTS
Yes	17
Did not require a lot of time	10
You could set own pace	4
As long as you have a vested interest	2
No	2
Took to much time	2

Follow-up to the last question, participants were asked what would be an ideal length of time for a tool like the T-Link Calculator. The majority of the interviewees said 10 to 15 minutes was an optimum amount of time for interacting and engaging with a tool such as the T-Link Calculator. "It depends on what I am using the Internet for, but I typically like to be able to get in and out between 10 to 15 minutes" (Interviewee 11). Interviewee 14 stated, "Anything over 15 minutes you are going to lose most of your population. Online time is real quick and snappy and people don't want to spend lots of hours filling out a tool." Two interviewees said 10 to 20 minutes was an optimum length of time whereas 2 more respondents said 30 minutes was ideal. "I think I would start to resist it if the online exercise took longer than 30 minutes and I probably would become mildly irritated as well" (Interviewee 15).

Table 21. Ideal Length of Time

LENGTH OF TIME	# OF INTERVIEWEE COMMENTS
10-15 minutes	8
10-20 minutes	2
30 minutes	2

Privacy

A final concern in regards to providing an engaging platform is being upfront on the level of privacy that the user can expect such as what information will be required and collected

(Macintosh, 2004). The participants were asked how comfortable were they with the level of privacy provided by the T-Link Calculator when providing their information. All interviewees were fine with the level of privacy provided by the T-Link Calculator. A little over half of the interviewees mentioned that the information provided was not private. It was "[c]ompletely comfortable because I wasn't providing anything that I would consider private information" (Interviewee 9). A less common answer provided by 2 participants: there were no major possible consequences from using the T-Link. "I was fine with it and I didn't think it was a major consequence. It wasn't like I was voting where if I click here a levy is going to change immediately" (Interviewee 7). Ten percent of interviewees also mentioned that they had never had any bad experiences in sharing information on the Internet while another 10% said the information was provided anonymously. Interviewee 17, "I didn't put my name on it anywhere so it was submitted anonymously unless they tracked the IP address, but I wasn't too worried about it." Therefore, privacy was not an issue and did not negatively impact the engagement level with the T-Link Calculator because most considered the information that was provided not private in nature.

Table 22. Comfort with Level of Privacy

LEVEL OF PRIVACY	# OF INTERVIEWEE COMMENTS
Fine	20
Information provided was not private	11
No possible major consequences	2
Never suffered any negative impacts from sharing information over the Internet	2
Information was given anonymously	2

Security

Security is another issue that should be openly documented on the site in the form of a security statement (Coleman & Gotze, 2010). Interviewees were asked if they were at all concerned

about the lack of a security statement on the T-Link Calculator site. Ninety-five percent of participants had no concerns about the T-Link Calculator lacking a security statement while one individual did mention that KDOT should have some kind of security statement on their site. Again, the most popular answer was that the information provided was not considered private, according to 11 of the interviewees. "No, it didn't seem liked it needed to be secure because the information wasn't that private. They didn't ask for my social security number or financial information" (Interviewee 16). The second most common answer given was I have never suffered any negative impacts from sharing information on the Internet, and this answer was a repeat from the previous question. Interviewee 6 said, "I have never had anything bad happen so I don't get concerned about those issues." Two respondents said they were unaware that the site lacked a security statement while 2 others assumed that it was okay being a government website. "This may be naïve, but I figured with it being a government site one would assume the information at this degree would be protected" (Interviewee 20). Again, the lack of a security statement had no impact on people's engagement with the T-Link Calculator.

Table 23. T-Link Calculator's Lack of Security Statement

LACK OF SECURITY STATEMENT	# OF INTERVIEWEE COMMENTS
No Concern	19
Information provided was not private	11
Never suffered any negative impacts from sharing information over the Internet	4
Was not aware that the site lacked a security statement	2
Assumed it was okay being a government website	2

Knowledge Gained

One of the goals of the study was to determine if individuals learned anything from engaging with the T-Link Calculator. Thus, interviewees were asked if they could describe any general knowledge gained from using the T-Link. Half of the interviewees said they learned about how much transportation infrastructure costs. Interviewee 12, "The hugeness of the budget spent on transportation; I wasn't aware that it cost that much." Three individuals developed a better understanding of what all KDOT does in regards to transportation. "I developed a better understanding of all the facets that do go into KDOT and the role they play in providing our road system" (Interviewee 6). Ten percent mentioned that they gained a new perspective and knowledge on transportation issues. "The knowledge I obtained from the T-Link was more of a perspective on transportation issues. The roads may be terrible in some locations, but nobody is really taking the time to figure out that it takes funds to fix them and those funds have to come from somewhere" (Interviewee 10). Furthermore, two respondents realized the difficult financial decisions that have to be made by government officials. Interviewee 17 responded that he had "a better understanding of the difficult financial decisions that are made by government officials when funding the different transportation choices."

Table 24. General Knowledge Gained

GENERAL KNOWLEDGE	# OF INTERVIEWEE COMMENTS
How much transportation infrastructure costs	10
Many different sides of KDOT and their role	3
Perspective and knowledge on general transportation issues	2
Difficult financial decisions that have to be made by government officials	2

Other Suggestions

Finally, participants were asked if they had any further suggestions on how to improve the engagement experience with the T-Link Calculator. Twenty percent of the respondents noticed that the budget numbers were dated on the T-Link Calculator. "One suggestion would be to update the budget information because it looked like it hadn't been updated since 2009. So whenever I saw something about 2009, it immediately had a negative impact on my interest level" (Interviewee, 1). Not having up-to-date information may negatively impact relevancy (Squire, 2005). Also, 15% of participants mentioned that KDOT needed to consider renaming the tool while three suggested simplifying some of the terminology to make it easier for the masses not in the transportation field to understand. Thus, information should be comprehensible (Coglianese, 2006). A final suggestion by 2 of the interviewees was to obtain a new more simplistic website address, thereby making the site easier to promote.

Table 25. Other Suggestions on T-Link Improvements

OTHER SUGGESTIONS	# OF INTERVIEWEE COMMENTS
More update budget information	4
Needs a better name	3
Consider simplifying language to cater to the masses	3
Streamline URL so its easier to promote	2

Overview

Overall, the results show there were positives and negatives to the T-Link Calculator in getting participants engaged in the site. The lessons learned and final conclusions from these results will be discussed in the next Chapter.

CHAPTER 5 - LESSONS LEARNED AND CONCLUSION

Introduction

Most of the people who participated in the study said that they learned something about the transportation system as it applies in Kansas with at least 50% of interviewees gaining knowledge on how much transportation infrastructure costs in Kansas. Interviewee 14 said, "I now have a better understanding of how much things costs." Thus, it appears, if you are able to get individuals to engage with the T-Link Calculator, it does provide them with a perspective on the true costs of transportation.

There were three main goals for this study. The first goal was to create an "e-participant" engagement model incorporating e-policymaking, e-learning, and digital game-based learning design criteria. This was achieved in the creation of the "E2DG Model of E-Participant Engagement" featured in Table 1, which provides the criteria necessary for proper evaluation of tools like the T-Link Calculator on their engagement/educative effectiveness. The second goal was to evaluate the T-Link Calculator using the E2DG Model. Twenty Kansas residents were interviewed and asked a series of questions regarding their engagement/educative experience with the T-Link Calculator using the criteria from E2DG Model. The results of these interviews are featured in Chapter 4. After the evaluation, the third goal was to assess lessons learned to determine what might improve future transportation e-engagement processes. Here are the lessons learned from the study of the T-Link Calculator.

Lessons Learned

In answering the question on whether the T-Link Calculator was successful at engaging people, the final results are mixed. Using the criteria from the E2DG Model of E-Participant Engagement, the T-Link Calculator succeeded with a clear majority of the users: Accessible, Delivery, Cognitive, Relevance, Achievements, Reflection, and Time. On the criteria of Fair, Story, Challenge and Collaboration the respondents were split with about half of the respondents saying it was either satisfactory or it failed. The areas that the T-Link Calculator failed to succeed were Feedback and Promotion. Privacy and Security criteria ended up being a mute issue due primarily to participants not viewing the information provided to KDOT as being private. See Table 26 for an overview of the lessons learned.

The T-Link Calculator received high marks on being accessible from participants in the study. Most liked the layout with the different tabs, with a few commenting specifically on the interactive features---the budget sliders and graphs. However, there were several features that individuals felt impeded the engagement and educative experience. While the graphs were accessible for some, it was not accessible for everybody. One suggestion would be to either provide further information explaining what the graphs mean or provide individuals an alternative way to view the budget changes. Another complaint by participants was the use of certain terminology. This may be something KDOT would want to address especially if they are trying to make the site accessible for all individuals. Simplifying the language or possibly providing users a link to "Key Terms" for terminology that cannot be simplified would probably be a step in the right direction. Finally, KDOT, for future applications, may want to stay away

from using Adobe Flash and switch to a technology platform that is supported by the increasing number of smartphones and Apple products.

Over half of the participants felt that the level of work required by the T-Link was at least appropriate or fair. It was no more taxing than the level of work required by other websites while several respondents thought certain features were less appropriate. Four individuals said the material made it less appropriate due to a lack of interest. There is probably a certain proportion of the population that will be lost on this factor alone. The only resolution would be to try to make the tool more appealing to the masses. Also, some individuals felt like the level of work was too easy. KDOT may want to consider adding an additional level that allows for more in- depth feedback from these individuals that goes beyond the "Advanced Mode." Furthermore, some individuals found it burdensome to click down a level into the "Learn More" links and suggested that KDOT should try to provide more of this content on the page if possible. Again, participants felt that KDOT should try to make the terminology easier to understand.

The delivery of the T-Link Calculator was well received by the majority of the participants. Again, the layout and the interactive graphs were a design positive. There were certain areas though that several participants recommended some changes in regards to delivery. At least 25% wanted to see more graphics especially female users. One suggestion by Interviewee 11 would be to feature a different picture at the top of the page for each individual tab so as to maintain the clean layout popular with many of the participants. Furthermore, it might be beneficial for learning if KDOT were to embed graphics into the "Learn More" links, thereby allowing visual learners to have better comprehension of the materials. Another item that several felt could

improve the T-Link engagement/educative experience is finding ways to incorporate interactive video in order to reduce the amount of text that has to be read. Some had trouble with the Adobe Flash sliders working properly, and if KDOT would switch to a different technology platform this would be resolved.

The story is another area where almost half of the participants saw need for improvement. Many of them thought the storyline about the tradeoffs that have to be made funding one transportation system versus another was not completely obvious. At least 9 of the participants recommended KDOT provide more of an introduction because the little white box (see Figure 5) at the beginning was not sufficient. One thought would be to give the introduction its own tab at the beginning, thereby allowing more room to give in-depth information on what to expect from the experience and the purpose behind the T-Link Calculator. Also, it may be beneficial for KDOT to try to place the individual more in the actual setting of a scenario, thereby increasing the simulation like qualities of the experience. An example given by Interviewee 20, "You have just driven over a pothole and now your car is in the shop. You are not happy and you wonder why your city does not have the necessary funds to fix its roads; thus, here is the T-Link Calculator to explain all the budgetary challenges in keeping the system running." Another example would be to immerse the participant in the environment (Dede, 2009) of being the decision maker by giving them an official role. KDOT than could give the participant a clear goal such as "We need your help in balancing the transportation budget for the State of Kansas" and proceed to explain the scenario from there. Also, participants would like KDOT to provide more information on the actual budget numbers so they have a better idea of what they are aiming for in their budget. This could be included in the introduction. Again, at least 7 participants would

like to see more interactive features like audio or visuals to reduce the amount of text while catering to different learning styles.

In regards to cognitive features, most of the users found the T-Link Calculator understandable. The two areas that created confusion for some were the interactive graphs and the site lacking a clear introduction. Again, more clarification needs to occur with these two features so as to increase comprehension.

The T-Link Calculator was challenging for less than half of the individuals, but maybe for the wrong reason due to the terminology used and lack of a clear purpose. Part of the problem in regards to challenge is that some did not understand what the goal or purpose was when interacting with the site. This needs to be clearly communicated at the beginning so users know what the challenge is and why they are there. For instance in golf, you know from the beginning that the challenge is to get the ball into the hole with the least amount of swings. Also, it might be necessary to offer a mode that is further advanced or just allow these individuals to have more latitude in answering the budgetary questions to increase their level of engagement.

Most of the individuals saw the T-Link Calculator as having at least some relevance due to being a taxpayer or driver on Kansas roads. Still, some felt that relevance could not occur unless KDOT saw their information as being relevant; therefore, for purposes of engagement, it is not only important that the tool be relevant to the user, but it must also be perceived as being relevant to the entity receiving the information. This refers back to the need for agencies to be open to receiving education from the public (Innes & Booher, 2000) as well as the information

being useful for a future action (Squire, 2005). Another item that needs to be addressed is updating the budget information so that the information is more relevant for present times. This is something that several participants found bothersome during the interviews. Furthermore, KDOT may want to provide an explanation on their website as to what the information will be used for. Some individuals did not see the information provided by the T-Link Calculator as being relevant. One possible way to address this is to identify scenarios that show the user the impacts that the transportation system has on all of us. However, this may not work for all participants especially participants who have no vested interest or shy away from political types of activities.

Most of the participants did feel that something was achieved in using the T-Link such as knowledge or becoming more informed on the transportation budget. For at least 4 individuals, their level of achievement would depend entirely on whether or not their level of input was actually considered by KDOT. Thus, if KDOT is interested in having these individuals engage with the site, they need to find a way to address this issue.

Collaboration is another area that needs to be addressed by KDOT to improve the educative and engagement experience for half of the users. The primary way to do this is to provide more active dialogue during the budgetary selection phase. One suggestion would be to provide more immediate feedback like maybe a pop-up box that would explain the consequences to the user of their funding decisions. For example: are you sure you want to cut funding for road maintenance, we currently have so many thousands of potholes that go unfilled each year.

Furthermore, the level of feedback received from KDOT on their budgetary decisions did not satisfy 75% of the participants. The suggestion by several, in order to make the experience more engaging, was to receive more feedback from KDOT regarding the feasibility of their results. If possible, people would like the tool to have the capabilities of saying your budget works here, but is not plausible for funding road design. Another consideration is adding features that allow for the results to be shared via email or printed (Interviewee 14), which is currently not viable. Furthermore, several participants would like to have the option of seeing results from around the state and would like to see this programmed into the tool as well.

A majority of the participants, 75% reflected on the T-Link Calculator. Yet, only a few actually went back to the site or referred somebody else to the site. This might be an opportunity where KDOT could provide the user the option of receiving more information about how their tax dollars are spent or allow the user to send an e-postcard to other potential users (Macintosh, 2004).

Even with the article in the New York Times, and several other forms of publicity, the T-Link Calculator failed to reach any of the participants in the study. Many of the participants had several suggestions in how to reach them. The most popular option was to advertise on a billboard along the Kansas turnpike with 30% of the interviewees. Also, Facebook, KDOT's website and printed advertisements were also offered up as possible options. Furthermore, a few of the participants for promotional purposes strongly encourage KDOT to find a better name like "Take the KDOT Challenge" recommended by Interviewee 16 along with a shorter website address.

Overwhelming, people were satisfied with the amount of time that the T-Link Calculator required. Most felt it did not require much in the way of time, and they liked being able to set their own pace. Thus, its imperative that if KDOT does decide to make any updates that it does not add to the overall time required for the activity. Many of the participants said that an Internet activity should take no more than 10 to 15 minutes for the interaction.

Finally, the criteria for privacy and lack of a security statement on the T-Link Calculator site ended up not being much of an issue in this study. Again, people were not concerned about privacy; however, the literature does suggest that government sites should have a security statement of some kind (Coleman & Gotze, 2010).

Table 26. Overview on Lessons Learned from T-Link Calculator

1. A simple layout is a plus for usability.
2. Interactive features are good as long as people understand them and they work properly.
3. Use language that everybody can understand.
4. Level of work required should not be more than what other sites expect from users.
5. Offer different levels of difficulty to cater to all skill types.
6. Put as much content as feasible on the actual page in order to eliminate extra clicks down into the site. However, be careful not to make the site to cluttered.
7. Interactive visuals and audio features engage different learning styles and genders.
8. Avoid using Adobe Flash to develop sites like the T-Link Calculator. Some new smartphones and Apple products do not support this technology platform.
9. Provide in-depth introduction so that users understand what is expected and the purpose behind the experience.

Table 26. Overview on Lessons Learned from T-Link Calculator (cont.)

10. Provide background information that is relevant to the scenario like actual budget numbers and make sure the information is up-to-date.
11. Information needs to be relevant to the user, and the user of the site has to feel it is relevant to whoever is receiving it.
12. Providing immediate feedback to facilitate collaboration.
13. Feedback is necessary so the user has a vested interest in the activity.
14. Feedback includes users seeing how their scenarios compare to others.
15. Reflection does not necessarily mean the user will repeat the exercise or invite someone else to use the site.
16. Promotion is essential; otherwise, nobody knows it is available.
17. Allow users to set their own pace while keeping the activity as short as possible.
18. Privacy and security are not necessarily an issue if the information is not considered personal.
19. Even if the site is developed to maximize engagement, this does not necessarily mean that all users will have a vested interest to engage.

Conclusion

There were few limitations that occurred with this study of the T-Link Calculator. One threat was the difference in time between when the participant used the T-Link Calculator and when the interview took place. The information regarding the T-Link was sent two weeks in advance to all the interviewees, but for some participants this was too much time. A few had trouble recalling their answers to some of the questions especially if they did not write down the information after the interaction. In order to get more accurate answers, it would be better to have the interviewees interact with the site no more than a couple of days prior to the interview.

A second limitation to this research is the selection of participants using a non-random sample. The answers received regarding the engagement/educative experience with the T-Link Calculator may be biased due to using a sample of convenience, and because of this factor there was an over-representation of participants in their 50s. This was partly due to participants' willingness, but also because of limited time and financial resources available to conduct this research. Furthermore, not having the necessary funding to conduct a large-scale study may hinder how these results can be applied to the larger population. Finally, because of the small sample size, more testing needs to be done in order to ensure that the right causal factors have been identified on how the T-Link Calculator could be more effective at engaging Kansans.

More research is necessary in this area. One recommendation in regards to future research is involving researchers that could represent and serve as experts on e-policymaking, e-learning and digital games. Having this knowledge could ensure that the right causal factors have been identified along with helping to advance the overall research design process and final interpretation of the results. Furthermore, it would be interesting to do a second round of research on the T-Link Calculator after some of the recommended adjustments are made to see if it does improve the overall level of engagement. This is important for identifying the right criteria necessary for engagement.

The T-Link Calculator may be a new phenomenon, but this is all changing with the advent of newer technologies on the horizon and an increasing interest to engage citizens while providing government transparency. Recently, the Metro Chicago Information Center along with several sponsors put out a request to all programmers for the development of "apps" that would educate

and engage citizens on transportation and community matters (Metro Chicago Information Center, 2011). One of the key areas of concern is longevity for these applications with the public. Metro Chicago Information Center would like to see these applications have a useful life that is longer than just a few months. This can be a challenge, especially if the programmer or agency does not know what are the necessary requirements needed for creating an engaging/educative experience. Thus, the educational experience that could have been provided by the T-Link Calculator or other types of applications does not occur. Furthermore, the time and resources spent on the development of new educational tools may go unrealized, making agencies less willing to spend additional monies on future tools even if the ultimate premise is good. More research is definitely needed for these types of applications that cannot be classified as just being an e-policy tool, but also contain aspects of digital gaming or e-learning so that agencies like KDOT, when developing these types of tools, will have some where to look.

This study identified criteria needed to make tools like the T-Link Calculator more engaging/educative. This required developing a model known as the E2DG Model of E-Participant Engagement that incorporated engagement criteria from e-policymaking, e-learning, and digital game-based learning. Twenty participants were interviewed on their level of engagement/educative experience with the T-Link Calculator using the E2DG Model. From the interviews, it was determined that the T-Link Calculator succeeded in some areas of engagement and failed in other areas. The positives were ease of usability, simplicity of the layout, instant results provided by sliders and graphs, the "Learn More" features, the different levels with "Basic" and "Advanced Mode," and the short amount of time required to interact with the site. However, the downsides for several individuals included not understanding the interactive

graphs, the T-Link's Adobe Flash platform not being compatible with certain applications or devices, and the terminology used. Also, some of the modifications that people suggested included providing instant feedback on individual results, expanding the introduction, providing a clear purpose as to what needs to be accomplished, and providing more definitive information on the actual budget numbers. If these modifications were made, this would help KDOT take the T-Link Calculator to the next level of engagement while providing a platform that would be more enticing to citizens for learning about the high costs of transportation.

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APPENDIX A

Introduction Email

Hello _____-

Again, I want to thank you for agreeing to participate in 30 minute interview for my Thesis project. I have recently been evaluating an educational website called the T-Link Calculator for the Kansas Department of Transportation (KDOT). In 2009, KDOT launched the website as a means to educate state representatives, but those plans were put on hold. Thus, KDOT decided to release the website information to the general public. The main purpose of the T-Link Calculator is to allow Kansans an opportunity to provide "virtual" input on how they would finance transportation in the State. A secondary purpose is to provide knowledge to citizens on how much transportation infrastructure is costing within the State.

The link to the T-Link Calculator is http://www.kansastlink.com/calculator/, and it would be great if you could spend at least 15-30 minutes on the website in the next couple of weeks prior to our interview. Please let me know if you have any problems accessing the website.

The focus of my thesis for the US Department of Transportation is to find out how engaging (at the citizen level) are these policy-making websites like the T-Link Calculator based on certain engagement factors. Thus, my main objective in the interview will be to ask a set of questions dealing with engagement to determine how engaging was your experience with the T-Link Calculator. I have attached the interview questions to this email, and it may be helpful to review them prior to interacting with the T-Link Calculator. If you have any questions, please don't hesitate to contact me via email.

I was wondering if you would have any time to meet on two weeks from now and if so, where would you like to meet? I recommend a quiet location to meet so that that interview can be electronically recorded.

I look forward to hearing from you soon.

Thank you,
Ariel Heckler

University of Kansas
Master's Student
Department of Urban Planning

APPENDIX B

Interview Protocol

To help with note-taking today, I would like to use a digital recorder to tape our conversations. I will be the only researcher on the project that will have access to the recordings, and my intent is to delete the recordings after I have transcribed the information. If this is okay, would you please sign this release form? In addition, you must sign a form devised to meet the University of Kansas human subject requirements. Essentially, this form states that: (1) all information will be held confidential, (2) your participation is voluntary and you may stop at any time if you feel uncomfortable, and (3) we do not intend to inflict any harm. Again, thank you for agreeing to participate in this study.

I have planned this interview to last no longer than one hour. During this time, I have several questions that I would like to cover during this time frame. If time begins to run short, it may be necessary for me to push ahead in order to ensure that all items are addressed.

APPENDIX C

Interview Introduction

You have been selected to speak with us today because you have been identified as someone who meets the demographic criteria of this study, and a resident of Kansas. My research project as a whole focuses on evaluating the effectiveness of the T-Link Calculator at engaging citizens on the subject of transportation finance. When the T-Link Calculator was initially developed in 2008 by the Kansas Department of Transportation, it was viewed as an electronic learning tool for Kansas residents, politicians and other transportation stakeholders to learn more the long-term financial and infrastructure impacts on the entire transportation system. After further analysis, it was discovered that the T-Link Calculator also includes aspects of electronic policymaking, where citizens are given an opportunity to present their views on setting policy and digital game-based learning, which combines learning and gaming. Thus, I have created an "e-participant" engagement model that incorporates the principles of engagement for all three platforms---e-policymaking, e-learning, and digital game-based learning---into one model. My intention today is to ask you questions using the "e-participant" engagement model and to gain feedback on the different criteria necessary for engagement with the T-Link Calculator. Through this process it is hoped the model and lessons learned from the T-Link Calculator evaluation will help improve future transportation e-engagement processes.

APPENDIX D

List of Interviews

Interview 1. Personal Interview. 18 March, 2011

Interview 2. Personal Interview. 18 March, 2011

Interview 3. Personal Interview. 20 March, 2011

Interview 4. Personal Interview. 21 March, 2011

Interview 5. Personal Interview. 21 March, 2011

Interview 6. Personal Interview. 22 March, 2011

Interview 7. Personal Interview. 22 March, 2011

Interview 8. Personal Interview. 22 March, 2011

Interview 9. Personal Interview. 23 March, 2011

Interview 10. Personal Interview. 23 March, 2011

Interview 11. Personal Interview. 1 April, 2011

Interview 12. Personal Interview. 1 April, 2011

Interview 13. Personal Interview. 1 April, 2011

Interview 14. Personal Interview. 1 April, 2011

Interview 15. Personal Interview. 1 April, 2011

Interview 16. Personal Interview. 8 April, 2011

Interview 17. Personal Interview. 16 April, 2011

Interview 18. Personal Interview. 16 April, 2011

Interview 19. Personal Interview. 17 April, 2011

Interview 20. Personal Interview. 20 April, 2011