PRECURSORS TO CONTEXT SENSITIVE DESIGN (CSD)
IN NON-CSD PROJECTS

by

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ABSTRACT

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This study searches for planning and design strategies required in Context Sensitive Design (CSD) transportation projects executed prior to the establishment of CSD standards. CSD is "a collaborative, interdisciplinary approach in which all stakeholders develop transportation facilities that fit their physical settings and preserve the aesthetic, scenic, historic and environmental resources, while maintaining safety and mobility" (Center for Transportation and Environment (CTE), 2007).

There were five pilot states which were Connecticut, Kentucky, Maryland, Minnesota, and Utah, agreed to implement the CSD approach in 1998. In the following years, many states looked to CSD as a more effective approach for improving long-term mobility. In the meantime, researchers of CSD, in the past, focused on identifying and retrieving CSD principles from completed transportation projects (NCHRP Report 642, 2009). However, there were little evidence of a systematical and comprehensively exploration of CSD in the completed transportation projects with regards to the investigate planning and design strategies for current and future projects.

This research used two non- CSD, but completed context-themed projects as research targets. Both were completed projects in North Texas and executed prior to the establishment of
CSD standards were implemented officially in 1998. One is the IH 30 Three Bridge Corridor Enhancement project along the Arlington (Texas) Entertainment District, and the other is the US 75 North Central Expressway Transportation Project in Dallas, Texas. Both project adopted planning and design strategies which were very similar in many respects to what is now called CSD. In addition, both were started prior to the implementation of CSD, and involved interdisciplinary teams consisting of state agencies, local governments, and private entities. The study sites included in their programming the increasing population of the Dallas-Fort Worth (DFW) metropolitan area, traffic mobility, and improvement of the regional economy. Both projects also respected local cultural, historical, and environmental features. For these reasons, it can be said that study sites comprehensively represented the integration of “CSD” into transportation planning and design decision-making.

This research seeks to benefit future transportation projects by determining how diffused the knowledge of CSD is in planning and design prior to implement of CSD. This research uses qualitative research methods by interviewing with stakeholders and professionals who involved in study sites to determine their experience related to diffused knowledge of CSD strategies. The interview questions also includes how different the projects would be if the strategies of CSD had been applied. By analyzing qualitative data from interviews, this research expands understanding of how CSD standards emerged from practices in place prior to establishment of Context Sensitive Design.
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CHAPTER 1
INTRODUCTION

1.1 Introduction

This study searches for planning and design strategies and outcomes of the strategies in two completed context-themed transportation projects The IH 30 Three Bridges Corridor Enhancement Project and The US 75 North Central Expressway Transportation Project. Context Sensitive Design (CSD) is “a collaborative, interdisciplinary approach in which all stakeholders to develop transportation facilities that fit their physical settings and preserve aesthetic, scenic, historic and environmental resources, as well as maintaining safety and mobility” (CTE, 2007). CSD is widely used in transportation projects as a means of more uniformly assessing design standards (Stamatiadis, 2009). With implementation of CSD into transportation projects, it is possible to decrease costs and the time for overall project delivery (Federal Highway Administration (FHWA), 1997). CSD also promotes and emphasizes meaningful stakeholder involvement as well as the early identification and resolution of project issues and barriers. Therefore, CSD improves predictability of project delivery, and risk management protection (Gray, 2009).

However, there are limited completed CSD projects in Texas, especially in North Texas. In addition, there are limited people who are willing to adopted CSD, because they think CSD is just the urban design approach and a policy which is a means of assessing design standards more uniformly. This study searches for planning and design strategies and outcomes of the strategies in two completed context-themed transportation projects (The IH 30 Three Bridges Corridor Enhancement Project and The US 75 North Central Expressway Transportation Project). The study uses face-to-face interviews with a wide range of stakeholders and professionals from state agencies, transportation departments, and local governments, private
agencies, and community groups. By a systematical investigation of the strategies of the study sites, the research is able to determine how diffused knowledge of CSD is in the planning and design stage, which would help people implement transportation projects with CSD in a more effective manner.

1.2 Research Objectives

This research uses a qualitative method to explore the presence of Context Sensitive Design (CSD) in two completed transportation projects in North Texas. Specific research objectives are aimed at:

- Understanding the planning and design strategies of the IH 30 Three Bridges Corridor Enhancement Project and the US 75 North Central Expressway Transportation Project
- Determining how diffused knowledge of Context Sensitive Design (CSD) is throughout the planning and design of transportation projects
- Identifying the outcomes and challenges of CSD strategies in the planning and design of transportation projects

1.3 Research Questions

The primary questions explored in this research are:

- How diffused knowledge of CSD is in the planning and design of the two projects used in the study?
- How is CSD generally applied to transportation projects?
- How different would the final design been if CSD had been applied to the projects?

1.4 Study Sites

This research uses the two projects completed in North Texas prior to the establishment of CSD. One is the IH 30 Three Bridge Corridor Enhancement project in the Arlington (Texas) Entertainment District completed in 2008, the other is the US 75 North Central Expressway Transportation Project completed in Dallas in 1999. They started at the early stage of the term CSD that was officially introduced in 1998. In addition, the study sites
comprehensively represented the integration of “CSD” into transportation planning and design decision-making, because study sites includes in their programming the increasing population of the Dallas-Fort Worth (DFW) metropolitan area, traffic mobility, and improvement of the regional economy. Both of them also respect local cultural, historical, and environmental features.

1.4.1 The IH 30 Three Bridges Corridor Enhancement Project

The IH 30 Three Bridges Corridor Enhancement Project was located at the IH 30 section in the Arlington (Texas) Entertainment District. As shown in Figure 1.1, the boundaries of the project extended from west of the Ballpark Way bridge to west of the Cooper Street bridge. The project connected several major attractions of the city of Arlington, Texas, including Six Flags Over Texas, the Ballpark, Arlington Convention Center, and Six Flags Hurricane Harbor. The Three Bridges Corridor also ran across Cooper Street, Collins Street, and Ballpark Way which are the major thoroughfares for Arlington. In addition, the study sites served as a gateway to other destinations, such as a large retail and commercial areas, central Arlington area, The University of Texas at Arlington, and River Legacy Park.

Figure 1.1 The IH 30 Three Bridges Corridor Enhancement Project
In 2002, TxDOT planned to reconstruct the IH 30 project. Initially, TxDOT established a multidisciplinary team including civil engineers, landscape architects, architects, and other professionals from private firms and public entities. This multidisciplinary team worked holistically from a broad picture to the small details. They created a distinctive CSD theme drawn from the facets of Arlington’s culture and history. The IH 30 project enhanced the transportation facility’s functional and aesthetic requirements, and strengthened the perception of its surroundings as a destination district.

The project provided an opportunity to define a distinct image of the corridor and created a sense of arrival feeling for the city of Arlington. Accordingly, the project satisfied the requirements of the surrounding community. In summary, the IH 30 project not only satisfied the capacity requirements and the total experience of the freeway users, but also integrated the context of the surrounding community into the infrastructure. “It tells the history of the area. It tells the history of a great city” the City Mayor Cluck (2010) said.

1.4.2 The US 75 North Central Expressway Transportation Project

The US 75 North Central Expressway Transportation Project was located between Woodall Rodgers Freeway and IH 635. As shown in Figure 1.2, it is a major north-south route from the Dallas Central Business District (CBD) to the north Dallas area (Texas Freeway, 2012). The southern end of the corridor was surrounded by multi-storied commercials, retails, residential buildings, and the Southern Methodologist University. It also runs parallel to the Dallas Area Rapid Transit’s (DART) Red and Blue Lines with seven stations along it. The project spans around 9.1 miles (Mobility, 2001).

US 75 was the first freeway of the city of Dallas. It opened in around 1950 (Texas Freeway, 2012). Before reconstruction, the section of US 75 along the North Downtown of Dallas was one of the most poorly designed freeway in the nation (Texas Freeway, 2012). As shown in Figure 1.3, the freeway was narrow and the geometrics were poor, its roller coaster design led to low areas that flooded in minor rainstorms. Furthermore, with the development of
the Dallas-Fort Worth (DFW) metropolitan area, Dallas was experiencing increased population, which led to much traffic pressure on US 75. Congestion on US 75 occurred throughout the day with almost seven-hour slowest speeds (Mobility, 2001). It was the most congested highway in Texas and one of the most dangerous in the nation (Humann, 2009).

Figure 1.2 The US 75 North Central Expressway Transportation Project

Figure 1.3 The North Central Expressway before construction, taken at 1990 (Humann, 2012)

The eventual solution to US 75 North Central Expressway Transportation Project was initialized by Dallas Area Rapid Transit (DART). In the early 1980’s, Dallas Major Starke Taylor
and DART campaign chairman Walt Humann had pledged to fix US 75. It took three year for them to delivery their promise to find an answer for the North Central Express.

Shortly thereafter, Walt Humann formed North Central Task Force (NCTF). NCTF was comprised of three groups: policy makers who were the governor, key mayors, the NCTF chair, technical staffs from the Texas Department of Transportation and the cities, consultants, and community representative of 200 local neighborhood business, environmental, economic, and political groups. This interdisciplinary group analyzed 128 alternatives of Highway and Rail transit for North Central Express project and offered a new approach to public officials to try to develop a plan (Humman, 2010).

During the projected 10-year construction period, NCTF formed the Mobility Task Force to help public agencies keep traffic moving. The city manager reported that there were almost no traffic complaints during construction (Humann, 2009). The entire project was completed by 1999, several months ahead of plan.

Since opening, the North Central project has received a number of national awards. It has been mentioned as one of the most beautiful and functional multimodal corridors in the nation (Humann, 2009). North Central Expressway project was one of the modern milestones in the history of context sensitive design improvements. As Walt Humann (2009) said, “it as the first time in Texas urban highway history, architectural and aesthetic feature was incorporated in the design”. Beauty and the dramatic improvement of highway functions are visual evidence of CSD which emphasizes implementing urban transportation facilities in harmony with surrounding environmental context. Figure 1.4 shows part of US 75 after construction, which displays the distinctive features of North Texas.
1.5 Definition of Terms

**Context:** is the background, environment, framework, setting, or situation surrounding a site (FHWA, 2012).

**Context Sensitive Design (CSD):** is a collaborative, interdisciplinary design approach that involves a broad range of stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions (FHWA, 2012).

**North Texas Clean Air Coalition (NTCAC):** is the nonprofit organization in the North Texas region dedicated solely to encouraging voluntary efforts to improve air quality in North Texas through educating, engaging and recognizing the business community. The Clean Air Coalition believes that business can both positively impact the environment and earn a profit (workingforcleanair.org, 2012).

**Intermodal Surface Transportation Efficiency Act (ISTEA):** is a United States federal law that posted a major change to transportation planning and policy to provide funding for transportation enhancements. It presented an overall intermodal approach to highway and transited funding with collaborative planning requirements, giving significant additional powers to metropolitan planning organizations (Research and Innovative Technology Administration (FHWA, 2012)).
National Environmental Policy Act (NEPA): established the notion of avoidance and minimization of disturbances. This law encourages transportation projects to consider environmentally sensitive solutions (FHWA, 2012).

Preservation: is the maintenance of something, especially historic value, in an unchanged condition (Encarta, 2005).

Stakeholders: is a group of state and local governmental agencies, academic institutions, the scientific community, non-governmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests, and private landowners (Schutt, 1999).

TxDOT: is an acronym for the Texas Department of Transportation (TxDOT, 2012).

American Association of State Highway and Transportation Officials (AASHTO): are standards setting body which publishes specifications, tests protocols and guidelines which are used in highway design and construction throughout the United States (FHWA, 2012).

Transportation Project: means any proposed or existing undertaking that facilitates any mode of transportation in the states (Oregon, 2012).

National Highway System Designation Act (NHSDA): is an act that was enacted in November 1995. It focuses on rehabilitation of highway on the National Highway System. In addition, the constructed and natural environment of the area, the environmental, scenic, aesthetic, historic, community, and preservation impacts of the activity, and access for other modes of transportation are also taken into account (FHWA, 2012).

1.6 Significance of Research

This study searches for planning and design strategies in projects completed prior to the establishment of Context Sensitive Design (CSD) standards. These strategies are similar to CSD which are applied to transportation projects after its establishment. With this exploration, this research helps to determine how diffused knowledge of CSD is in planning and design by studying two completed North Central Texas transportation projects which are IH 30 Three
Bridge Corridor Enhancement Project and US 75 North Central Expressway Project, respectively. The research is able to obtain a comprehensive understanding of CSD within projects, and help people implement transportation projects with CSD in a more effective manner.

1.7 Delimitations

First, there are limited literatures related to CSD or similar strategies ten years ago. Second, there is limited number of completed transportation projects in Texas adopting CSD. There are only eight CSD projects in Texas, most of them are ongoing, and one was stopped because of limited funding. Third, some stakeholders and professionals of research projects could not to be reach for interview, since the projects were completed about ten years ago. However, this research is able to find the key stakeholders and professionals to obtain a comprehensive understanding concerning these two study sites.

1.8 Summary

This research searches for planning and design strategies in two successful context-themed transportation projects (the IH 30 Three Bridges Corridor Enhancement Project and the US 75 North Central Expressway Transportation Project). By a systematical investigation of the strategies of the study sites, the research is able to determine how diffused knowledge of CSD is in the planning and design stage, which would help people implement transportation projects with CSD in a more effective manner.
CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Context Sensitive Design (CSD) is playing an important role in transportation projects. In this chapter, the study introduces the definition of transportation projects, starting with its background in Section 2.2.1. In Section 2.3, the study presents the definition of CSD and its key elements: interdisciplinary team and stakeholders. Then the study introduces project development process where CSD is integrated. Section 2.4 gives some case studies which adopted the CSD methods successfully in their development process. Section 2.5 summarizes this chapter.

2.2 Overview of the Transportation Planning and Design

2.2.1 Transportation Project

The term “transportation project” means a project for a public freight rail facility or a private facility providing public benefits to highway users; It could also refer to a project for an intermodal freight transfer facility; a means of access to a facility; or a service improvement to a facility (CUSC, 2005). A transportation project involves the combination of private and public sector funds, including investment of public funds in private sector facility improvements.

2.2.2 Traditional Transportation Planning and Design Process

Transportation planning is “a field involved with the evaluation, assessment, design and siting of transportation facilities which included generally streets, highways, footpaths, bike lanes and public transport lines”(Shelton, 2004, p. 2)
There are basically five distinct stages exist in a transportation planning and design process, planning, project development, final design, right-of-way, and construction (FHWA, 2012). After construction is completed, ongoing operation and maintenance activities still continue throughout the life of a transportation facility. Each different stage involves in different participants and decision-making processes. For example, during the first three stages, designers and communities are key participants. When the stage “final design” is finished, right-of-way is purchased and construction bid packages become available. Consequently a contractor is selected to initiate construction. Usually during the last two stages, the design team and engineers are involved throughout right-of-way, and construction stages (FHWA, 1997).

However, the transportation planning and design process follows a collaborative decision-making model instead of five distinct decision-making processes in the traditional way (Maclver, 2011). Traditional planning methods are not suitable for modern transportation projects. For example, modern transportation projects are able to not only improve the facilities, but also integrate the planning and design to the surrounding natural communities. Therefore, the engineering team should collaborate with the landscape designer, and the community representatives. It is important to redefine the problem statement for transportation projects.

2.3 Background

2.3.1 Context

Context is scenic, aesthetic, historic and environmental resources (FHWA, 2012). These resources do not exist as isolated elements, they coexist inseparably. Analyzing the opportunity and constraint of each context will help the projects be in harmony with surrounding environment (FHWA, 2012). On the other hand, transportation systems deal with dynamic and inconstant scenarios, which could involve in these scenic, aesthetic, historic and environmental resources. According to Vieira (2011), “Context is what allows the understanding of transportation systems and how it impacts the way people decide to use the available
surrounding resources” (Vieira, 2011, p. 47).

Figure 2.1 Historical and cultural resources

Figure 2.2 Natural and environmental resources

Figure 2.3 Recreational and scenic resources
2.3.2 Definition of Context Sensitive Design

In 1998 “Thinking beyond the Pavement Conference” was held at the University of Maryland Conference Center. The conference provided a landmark opportunity for 325 invited participants from 39 states and the District of Columbia to develop a vision of excellence in highway design for the 21st Century. Since the “Thinking beyond the Pavement” conference was held in 1998, CSD has taken root within Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) as a philosophy for developing transportation projects (CET, 2007). In 2001, FHWA and AASHTO expanded the definition of CSD to include as “…CSD is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility. It is an approach that considers the total context within which a transportation improvement project will exist” (FHWA, 2012).

In one word, Context Sensitive Solutions is a revolution in states DOTs to improve mobility in the long run. The Minnesota Department of Transportation, one of the five pilot states to agree to implement the CSD approach, refers to CSD as roadway standards and development practices (FHWA, 2012). The Minnesota Department of Transportation also
acknowledges that CSD allows roadway design decisions to better balance economic, social and environmental objectives (MDOT, 2010). Other pilot states are Connecticut, Kentucky, Maryland, and Utah (FHWA, 2012). The Kentucky Transportation Center states that CSD is a planning and design philosophy which helps the projects exist in harmony with the community and environment (Hartman, 2004).

2.3.3 History

Milestones in the history of CSD show how the field has evolved beginning in 1969 and has been gaining momentum ever since (See Table 2.1). In 1969, the National Environment Policy Act (NEPA) was passed, requiring transportation agencies to consider adverse impact of transportation projects on the environment and natural resource in order to protect, maintain, and enhance environment (FHWA, 2012). This Act was the first known law to require agencies to adopt some preliminary CSD concepts in transportation projects. In the next twenty years, concepts about public involvements and multiple communities’ interactions in transportation project decision-making had evolved. As a result, the Intermodal Surface Transportation Efficiency Act (ISTEA) was passed, It stated that modern intermodal transportation not only focused on constructing roads, but also on providing diverse surface transportation options with consideration of environmental enhancements and community issues (FHWA, 2012). The National Highway System Designation Act further emphasized these concepts in November 1995. It stated that environment, scenic, aesthetics, history, community, and accessing to other modes of transportation were important at the same time, demonstrating that it required better management of transportation system through new approaches to planning (Slack, 2009).

Two years later, the foundation of CSD was laid with the publishing of “Flexibility in Highway Design” in 1997 (FHWA, 1997), the text regulated that flexible designs should be encouraged to sustain environment and community interests without compromising safety. One year later, the Transportation Efficiency Act for the 21st Century (TEA-21) was passed. This Act enhanced requirements for public involvement in decision-making and integration of planning
and environmental considerations in the decision-making process. With the laws and regulations being passed, people realized that the integration of CSD with the projects can bring unexpected benefits to transportation agencies. The theory and researches about CSD got explosively development. As a result, in 2004, FHWA and partners launched contextsensitivesolutions.org. It was the new web-based national resource center of CSD which collected and provided practitioners with guides of how CSD was applied to transportation practices. This website advanced the successful use of CSD in the transportation planning and design process.

Since 2004, the Texas Department of Transportation (TxDOT) has incorporated Context Sensitive Design to help establish the regional, local and neighborhood vision or long-term objectives. FHWA also provides CSD training courses that present a general overview of the opportunities to apply CSD to phases of planning, development, design, and implementation of the transportation improvement projects. Many design personals within TxDOT have attended it, including engineers, planners, landscape architects and technicians. In 2004, TxDOT launched 2004 Design Conference which included a session about CSD with presenters from FHWA (FHWA, 2012). The purpose of TxDOT’s 2004 CSD Conference was to provide participants with a general appreciation and understanding of the CSD philosophy and principles (TxDOT, 2004). The speaker analyzed six Texas transportation projects. And the US 75 North Central Expressway Transportation Project was one of these projects.

Moreover, TxDOT revised its Project Development Process Manual to require that CSD is considered in project evaluations. Texas was the first state to officially adopt the “Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities” manual written by the Institute of Transportation Engineers (ITE) (Houston Tomorrow, 2009). Polikov (2009), a Fort Worth-based planner, said that “TxDOT is the first state transportation agency in the country to include community needs in its manual, including those of neighborhoods along a proposed road, local residents, walkers, bikers, commercial developers
and cities” (Houston Chronicle, 2009, p.79).

Table 2.1 Significant Events in the History of Context Sensitive Design (FHWA, 2012)

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>National Environmental Policy Act (NEPA)</td>
</tr>
<tr>
<td></td>
<td>Requiring transportation agencies to consider adverse impacts of road projects on the environment</td>
</tr>
<tr>
<td>1988</td>
<td>National Highway System (NHS) Task Force</td>
</tr>
<tr>
<td></td>
<td>Recommending the creation of a National Highway System</td>
</tr>
<tr>
<td>1991</td>
<td>Intermodal Surface Transportation Efficiency Act (ISTEA)</td>
</tr>
<tr>
<td></td>
<td>Establishing new requirements for multimodal transportation planning</td>
</tr>
<tr>
<td>1995</td>
<td>NHS Designation Act</td>
</tr>
<tr>
<td></td>
<td>Taking into account the constructed and natural environment of the area; the environmental, scenic, aesthetic, historic, community, and preservation impacts of the activity; and access for other modes of transportation</td>
</tr>
<tr>
<td>1997</td>
<td>Flexibility in Highway Design</td>
</tr>
<tr>
<td></td>
<td>Using flexible design to help sustain important community interests without compromising safety</td>
</tr>
<tr>
<td>1998</td>
<td>Thinking Beyond the Pavement National Workshop</td>
</tr>
<tr>
<td></td>
<td>Integrating highway development with communities and the environment while maintaining safety and performance</td>
</tr>
<tr>
<td>2004</td>
<td>contextsensitivesolutions.org</td>
</tr>
<tr>
<td></td>
<td>Launching the new web-based national resource center for Context Sensitive Design (CSD)</td>
</tr>
<tr>
<td>2006</td>
<td>“Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities”</td>
</tr>
<tr>
<td></td>
<td>Advancing the successful use of CSD in the planning and design of major urban thoroughfares for walkable communities</td>
</tr>
<tr>
<td>2007</td>
<td>&quot;Results of Joint AASHTO/FHWA Context Sensitive Solutions Strategic Planning Process&quot;</td>
</tr>
<tr>
<td></td>
<td>Refinement of the 1998 CSD qualities and characteristics</td>
</tr>
<tr>
<td>2009</td>
<td>National Dialogue on Context Sensitive Design</td>
</tr>
<tr>
<td></td>
<td>Highlighting exemplary case studies of CSD projects</td>
</tr>
<tr>
<td></td>
<td>&quot;Quantifying the Benefits of Context Sensitive Solutions&quot; (NCHRP Report 642)</td>
</tr>
<tr>
<td></td>
<td>Expanding the core principles of CSD to 15 distinct and actionable principles that can be used to guide CSD projects</td>
</tr>
</tbody>
</table>
2.3.4 Stakeholder

Generally, stakeholder is defined as individual or group who stands to gain the benefits from success or lose from failure (Nuseibeh, 2000). A stakeholder who specifically takes part in a transportation project is defined as a person, or group of people, who have a vested interest in the success of a project and the environment in which the project operates (Department for International Development (DFID), 2001). Stakeholders include community leaders, local officials, local governments, property owners, civic organizations, and utility companies (Texas Design Conference, 2004). Many stakeholders are involved in the transportation planning and design process. Key stakeholders are those who are directly affected by an activity, such as the desired beneficiaries of the projects and their implementing agencies. Secondary stakeholders are indirectly affected by the project, for example, irregular road users (DFID, 2001).

CSD for the transportation projects takes a range of stakeholders into account, such as the informers from school, the parks, the libraries, the shops and restaurants, the historic sites, and the neighborhoods. These stakeholders give more insights about public attitudes, values, perceptions, and interests. Being aware of perceptions of these key stakeholders and the possible conflicts among them provides an opportunity for designers to develop a strategy to accomplish the project (Georgia Department of Transportation (GDOT), 2006).

TxDOT also encourages public involvement to obtain early and timely information about the transportation issues. For example, before adopting a plan, TxDOT’s statewide public involvement process allows for at least 30 calendar days from the public hearing notice and at least 10 days after the public hearing, for the public to review and provide comments (Implementing plan, 2011).

2.3.5 Interdisciplinary Team

An interdisciplinary team is described as “a group of people with complementary skills who are committed to a common purpose, performance goals, and approach, for which they hold themselves mutually accountable” (Carrier, 1995, p. 13). Representatives on a project
team should include project development engineers, traffic engineers, planners, environmental staff, architectures, landscape architectures, and other specialists (GDOT, 2006). GDOT stated that “…project team composition for CSD projects should include skill sets that bring both broad perspectives and clear vision, technical knowledge and intuitive thinking, as well as reasoned problem solving and breakthrough ideas” (GDOT, 2006).

Junor et. al. captured important features of an interdisciplinary team (Junor, 1994). They described these features as “maximize clinical effectiveness”. They thought that an interdisciplinary team needs to share the same goals and should balance each one's values in order to maximize the project benefits.

For this reason, each state has a performance management system to assess its work in order to give the agency staffs the ability to change work processes based on those measurements (McMinimee, 2009). Performance management system includes activities which measure the performance of a department, employee, or even the processes to build a product or service.

In 2009, the American Association of State Highway and Transportation Officials (AASHTO) introduced performance management system in six states which were Arizona, Florida, Missouri, Virginia, Washington, and Utah. The DOTs of the six states presented innovative practices of interdisciplinary teams which focus on design and other services relative to the project implementation process.

2.3.6 Qualities of Context Sensitive Design

As an approach to transportation, CSD has spread rapidly since 1998. It is because CSD practitioners and advocates understand and embrace its many important benefits (Stamatiadis, 2009). Basically, a CSD process is able to (FHWA, 2007)

- Establish an interdisciplinary team early, including stakeholders, with skills based on the needs of the transportation activity.
- Seek to understand the landscape, the community, valued resources, and the role of all
appropriate modes of transportation in each unique context before developing engineering solutions.

- Communicate early and continuously with stakeholders in an open, honest, and respectful manner.
- Tailor public involvement to the context and phase.
- Utilize a clearly defined decision-making process.
- Track and honor commitments through the life cycle of projects.
- Involve stakeholders (including transportation officials) in the phases of a transportation project.
- Clearly define the purpose and seek consensus on the shared stakeholder vision and scope of projects and activities, while incorporating transportation, community, and environmental elements.
- Secure commitments to the process from local leaders.
- Tailor the transportation development process to the circumstances and uses a process that examines multiple alternatives, including all appropriate modes of transportation, and results in consensus.
- Encourage agency and stakeholder participants to jointly monitor how well the agreed-upon process is working, to improve it as needed, and when completed, to identify any lessons learned.
- Encourage mutually supportive and coordinated multimodal transportation and land-use decisions.
- Draw upon communication and visualization tools to better inform stakeholders, encourage dialogue, and increase credibility of the process.
2.3.7 Project Development Process with Context Sensitive Design

The application of CSD in the transportation projects represents a good practice in transportation projects decision-making, CSD is also a comprehensive way to develop projects and service that DOTs provide to the public.

The CSD process includes six phases: defining the existing problem, establishing evaluation framework, developing alternatives, evaluating alternatives, selecting solution, and implementing solutions. Figure 2.5 shows these six phases. A project begins with defining the problem. Usually the public and stakeholder involvement is an important activity of understanding of the problem. To define the problem, stakeholders usually ask several questions, such as, what is the whole problem, what is the severity of the problem, and what are the underlying issues? This phase identifies the public values through the public involvement process, and results in a common understanding and acceptance of the defined requirements.

After the problem and requirements have been defined, a framework is developed to evaluate alternatives. This phase establishes the criteria for measuring effectiveness of alternatives. It also determines how the evaluation will be conducted. When developing the evaluation framework, it is critical to address the values of the stakeholders. In this process, stakeholders, professionals, staff members from the sponsoring agencies, bring a set of fixed ideas about the best solution in the developing process. However, such ideas often vary widely from one group to another. For example, some ideas may work in some situations but will not in others. Thus CSD requires all parties to understand the solution sets and appreciate other parties’ value.

Furthermore, it is important to portray alternatives in an understandable format is important. For example, the engineering drawings of an arterial freeway improvement might not be understandable to other stakeholders. So it is important for an engineering group to place emphasis on preparation of understandable presentation formats. The type of drawings, use of color, appropriate mapping are all factors in creating good presentations (NCHRP, Report 480,
Finally, stakeholders, either individuals or members of advisory committees, should provide meaningful inputs about the selected solution, during the selection process. They should know or be informed of what the budget constraints are and whether sources of funding are available (NCHRP Report 480, 2009). Therefore, development of the funding plan can be assured and that project alternatives remain financially feasible.

Figure 2.5 Project development process with Context Sensitive Design
2.3.8 Current Practices of Context Sensitive Design in U.S

Context Sensitive Design (CSD) has been widely applied to transportation projects and brought great benefits to the involved stakeholders. The number in the highlight states (See Figure 2.6) represents the number of CSD projects in the states by the end of 2008. Following are some case studies which adopted CSD in their projects planning and design phases. They are introduced based on the different project steps.

First, CSD suggests that the public and stakeholder involvement is the first step and a primary activity in the project. It is necessary to develop an effective public involvement plan within an internal management process. The process involves four steps: identifying stakeholders, interviewing stakeholders, selecting public involvement techniques, and planning for implementation (NCHRP Report 480, 2009). Identifying stakeholders is to identify the individuals and groups which are likely to be affected by the project, such as property owners, facility users, local jurisdiction, state transportation professionals, and business organizations. For example, The Mandela Parkway Corridor Improvement project, which is one of 33 case studies included in National Cooperative Highway Research Program (NCHRP), intends to reduce vehicle speeds and attracted pedestrian circulation while balancing traffic demands. It involved in a variety of stakeholders, such as shop owners who might see more pedestrians walking past their businesses, bicycle commuters who would have another option for travel and can more easily ride to the downtown area, and local citizens who would like to shop in downtown (FHWA, 2012). Furthermore, integrating the public involvement activities into the total project scope is a useful tool to trade-off benefit among stakeholders.

Second, conducting one-on-one interview with stakeholders can improve understanding of stakeholder issues and characteristics. Selecting effective public involvement techniques increases the likelihood of successful information change. For example, the East Side Highway Corridor project communicated with project stakeholders through multiple channels such as workshops, presentations, television appearances, a website and newsletters. The project study
teams were able to present project information in a transparent manner and build a good relationship with the public (FHWA, 2012).

Third, the Needs Based Implementation Plan (NBIP) is the process that stakeholders actively participate in and provide input throughout the process. It is an important tool in the development of evaluation criteria. The SR 179 Corridor Plan conducted by Arizona Department of Transportation (ADOT) is a good example which successfully addressed the selection of evaluation criteria through NBIP. The project began with identifying the core values by all stakeholders, including scenic beauty, public safety, environmental preservation, economic sustainability. They are also components of the vision of the corridor. As public involvement development, the evaluation criteria and performance measures are used to narrow the alternatives to a preferred planning concept for each segment of the corridor. The benefit of NBIP is that planning process becomes less contentious as the planning becomes more complex.

Fourth, all the stakeholders determine the preferable solution which is able to satisfy all the major CSD principles. These principles include maintaining environmental harmony, addressing economic and social issues, and creating a lasting value for the community. Finally the project is implemented based on the preferable solution.

In order to quantify the benefits from applying CSD, some researchers investigated more than 30 case studies across the county and presented performance measures by categorizing benefits from CSD major principles. The National Cooperative Highway Research Program (NCHRP Report 642, 2009) investigated 33 transportation highway construction projects across U.S., and identified a set of performance measures for CSD principles. Each case study in the report was assessed using 15 principles of CSD, which ranged from using interdisciplinary teams and involving stakeholders to addressing community and social issues, utilizing the full range of design choices, addressing aesthetic treatments and enhancements, and how effectively are agency resources used. Based on this set, NCHRP presented a
quantitative evaluation of the resulting benefits from applying CSD to the transportation projects. The report details 22 categories of benefits, including improved project scoping and budgeting, increased stakeholder and public participation, and decreased costs.

Ross et. al. undertook a review and experts survey of current practice of CSD programs to identify the state of the practice of CSD in U.S., the survey estimated the benefits of the CSD approach with integration of safety, community values, and economical efficiency as criteria.

![Map of U.S.](image)

**Figure 2.6 Current practices of Context Sensitive Design in the U.S (FHWA, 2012)**

### 2.4 Summary

This chapter introduces the history of Context Sensitive Design (CSD), definition and its key elements: multidisciplinary team and stakeholders. The integration of CSD into the project development processes is also addressed with some successful examples. The qualities of CSD are presented particularly as well. These quality metrics provides a guide for this searching for planning and design strategies of CSD in the transportation projects for this research.
CHAPTER 3
RESEARCH METHODS

3.1 Introduction

This chapter introduces the research methods used to explore the planning and design strategies in two projects prior to the establishment of Context Sensitive Design (CSD) standards. First, it addresses the selection criteria of the targeted projects. Second, this chapter presents the research methods for data collection in in-depth interview. Particularly it introduces the interviewees and interview questions in detail. Third, it summarizes this chapter.

3.2 Projects Selections

This research focus on the two projects in the North Central Texas area. They are the IH 30 Three Bridges Corridor Enhancement Project and the US 75 North Central Expressway Transportation Project. Both of them were executed prior to the establishment of CSD standards. They did not specifically use CSD standards, but the key strategies of the interdisciplinary team undertook in these project were very similar to what is called CSD.

3.3 Research Design

3.3.1 Interviews

This research uses in-depth interviews to generate data. In-depth interviewing is a qualitative research technique which involves intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation (Carolyn, 2006). For example, the study may ask respondents about their experiences and expectations related to the projects, the thoughts they had about the development of the projects.
This research interviews stakeholders and professionals involved in the transportation projects to determine their experience related to the CSD strategies. Interviews are scheduled by email. Before setting up interviews with respondents, the interviewer explains the purposes of the interview, why the respondent has been chosen, and the expected duration of the interview. Interviews are audio recorded. After the interviews are completed, each audio tape will be transcribed, and typed exactly as they were recorded, word-for-word, by the researcher. The tape and transcription will not be used for any future research purposes not described here.

The interview questions are designed to gain insights into how the CSD-like strategies were applied into the two projects, how it effectively influenced the implementation process, and what would be like if the strategies had been applied. Data from these interviews are analyzed to understand the integration of “CSD” into aspects of the two projects. Further investigation is conducted to explore the outcomes and challenges of implementing the two projects when the strategies were integrated. The goal of the interview process is to determine their knowledge, experience, and insights related to CSD strategies throughout the two projects.

3.3.2 Interview Participants

The interview respondents include project professionals from TxDOT and private firms who were responsible for the two projects, and professionals who have some input to the initial design, or have been responsible for the ongoing maintenance and redesign of the landscape portion of the two projects, or could provide insights into the projects as well. Particularly, they are urban planners, architectures, landscape architects, and engineers in the private firms, and landscape designers from TxDOT. Other respondents include stakeholders from the North Central Texas Council of Governments, and the citizen community.

Totally, seventeen respondents are asked to participate in this research. A brief description of the roles held by each respondent in the IH 30 Three Bridges Corridor Enhancement Project is as follows:

1. Respondent One was involved with the landscape architecture design of the project.
2. Respondent Two was involved with the service design engineering of the project.
3. Respondent Three was involved with the service civil engineering of the project.
4. Respondent Four was involved with the design team management of the project. His design team also took responsibility for the development of the aesthetic element of the project.
5. Respondent Five and Six were involved as the principles heading up the transportation and traffic planning team.
6. Respondent Seven was a director of Transportation in regional council government.

   A brief description of the roles held by each respondent in the US 75 North Central Expressway Project is as following:
7. Respondent Eight was involved with architecture design.
8. Respondent Nine was employed by TxDOT and acted as a project director for the project.
9. Respondent Ten was the urban design group leader in charge of the project.
10. Respondent Eleven was involved in the civil engineering of the project.
11. Respondent Twelve is the TxDOT district landscape architect who has dealt with the project maintenance and recent replanting.
12. Respondent Thirteen was the construction engineer of the project.
13. Respondent Fourteen was the TxDOT Project manager of the project.
14. Respondent Fifteen was the transportation planner of the project.
15. Respondent Sixteen was involved in the architecture design of the project.
16. Respondent Seventeen was the local citizen community leader.

3.3.3 Interview Questions

Open-ended questions are best when the goal is to learn the respondents’ perspectives regarding the topic at-hand (Spradley, 1979). For this study, questions are focused on:

1. What was your vision for the project?
2. What steps did you take to achieve this vision? Following questions are asked:
a. What stakeholders were involved in the design process?

b. Did this project address aesthetic, scenic, historic or environmental resources?

c. During construction, what role did safety and mobility play?

3. Was your vision achieved finally?

3.4 Summary

This chapter summarizes the qualitative research methods used in this research. In-depth Interviews are used to collect data about the ideas and the planning strategies of the participants of the IH 30 Three Bridges Corridor Enhancement Project and the US 75 North Central Expressway Transportation Project. With analyzing the data, the results determine respondents' experience related to CSD strategies.
CHAPTER 4
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis and findings of the interview research. Section 4.2 introduces the steps to analyze the responses to the interview questions using the Grounded Theory. The Grounded Theory method generates conceptual aspects of categories which illustrate the respondents’ main concerns (Taylor and Bogdan, 1998). The Grounded Theory method also helps explain the behaviors of the respondents in archiving the visions of the study sites. By applying the obtained theories to the interview questions, Section 4.3 addresses the planning and design strategies the respondents adopted to complete the two projects. Section 4.4 summarizes this chapter.

4.2 Data Analysis Method

4.2.1 The Grounded Theory Method

After finishing the interviews, the transcribed recordings are analyzed based on the qualitative data analysis techniques –The Grounded Theory Method-- introduced by Taylor and Bogdan (Taylor and Bogdan, 1998). Grounded Theory is a specific methodology developed by Glaser and Strauss for the purpose of building theory from data (Strauss and Corbin, 2008). Strauss and Corbin (1990), authors of "Basics of Qualitative research: Grounded Theory Procedures and Techniques", defined the the Grounded Theory as follows: “The grounded theory approach is a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon” (p.24). The primary objective of grounded theory is to expand upon an explanation of a phenomenon by identifying
the key elements of that phenomenon, and then categorizing the relationships of those elements to the context and process of the experiment (Brown, Stevenson, & Troiano, 2002). In other words, the goal is to go from the general to the specific without losing sight of what makes the subject of a study unique.

The main aim of qualitative data analysis is to discover the perceptions and experiences of the participants so that the codes are able to be extracted. These codes are then grouped into categories related to the different interview questions. This research collects data by using in-depth interviews and then extracts codes using the “open-coding” technique (Strauss and Corbin, 1998).

The open-coding technique is a process of discovering the properties and dimensions of the concepts contained in each interview. The process of open-coding allows to expose the thoughts, ideas and meanings contained within the text of interviews (Glaser, 1978). In general, during the open-coding process data is broken down into discrete parts, closely examined and compared for similarities (or differences). Open-coding is effective in theory building as it allows identifying concepts or phenomena (Strauss and Corbin, 1998).

After finishing the interviews, the transcribed recordings are analyzed based on the qualitative data analysis techniques. The first step is to understand the data. Ellen Taylor and Marcus Renner (2003) said, “Good analysis depends on understanding the data” (Taylor Marcus, 2003, p. 15). This study focuses on the research objectives:

- Understanding the planning and design strategies of the study sites;
- Determining how diffused Context Sensitive Design (CSD) is throughout the planning and design process of transportation projects;
- Identifying the CSD strategies required in the planning and design of transportation projects.

Strategic planning is a decision-making process of defining the strategies within a team or organization on allocating its resources (Olsen, 2012). Therefore, within the team or
organization, the opinions from key participants are important in the planning and design process. This research focuses on the opinion of each respondent to every interview question based on different criteria. After each interview, the notes and interview videos are reviewed. And a table is created to categorize each respondent’s ideas, concepts, and behaviors. Basically, each table includes the respondent’s answers to the three questions in the interview:

1. What was your vision for the project?

2. What steps did you take to achieve this vision?
   - What stakeholders are involved in the design process?
   - Did this project address aesthetic, scenic, historic or environmental resources?
   - During construction, what role did safety and mobility play?

3. Was your vision finally achieved?

Each table also includes the respondent’s vision of the project, the steps they took to archive the vision, and their perceptions of the final results (See Appendix A). Note that some responses are similar, and some responses are from few specific respondents. Consequently, the responses are concluded into different categories. Each category collects similar concepts. All the categories are combined and analyzed to generate a theory which is able to explain the objective of the research. Table 4.1 introduces the four stages of analysis.

Table 4.1 The Four Stages of the Qualitative Data Analysis (Thornberg, R., 2012)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codes</td>
<td>Identifying anchors that allow the key points of the data to be gathered</td>
</tr>
<tr>
<td>Concepts</td>
<td>Collections of codes of similar content that allows the data to be grouped</td>
</tr>
<tr>
<td>Categories</td>
<td>Broad groups of similar concepts that are used to generate a theory</td>
</tr>
<tr>
<td>Theory</td>
<td>A collection of concepts that explain the objective of the research</td>
</tr>
</tbody>
</table>

4.2.2 R Language Qualitative Data Analysis (RQDA)

Unlike the quantitative research methods, qualitative analysis is an intuitive and inductive process (Taylor and Bodgan, 1998). Qualitative research usually lacks a division of labor between data collectors and coders (Taylor and Bodgan, 1998). In order to move from a
mass of words to a final report, this study uses R Language Qualitative Data Analysis (RQDA) program to organize the data. RQDA is an R package for computer assisted qualitative data analysis (RQDA, 2012). Through customized R functions, it can import a batch of files, calculate the relations between two coding given the coding indexes, give a summary of coding and inter-code relationship. As shown in the right sub-figure of Figure 4.1, this study first highlights key points of the respondents in different colors. Second, the left sub-figure shows that the research gathers the key points of the data into codes. The benefit of the RQDA process is to help organize the data.

Figure 4.1 R Language Qualitative Data Analysis (RQDA) Highlights the Important Idea
4.2.3 Categorize Information

After obtaining a list of descriptive codes, this study groups the codes with similar content. Each grouped codes is called a concept. Figure 4.3 and Figure 4.5 shows the lists of codes from each respondent. These concepts are identified as the responses to the interview questions. Figure 4.4 and Figure 4.6 shows all the concepts from the descriptive codes. Finally, similar concepts are generalized into a theory which explains the objective of the research.

4.3 Analysis of the Interviews

4.3.1 The Project Vision

In responses to the first question, all respondents described their visions differently (See Table 4.2). They did not have a personal vision, but generated a vision that reflected the public aspirations. Table 4.3 presents the list of the collected codes which were extracted from the Table 4.2 to the first interview question. By integrating them into five points (See Figure 4.2), five major visions are identified. In other words, the five visions are developed from the five points. The five visions include surrounding context integration, enhancing the community image and local identity, the maximize benefits and minimize impacts, improving visual quality, and lasting value to the community and the transportation system, respectively.

Among the five visions, enhancing the community and city image got more attention than others. Twelve out of seventeen respondents stated that their vision were reflecting community values, and enhancing the community and city image. The following subsections introduce the five major visions individually.

4.3.1.1 Incorporate Transportation Systems into the Regional Context

Three respondents expressed the idea of connecting the involved regions together. For example, Landscape Architect One of the IH 30 project agreed that the whole area was connected by the roadway infrastructure. As he said, “One of the strongest things that we can do is to tie them together thematically, visually from an automobile standpoint and from a
pedestrian standpoint and link this whole district together.” (personal communication, September 18, 2012)

Table 4.2 Interview Notes from the First Interview Question

<table>
<thead>
<tr>
<th>The IH 30 Three Bridges Corridor Enhancement Project</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Architect One</td>
<td>It should take all that input and turn it into a useful design vocabulary</td>
</tr>
<tr>
<td></td>
<td>It should tie the district together with the infrastructure</td>
</tr>
<tr>
<td></td>
<td>It should be a classic and a timeless line with celebration at the bridges</td>
</tr>
<tr>
<td>Design Engineer One</td>
<td>It should function as a freeway</td>
</tr>
<tr>
<td></td>
<td>It should show entertainment area of Arlington as a destination point</td>
</tr>
<tr>
<td>Civil Engineer One</td>
<td>It should have high quality impact and benefit not only the users of the freeway but also the citizens of Arlington</td>
</tr>
<tr>
<td></td>
<td>It should be an expression of the significance of Arlington within the Dallas - Fort Worth area</td>
</tr>
<tr>
<td>Landscape Architect Two</td>
<td>It should establish an image of Arlington within the metropolis area</td>
</tr>
<tr>
<td>Traffic Engineer One and Two</td>
<td>It should provide an access to entertainment area of Arlington</td>
</tr>
<tr>
<td>Stakeholder One</td>
<td>It should increase the capacity of the road</td>
</tr>
<tr>
<td></td>
<td>It should create urban design features</td>
</tr>
<tr>
<td></td>
<td>It should increase the reliability of the corridor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The US 75 North Central Expressway Project</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Architect One</td>
<td>It should create a modern main street at a scale of a freeway and to do with all aspects of the freeway facility</td>
</tr>
<tr>
<td>Project Director From TxDOT</td>
<td>It should promote the capacity and minimize impact on the community</td>
</tr>
<tr>
<td>Architect Two</td>
<td>US 75 should reflect that position in the community</td>
</tr>
<tr>
<td></td>
<td>It should be an interstate road system that spans the United States</td>
</tr>
<tr>
<td></td>
<td>It should be a part of the city of Dallas area</td>
</tr>
<tr>
<td></td>
<td>It should connect different parts of the Dallas and even different cities within the DFW area</td>
</tr>
<tr>
<td>Transportation Planner One</td>
<td>It should have visual quality, impact mitigation, and environmental integration</td>
</tr>
<tr>
<td>Civil Engineer Two</td>
<td>It should take the vision of the architects, and TxDOT, develop sub-plans that can be constructed</td>
</tr>
<tr>
<td>Landscape Architect Three</td>
<td>It should become a project</td>
</tr>
<tr>
<td>Construction Engineer One</td>
<td>It should make sure the contractors implemented it according to the plans</td>
</tr>
</tbody>
</table>
Table 4.2 - Continued

| Project Manager From TxDOT | It should be a community-based design  
|                           | It should provide look and an identifiable appearance treatment for entire the corridor |
| Urban Designer            | It should make the freeway compatible with the surrounding community and commercial areas |

Moreover, connecting with surrounding context shows the project site is a destination point. For example, the two projects were introduced as the “front door” of the surrounding context. According to Design Engineer One of the IH 30 project said, “We want people to get off the highway. The vision is to give the drivers opportunity to get off the highway.” (personal communication, October 5, 2012) Urban Designer One of the US 75 project also said, “…put the freeway compatible with the surrounding community and commercial area” (personal communication, October 4, 2012).

Table 4.3 List of the Collected Codes Extracted from Table 4.2

<table>
<thead>
<tr>
<th>First Interview Question</th>
<th>Codes (different colors represents the different concepts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What was your vision for the project?</td>
<td>tie the district together; be a classic and a timeline with celebration at the bridges; function as a freeway; a destination point; not only the users of the freeway but also the citizens of Arlington; an expression of the significance of Arlington; an access to entertainment area of Arlington; increase the capacity of the road; create urban design features; increase the reliability of the corridor; create a modern main street at a scale of a freeway; promote the capacity and minimal impact on the community; reflect that position in the community; an interstate road system that spans the United States north south east and west; a part of the city of Dallas area; connect different parts of the Dallas and even different cities within the Dallas area; visual quality, impact mitigation; environmental integration; a community based design; provide look and an identifiable appearance treatment for entire the corridor; make the freeway compatible with the surrounding community and commercial areas; make it beautiful and appreciated by the people of Dallas area; last a lifetime and it should not become outmoded</td>
</tr>
</tbody>
</table>
4.3.1.2 Enhance Community Image and Local Identity

The city of Arlington, Texas is located in the center of the Dallas-Fort Worth (DFW) Metropolitan area with entertainment values and a sense of civic pride. There are several key attractions in the Arlington entertainment district. Namely, they are Six Flag, the Ball Park, Hurricane Harbor, and The University of Texas at Arlington. But it lacked attractive features that would increase tourism before the IH 30 project was completed. Most respondents mentioned the major vision of the IH 30 Three Bridges Corridor project was to add a sense of style to the city of Arlington. Particularly, it was to emphasize on its best features and tell a story of its historical and celebrated character. According to Landscape Architect One said, “…creating a classic and a timeline with celebration at the bridges. The Three Bridges Project expresses its center of the Dallas-Fort Worth Metropolitan area. It really made a statement for Arlington.” (personal communication, September 18, 2012) Landscape Architect Two said, “The project was an opportunity to establish an image of Arlington and significance of Arlington within DFW Metropolitan and the region” (personal communication, September 19, 2012). In addition,
Architect Two of the US 75 Project also said, “When (the US 75 was) completed, (it) reflects that position in the community” (personal communication, September 21, 2012).

4.3.1.3 Maximize Benefits, Minimize Impacts

Seven of Seventeen respondents spoke that the project should construct a multiple-lane freeway. They also mentioned that the vision of the freeway is more than a freeway. Landscape Architect Two of the IH 30 project said, “High quality impacts and benefits not only the users of the freeway but also the citizens of Arlington” (personal communication, September 19, 2012). Architect One of the US 75 project also commented that the project should create a modern main street at a scale of a freeway and to do that all aspects of the freeway facility (personal communication, September 22, 2012). The Texas Department of Transportation (TxDOT) manager mentioned that the US 75 project was a community-based design.

Architect Two introduced three potential ways of thinking of highway to promote the freeway functions. There are national level, city level, and community level. According to him, in national level, the US 75 should be an interstate road system that spanned around United States. In city level, the US 75 should be a highway within the city of Dallas and its expression could be considered singularly as a part of the city of Dallas. In community level, the US 75 should be a highway that connects different parts of Dallas and even different cities in the DFW Metropolitan area (personal communication, September 21, 2012). Moreover, TxDOT Project Director also said his vision of the US 75 was to promote the capacity and minimize impacts on the community (personal communication, September 26, 2012). Several respondents introduced their design philosophy of reducing the negative impacts on the surrounding community.

4.3.1.4 Improve Visual Quality

Three of seventeen respondents stated that their visions were increasing aesthetic quality. All of three respondents were involved in the US 75 North Central Expressway Project. They stated that the project was not only to build a highway in the corridor functionally but also
to be appreciated by the people of Dallas aesthetically. Stakeholders Two said, “It was not necessarily totally an art form but it was more than just a plain old concrete highway” (personal communication, September 25, 2012). TxDOT Project Manager also said, “The vision is to provide a look and appearance treatment for entire corridor” (personal communication, October 1, 2012).

4.3.1.5 Lasting Value to the Community, and the Transportation System

Only one of seventeen respondents said the project should add lasting value to the community and transportation system. For example, Stakeholders Two of the US 75 said, “The vision was that it would last a lifetime. The design would be vibrant 20, 30, 50 years from now and that it would be have beautiful landscaping” (personal communication, September 25, 2012).

4.3.1.6 Summary of the Project Vision

In responses to the first question, all respondents described their visions differently (See Table 4.2). They did not have a personal vision, but generated a vision that reflected the public aspirations. According to the analysis of the first question, the visions of the US 75 project emphasized on minimally negative influence on the surrounding community, as well as increasing visual quality. The IH 30 project should enhance the image of the Arlington (Texas) Entertainment District area. The research also finds that an important vision of the two projects was to integrate the highway systems with surrounding context. The respondents of the US 75 project stated that the original transportation plan was developed in a traditional manner, but failed to complete. It was because it did not reflect local community values. As a result, highway designers and community stakeholders came together to develop a revised vision which accommodated public wishes.

4.3.2 The Characteristics of Project Process

In responses to the second question, all respondents described the steps they did in order to achieve the vision the projects (See Table 4.4). Table 4.5 presents the list of the
collected codes which were extracted from the Table 4.4 to the second interview question. Five key points are identified in this process (See Figure 4.3). The five characteristics are developed from Figure 4.3 which include wide involvement of stakeholder in phases of projects, early establishing an interdisciplinary team, clearly defining the purposes and seeking consensus on the shared stakeholders visions, earing coordination, and context sensitivity, respectively. The following subsections introduce the five characteristics individually.

Table 4.4 Interview Notes from the Second Interview Question

<table>
<thead>
<tr>
<th>IH 30 Three Bridges Corridor Enhancement Project</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LA1 We had an agreement with the engineers from the very beginning of the project</td>
<td>We had civil engineers, structural engineers, transportation planners, landscape architects and state planners, policy planners on the same team</td>
</tr>
<tr>
<td>DE1 We worked with lots of the stakeholders along the city of Arlington throughout the years</td>
<td></td>
</tr>
<tr>
<td>CE1 We participated the public meetings and took input from the neighborhoods</td>
<td>We had meetings with stakeholders and the properties all along the corridor</td>
</tr>
<tr>
<td>LA2 We were in the design concepts was the developments of murals that depicted the story of city</td>
<td></td>
</tr>
<tr>
<td>TE1 and TE2 We do what we need to access to the entertainment area of Arlington, how to do it and how to fit the TxDOT design factors</td>
<td></td>
</tr>
<tr>
<td>SK1 We adopted a bottom-up approach</td>
<td>We talked to a lot of people in the grass roots level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>US 75 North Central Expressway Project</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 We had stakeholder meetings at different locations along the corridor</td>
<td>We developed that preferred alternative further in more detail and then we went out and had another public meeting</td>
</tr>
<tr>
<td>PDTx We reknitted the communities which were spited by the original roadway in late 1940</td>
<td>We identified the five major across streets and put special efforts to make them more reliable</td>
</tr>
<tr>
<td>A2 We envisioned three potential ways of thinking of the highway</td>
<td>-National level</td>
</tr>
<tr>
<td></td>
<td>-City level</td>
</tr>
<tr>
<td></td>
<td>-Community level</td>
</tr>
<tr>
<td>TP1 We started with a numbers of alternative options and gradually cut down to three options</td>
<td></td>
</tr>
<tr>
<td>CE2 We were developing a lot of the engineering requirements at the same time the architects were trying to develop a vision</td>
<td>We worked very close with architects on their vision</td>
</tr>
<tr>
<td></td>
<td>We did a complex of construction sequencing and traffic control plans</td>
</tr>
</tbody>
</table>
Table 4.4 - Continued

| LA3 | I was not actually involved in the day to day design |
| CSE1 | We consisted mainly of executing the construction, working with the stakeholders, and then taking the details from the construction plans and making sure the contractors implemented that according to the plans. Maintenance of Traffic plan (MOT) was designed to improve the flow of traffic during the construction. Intelligent Transportation Systems (ITS) was deployed that we had operators used remote control cameras to look at the condition of the highway to where we could deploy police and fire response for the accidents. |
| PMTx | We had the workshop, looking at the hardscape and the softscape standpoints in order to find the greenery in the freeway. |
| UD1 | We took a national tour of freeways in order to get more ideas about the aesthetic involvement treatment. |
| ST2 | We created the North Central Task Force that were representatives from business organizations and neighborhoods. |

Table 4.5 List of the Collected Codes Extracted from Table 4.4

<table>
<thead>
<tr>
<th>Second Interview Question</th>
<th>Codes (different colors represents the different concepts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What steps did you take to achieve this vision?</td>
<td>an agreement with the engineers from the very beginning of the project; had civil engineers, structural engineers, transportation planners, landscape architects and state planners, developments of murals that depicted the story of city; policy planners on the same team; worked with lots of the stakeholders along the city of Arlington; public meetings; did lots of research on the city; adopted a bottom-up approach; stakeholder meetings at different locations along the corridor; identified the five major across streets; envisioned three potential ways of thinking of the highway; alternative options; a lot of the engineering requirements at the same time the architects were trying to develop a vision; worked very close with architects on their vision; looking at the hardscape and the softscape standpoints in order to find the greenery in the freeway; took a national tour of freeways in order to get more ideas about the aesthetic involvement treatment; created the North Central Task Force;</td>
</tr>
</tbody>
</table>

4.3.2.1 Wide Involvement of Stakeholder in All Phases of Projects

The US 75 North Central Expressway Project “was the second largest civic project ever undertaken in the Metropolitan”, as Architect Two said (personal communication, September 21, 2010).
The stakeholder involvement in the planning and execution phase in the US 75 was the precursor of how all the other projects were planned. According to Construction Engineer One said, “Before 1985, most state DOTs when they planned a project would discourage any involvement from city staffs or residential areas or any stakeholders” (personal communication, September 24, 2012).

A task force called the North Central Task Force (NCTF) was created to coordinate the corresponding tasks in the US 75 project. Members of NCTF were representatives from the business organizations and neighborhood. Civil Engineer Two said, “NCTF involved stakeholders from the community. It included county officials, city officials, and neighborhood groups.” (personal communication, September 26, 2012) Stakeholders Two mentioned that they adopted several steps to encourage stakeholder involvement. First, they went out to the community and neighborhood organizations. Second, the business executives of the community assembled their inputs. Third, as community leader said, “we would speak to them, and say we do not have all the answers, what is your suggestion to how to improve the freeway and then ultimately when the design was finalized, will you help us? Will you help us in the implementation by mobility task force, by donating right away?” (personal communication, September 25, 2012).

Similarly, the IH 30 Three Bridges Corridor Enhancement Project also involved stakeholder involvement. As Design Engineer One said, “we need a lot of the stakeholders along here we have worked with throughout the years in Arlington”. Broad stakeholder involvement was important because it satisfied the entertainment requirements of the City of Arlington, Texas (personal communication, October 5, 2012). The Civil Engineer One said, “The Arlington Chamber of Commerce and the North Central Texas Council of Governments are working, those two working together with Texas Department of Transportation (TxDOT) to get the funding was really important”(personal communication, September 19, 2012).
Stakeholder involvement also occurred in the development phase of the two projects. Architect One from the US 75 North Central Expressway Project said, “We had stakeholder meetings at different locations along the corridor, so that neighborhoods could be shown what the project options were and provide their feedback” (personal communication, September 22, 2012). Once the construction contracts were awarded, they created an extensive public outreach program. As Construction Engineer One mentioned, every six months they ran a large meeting and invited stakeholders and residents along the corridor, so these meetings would be attended by as many as 200 or 300 people and they provided the progress report of the construction to date (personal communication, September 26, 2012). There was another Task Force called North Central Mobility Task Force including a number of stakeholders plus Dallas policemen, and Dallas Area Rapid Transit (DART), bus operators. According to Civil Engineer Two said, “They were also constructing the DART red line at the same corridor, so all those entities had work together and coordinate quite a vast number of issues during the construction”. He also said, “That was the first project the public wishes were accommodated and the results...
had a very pedestrian-friendly environment as the system” (personal communication, September 26, 2012).

4.3.2.2 Establishing an Interdisciplinary Team

The IH 30 Three Bridges Corridor Enhancement Project established an interdisciplinary team, including civil engineers, structural engineers, transportation planners, landscape architects, state planners, and policy planners. For example, Landscape Architect One emphasized the importance of establishing an interdisciplinary team, he said “Something that the transportation planner would resonate with me might impact my thinking, and something that I would say might impact the way the engineers were thinking and so we had the benefit of each other’s ideas through the whole project. Two ways that the vision was brought to fruition was having the landscape architects involved from the very beginning and having a good interdisciplinary team” (personal communication, September 18, 2012).

In addition, both Landscape Architect Two and Design Engineer One spoke that the first thing they did was putting together a strong team to make sure they would be able to do the quality project. Design Engineer really appreciated their interdisciplinary team. He stated that traffic engineer provided highway access to the city, and the North Central Texas Council Governments (NCTCG) helped with the planning. The Design Engineer also said that TxDOT took responsibility for the geometric design on the project, and Land-tech engineers did all their soils testing for walls, bridges, and pavement design.

Similarly, it was the first time for TxDOT to hire public information professionals in the field of public affairs in the US 75 project. Stakeholder Two said, “It was the first time in the state of Texas and pretty much first in the Southwest in terms of landscaping that TxDOT wanted to hire one single landscape architect who was not from the highway department” (personal communication, September 25, 2012). The City of Dallas and TxDOT hired a transportation planner to work alongside in order to solve the US 75 North Central Expressway complicated problems, including highway and transportation problems.
In addition, respondents also provided a variety of public and agency involvement techniques including advisory committees, public meeting, focus groups, surveys to share information and obtain community input and feedback. Two of respondents from the US 75 project mentioned that developing a video animation was a good idea to show the alternatives to the public.

4.3.2.3 Clearly Defining the Purpose and Seeking Consensus on the Shared Stakeholder Vision

Most respondents of the IH 30 Three Bridges Corridor Enhancement Project defined the vision by gathering the stakeholders’ vision. Landscape Architectural Two said, “Our team met significantly large land property owners in the area, gathered their input and tried to gain support for the project and shared with them and listened to them”. He also mentioned about doing research on the city in order to establish an architectural theme for the City of Arlington, Texas (personal communication, September 19, 2012). Therefore, he hired the Landscape Architect One to lead the process of identifying those architectural aspects that reflected the City of Arlington with the people from the City of Arlington. He also stated that their team incorporated in the City of Arlington’s plans, thoroughfare plans, bicycle plans, and trail plan for future needs of the city. Generally this definition process involved a lot of people and time, and therefore it was difficult to tackle. Landscape Architectural Two said most members of the team were local people who lived this area for twenty plus years, so it was easier for them to define the purpose of project (personal communication, September 19, 2012).

One of the most challenges of the US 75 North Central Expressway Project was seeking consensus on shared stakeholder vision. Transportation Planner said, “The purpose of the project they told about two years”. He explained that because the business community was interested in a certain way about economic development, the neighborhood along the expressway concerned about the impacts, the transit department concerned about the transit, so there were many many challenges.” However, they set up an office at Dallas to complete this
He also said, “We reviewed these options with various different groups. Finally we narrow down numbers of options to only three.” (personal communication, October 1, 2012)

4.3.2.4 Early Coordination

Early coordination is a process to identify issues, concerns, problems and opportunities early in the project. In the traditional transportation projects, the engineers conducted all their work and then the landscape architects came in afterwards and tried to fix it or make it prettier. The two projects did not take this traditional way. The respondents revealed that early coordination was an important process they did. For example, Landscape Architect One of the IH 30 project commented, “The first thing was I had an agreement with the engineers from the very beginning of the project”. He also mentioned it was very important that landscape architect and the enhancements team involved from the very first meeting (personal communication, September 18, 2012).

The Civil Engineer One also stated that when the US 75 project started, the architects had started the same time as the engineers did, and so engineers were developing engineering requirements at the same time the architects were trying to develop a vision. He said, “So Architect and I worked hand in hand all throughout the project, we would sit in each other’s offices and actually go to the plans and work through details and questions that we had concerning” (personal communication, September 19, 2012).

4.3.2.5 Developing a Context Sensitive Solution

Early understanding of the community and valued resource is the foundation of the project development. For example, the IH 30 Three Bridges Corridor Enhancement Project valued the entertainment district are and the surrounding context. Landscape Architect One said, “We were going on from an architectural standpoint, from a design vocabulary standpoint in terms of materials and finishes and those types of thing and actually up on those and used them so that it looked like it was something that belonged in that community”(personal communication, September 18, 2012). The other Landscape Architect described that they addressed more of
the cultural resources and focused on the people (personal communication, September 19, 2012). In summary, the IH 30 project incorporated safe pedestrian crossing with shade coverings, which was different from City of Arlington originally thought about.

On the other hand, the US 75 North Central Expressway Project focused on urban environmental sensitivity. For example, Architecture One stated that they created a pleasant urban environment introducing a lot of landscape materials to soften the concrete highway (personal communication, September 22, 2012). Stakeholder Two also referred this idea to relaxing types of the community. He explained, “Moving traffic along at 50 miles an hour rather than having you stay and moving at 1 or 2 miles an hour dramatically improves the pollution right there. In that particular park, it did not solve at all because other quarters are polluting as well, but it made a major impact and all of the vegetation and the landscaping features gave it a quieter” (personal communication, September 25, 2012).

In summary, both projects were more than just transportation projects. They considered the geometric, traffic, safety, and financial aspects along with a broad community.

4.3.3 Summary of the Stakeholders Involvement of the Projects

In responses to the second question, both the US 75 project and the IH 30 project identified all of the potential stakeholders, developed an understanding of their values and priorities, and created an interdisciplinary setting for decision-making. In the early days of the IH 30, the chamber created a committee working with the city of Arlington to bring the neighborhoods and businesses into the decision making process. The North Central Texas Council of Governments was made up of forty-three people. There were elected policy-makers who funded the project, the officials at the state level who approved expenditures, and people from TxDOT. In addition, The University of Texas at Arlington and a community college along the IH 30, Six Flags over Texas, Texas Rangers, car dealerships, and restaurant owners along the corridor were also stakeholders.
There were several hundred people involved in the US 75 project. People included the general public, the driving public, the adjacent business community, and the residential communities with around 200 neighborhood organizations and business organizations.

4.3.4 Summary of the Resources the Project Addressed

Respondents had different opinions about the aesthetic resources, scenic resources, historic resources, environmental resources. However, most respondents of the IH 30 project agreed they were sensitive to aesthetic resources and historic resources. And most respondents of the US 75 project provided the information that they addressed the aesthetic resources (see Table 4.6).

<table>
<thead>
<tr>
<th>Project/Resources</th>
<th>aesthetic resources</th>
<th>scenic resources</th>
<th>historic resources</th>
<th>environmental resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>The IH 30 Three Bridges Corridor Enhancement Project</td>
<td>Y</td>
<td>N/Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>The US 75 North Central Expressway Project</td>
<td>Y</td>
<td>N/Y</td>
<td>N/Y</td>
<td>N/Y</td>
</tr>
</tbody>
</table>

Aesthetic and historical consideration is one aspect of the community values that needs to be considered. For example, the IH 30 project addressed the aesthetic resources because one purpose of the project was to advocate the community, and present people an idea that Arlington was more than Six Flags and Rangers (See Figure 4.4). Similarly, Stakeholder Two of the US 75 project stated that it was the first time in Texas to make the highway distinctively different by developing freeway aesthetics and landscaping (personal communication, September 25, 2012) (See Figure 4.5).

According to the definition of “context” in literature review, every project has a specific context. From the transportation systems standpoint, a successful planning and design strategy is able to cover historical elements, natural elements in landscaping, and the impact of different income groups and ethnic groups.
4.3.5 Summary of the Achieved Visions

Visions were identified by respondents differently, and everyone’s vision of the IH 30 project was archived (See Table 4.7). However, Landscape Architecture One was unhappy because he thought the final project did not reflect the original vision. He explained, “there were different players looking at something over along a period of time, something got lost in translation” (personal communication, September 18, 2012). Stakeholder One said, “It was too early to tell if the vision of a dramatic change in land use was going to occur, because on the
north side of the corridor, they have not yet seen the mixed-use developments and the higher densities that they had hoped for” (personal communication, October 23, 2012). Most of US 75 project stated that the final project implemented almost everything that they had proposed, but they were upset about the maintenance of landscape.

Table 4.7 Interview Notes from the Third Interview Question

| IH-30 Three Bridges Corridor Enhancement Project |  
| LA1 | "...is partially achieved"  
Freeways is more bigger and wider  
Original vision gets lost in project delivery |
| DE1 | "...turned out better than it anticipated"  
The colors and the staining techniques and the murals had multiple depth to them so that they actually looked more real  
Stamped concrete pavement on the actual surface of the roadway it looks better from the air |
| CE1 | "...great success"  
Efficiently, quickly and safely transportation improvement convinces people to come to Arlington |
| LA2 | A huge economic impact on the city |
| TE1 and TE2 | "Yes"  
Provides the access to city of Arlington Entertainment District area that the people looking for |
| SK1 | "...to early to tell if the vision was archived"  
On the north side of the corridor, it have not yet seen the mixed-use developments |

| US 75 North Central Expressway Revolution Project |
| A1 | "...was largely achieved"  
Extends the design into the neighborhood |
| PD1 | Yes  
Reflects the neighborhood style and features  
Establishes the new standards for future transportation projects |
| A2 | "Accomplished the goals"  
Builds an appropriately prominent highway that is representative of Dallas or the State of Texas or the US government |
| TP1 | "Yes or No"  
The scale of concrete structure material is not harmony with the surrounding land use  
Landscape is be maintained  
Quality architecture and landscape treatments bring highway infrastructure into the surrounding communities |
4.4 Summary

This chapter discussed the findings of the research. The results find that reflecting community values is the foundation of the planning and design strategies. In addition, this research also addresses the precursors to Context Sensitive Design (CSD) to emphasize on identifying potential stakeholders, developing an understanding of their values. The research reveals the key difference between the modern project development approach and a traditional approach.
CHAPTER 5
CONCLUSION

5.1 Introduction

This chapter concludes this research. Section 5.2 presents the significance of the findings from the interview data. Section 5.3 gives the relevance of landscape architecture to Context Sensitive Design (CSD). Section 5.4 proposes some directions for future research.

5.2 Significance of Findings

5.2.1 Differences from the Traditional Transportation Projects

The research reveals the central difference between the traditional transportation decision-making process and diffused knowledge of CSD. The central difference is the methodology used to understand and reflect the community values in the decision-making process. As introduced in Chapter 2, traditional transportation projects adopted five distinct steps to make decisions. On the other hand, diffused knowledge of CSD created an interdisciplinary team to early coordinate the process.

Transportation projects provide public benefits and improve facilities. From this research, both projects brought high quality impacts and benefits to the users of the freeway but also to the citizens of the City of Arlington and the City of Dallas. This means that the diffused knowledge of Context Sensitive Design (CSD) is beyond to increase the capacity of the road, which is the major objective of the traditional transportation projects. It focuses more on “urban road design” at the transportation system scale. For example, According to Stakeholders One stated, the IH 30 project should increase the reliability of the road, and reduce congestion
(personal communication, October 23, 2012). Thus, they increased the capacity by building the frontage roads, and added urban design features that would help change the land usage.

5.2.2 Similarity with Context Sensitive Design (CSD)

This research indicates that the planning and design strategies of the two study sites are another way to “think beyond the pavement” about the impact of a highway on the area. Although both projects did not adopt the official CSD matrix when they started, they had similar objectives of developing multi-dimensional elements, including congestion relieve, highway reliability, accessibility to downtown and land usage, frontage road reliability. In addition, both projects have significant architectural features along the corridors (see Figures 5.1).

Figure 5.1 The US 75 has significant architectural features along the corridors (Texas Freeway, 2012)

Figure 5.2 The IH 30 has significant architectural features along the corridors
Another similarity with CSD is the characteristic of the process. Both projects adopted the similar strategic metrics with CSD. For example, both projects adopted what they called “bottom-up approach” which was similar to the technique of creating interdisciplinary teams in CSD. Stakeholder of the IH 30 project explained “bottom-up approach” is an approach the project calls for multidisciplinary collaboration of technical professionals, local community interest groups, landowners, facility users, the general public, and essentially any stakeholder who lives and works near transportation facility. In addition, the research also verifies early stakeholders’ involvement can gain an understanding and appreciation of community values so that they can address the planning and design process.

Diffused knowledge of CSD emphasizes on community values, which is another similarity to CSD. According to the responses to the interview questions, the term “community value” encompasses a broad spectrum of ideas in a holistic manner. Moreover, the research reveals four dimensions which involve in determining a community’s specific values. These dimensions confirm the importance of stakeholders’ involvement in the phrases of process and collaborative decision-making.

The four dimensions are summarized as below:

- Community vision: it is identified as the expectation that people have for their community;
- Need: it is not just transportation need but community amenity;
- Mobility: it is for people, goods and services throughout the community;
- Safety: it is for all travelers and community members regardless of mode.

To sum up, the research verifies the research projects are precursors of the CSD projects. The visions of the research projects are precursors to what are CSD concerns. The characteristics of research process are precursors of CSD guiding principles. In addition, both projects are two meaningful examples of CSD integration in transportation planning and design process.
5.2.3 Outcomes of CSD Integration into Planning and Design Process

The responses to the third question reveal the outcomes of integration CSD into the project design process. The outcomes include increasing stakeholder and public participants, decreasing time for overall project delivery, minimizing overall impacts on human environment, improving mobility, walkability, bikeability, and safety for users, and designing appropriate features to the context.

5.2.4 Challenges of Implementing CSD

The results also imply some potential challenges of implementing CSD. Both projects indicated that incorporating features and context sensitivity increased the cost of the projects. Thus it brought difficulties to develop the budget. However, outside stakeholders were important since they were able to rise funding. For example, Arlington Chambers of Commerce played a big role in supporting the IH 30 project. They thought IH 30 was not a typical highway project. Therefore they generated interests and enthusiasm, and brought political pressure to make the project happened.

Another major challenge is to maintain the landscaping features. For example, after completing the US 75 project, the highway department and taxpayers were resultant to allocate money for further maintenance. Thus, applying CSD to phases of project is a challenge issue for future project development.

Moreover, this research suggests that applying CSD does not mean that every step of project should follow this rule. For example, a stakeholder of the IH 30 project explained that it was not always to design fifteen or more feet lanes for cyclists, because many trucks drivers may be unable to notice it. Thus, planning and design should be more informative.

5.3 Relevance to the Landscape Architecture Professionals

The State Departments of Transportation fully appreciates the benefits of CSD. Therefore, they encourage agencies to adopt CSD in the transportation projects. This research contributes to the current implementation of CSD in the transportation projects. In this study,
both projects are context-themed projects. Consequently, the planning and design strategies can provide meaningful instructions to current CSD integration.

In addition, the research presents the importance of landscape architecture design in transportation planning. For example, landscape architect can take responsibility of planting design in order to increase aesthetics as well as develop functional transportation facilities. In other words, landscape architecture design plays an important role in context-themed projects. Thus, a thorough study of the planning and design strategies about landscape architecture contributes to the future transportation systems.

5.4 Suggestions for Future Research

The findings of this study also indicate several opportunities for further investigation of Context Sensitive Design:

- Provide recommendations which can contribute to future transportation projects;
- Examine the benefits of CSD, including safety, mobility, and preservation of scenic, environmental values;
- Evaluate the outcomes of integration CSD into planning and design process;
- Explore solutions for addressing challenges of integration CSD.

5.5 Summary

This research examines the planning and design strategies of the two completed projects which started before CSD was officially established. The results present the differences of the two projects from the traditional transportation projects in design methodologies, and similarities to CSD. Consequently, the research proposes that the definition of the transportation projects is undergoing modification, or strengthening. It would be better for new definition to consider the functional and aesthetic pleasing benefits to the public. Therefore, landscape architecture must be playing an important role in the future transportation projects applying CSD. Finally this research summarizes the challenges of integrating CSD and provides research directions for future researches related to CSD and the transportation projects.
APPENDIX A

INTERVIEW LETTER
Dear Mr./Ms. XXX,

My name is Xiwen Feng, and I am a Master of Landscape Architecture student at The University of Texas at Arlington. My graduate thesis this fall is on Context Sensitive Design (CSD) as it relates to project _______. Context Sensitive Design is "a collaborative, interdisciplinary approach in which...transportation facilities...are developed to...fit their physical settings and preserve aesthetic, scenic, historic and environmental resources, as well as maintaining safety and mobility".

I am aware that this project did not specifically use CSD metrics, but the key strategies you undertook in this project were very similar in most respects to what is called CSD.

This research will systematically investigate the integration of "CSD" in project_______. This is qualitative a research project requiring interviews with key stakeholders such as yourself.

May I contact you further regarding information for this study and to schedule an interview?
Your participation will greatly help my research. And I would really appreciate it!

Yours Sincerely,

Xiwen Feng

Program in Landscape Architecture | School of Architecture | The University of Texas at Arlington |

Student ID: 1000740507

Email: Xiwen.feng@mavs.uta.edu

Phone: 214-600-3362
APPENDIX B

INTERVIEW TRANSCRIPTIONS NOTES
### Questions

<table>
<thead>
<tr>
<th>Questions</th>
<th>Landscape Architect One to the question were sorted into</th>
</tr>
</thead>
</table>
| 1. What was your vision for the project?                                | It should take all that input and turn it into a useful design vocabulary  
It should tie the district together with the infrastructure  
It should be a classic and a timeline with celebration at the bridges |
| 2. What steps did you take to achieve this vision?                       | We had an agreement with the engineers from the very beginning of the project  
We had civil engineers, structural engineers, transportation planners, landscape architects and state planners, policy planners on the same team |
| 3. Was your vision achieved finally?                                     | "...is partially achieved"  
Freeways is more bigger and wider  
Original vision gets lost in project delivery |
Response Two

<table>
<thead>
<tr>
<th>Questions</th>
<th>Design Engineer One to the question were sorted into</th>
</tr>
</thead>
</table>
| 1. What was your vision for the project?                                 | It should function as a freeway  
It should show entertainment area of Arlington where a destination point                                                                                                                   |
| 2. What steps did you take to achieve this vision?                       | We worked with lots of the stakeholders along the city of Arlington throughout the years                                                                                               |
| 3. Was your vision achieved finally?                                     | "...turned out better than it anticipated"  
The colors and the staining techniques and the murals had multiple depth to them so that they actually looked more real  
Stamped concrete pavement on the actual surface of the roadway it looks better from the air                                                                                           |
Response Three

<table>
<thead>
<tr>
<th>Questions</th>
<th>Civil Engineer One to the question were sorted into</th>
</tr>
</thead>
</table>
| 1. What was your vision for the project?       | It should have high quality impact and benefit not only the users of the freeway but also the citizens of Arlington  
It should be an expression of the significance of Arlington within the Dallas - Fort Worth area  
It should establish an image of Arlington within the metropolis and the region |
| 2. What steps did you take to achieve this vision? | We participated the public meetings and took input from the neighborhoods  
We had meetings with stakeholders and the properties all along the corridor  
We did lots of research on the city of Arlington, trying to develop an architectural theme  
We were in the design concepts was the developments of murals that depicted the story of city |
| 3. Was your vision achieved finally?            | “...great success”  
Efficiently, quickly and safely transportation improvement convinces people to come to Arlington  
A huge economic impact on the city |
<table>
<thead>
<tr>
<th>Questions</th>
<th>Landscape Architect Two to the question were sorted into</th>
</tr>
</thead>
</table>
| 1. What was your vision for the project?      | It should have high quality impact and benefit not only the users of the freeway but also the citizens of Arlington  
It should be an expression of the significance of Arlington within the Dallas - Fort Worth area  
It should establish an image of Arlington within the metropolis and the region                                                                                                                                 |
| 2. What steps did you take to achieve this vision? | We participated the public meetings and took input from the neighborhoods  
We had meetings with stakeholders and the properties all along the corridor  
We did lots of research on the city of Arlington, trying to develop an architectural theme  
We were in the design concepts was the developments of murals that depicted the story of city                                                                                                                                 |
| 3. Was your vision achieved finally?           | "...great success"  
Efficiently, quickly and safely transportation improvement convinces people to come to Arlington  
A huge economic impact on the city                                                                                                                                                                                                 |
Response Five

<table>
<thead>
<tr>
<th>Questions</th>
<th>Traffic Engineer One to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should provide an access to entertainment area of Arlington</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We do what we need to access to the entertainment area of Arlington, how to do it and how to fit the TxDOT design factors</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td></td>
<td>Provides the access to city of Arlington Entertainment District area that the people looking for</td>
</tr>
</tbody>
</table>
**Response Six**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Traffic Engineer Two to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should provide an access to entertainment area of Arlington</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We do what we need to access to the entertainment area of Arlington, how to do it and how to fit the TxDOT design factors</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;Yes&quot; Provides the access to city of Arlington Entertainment District area that the people looking for</td>
</tr>
</tbody>
</table>
**Response Seven**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Stakeholder One to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should increase the capacity of the road&lt;br&gt;It should create urban design features&lt;br&gt;It should increase the reliability of the corridor</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We adopted a bottom-up approach&lt;br&gt;We talked to a lot of people in the grass roots level&lt;br&gt;We had lots of meetings, brainstorm and then advanced the ideas of the process versus</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;...to early to tell if the vision was achieved&quot;&lt;br&gt;On the north side of the corridor, it have not yet seen the mixed-use developments</td>
</tr>
</tbody>
</table>
Response Eight

<table>
<thead>
<tr>
<th>Questions</th>
<th>Architect One to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should create a modern main street at a scale of a freeway and to do with all aspects of the freeway facility</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We had stakeholder meetings at different locations along the corridor</td>
</tr>
<tr>
<td></td>
<td>We developed that preferred alternative further in more detail and then we went out and had another public meeting</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;...was largely achieved&quot;</td>
</tr>
<tr>
<td></td>
<td>Extends the design into the neighborhood</td>
</tr>
</tbody>
</table>
### Response Nine

<table>
<thead>
<tr>
<th>Questions</th>
<th>Project Director from TxDOT to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should promote the capacity and minimal impact on the community</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We reknitted the communities which were spited by the original roadway in late 1940</td>
</tr>
<tr>
<td></td>
<td>We identified the five major across streets and put special efforts to make them more reliable</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Reflects the neighborhood style and features</td>
</tr>
<tr>
<td></td>
<td>Establishes the new standards for future transportation projects</td>
</tr>
</tbody>
</table>
**Response Ten**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Architect Two to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>US 75 should reflect that position in the community&lt;br&gt;It should be an interstate road system that spans the United States north south east and west&lt;br&gt;It should be a part of the city of Dallas area&lt;br&gt;It should connect different parts of the Dallas and even different cities within the Dallas area</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We envisioned three potential ways of thinking of the highway&lt;br&gt;National level&lt;br&gt;City level&lt;br&gt;Community level</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;Accomplished the goals&quot;&lt;br&gt;Builds an appropriately prominent highway that is representative of Dallas or the State of Texas or the US government</td>
</tr>
<tr>
<td>Questions</td>
<td>Transportation Planner One to the question were sorted into</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should have visual quality, impact mitigation, and environmental integration</td>
</tr>
</tbody>
</table>
| 2. What steps did you take to achieve this vision?                       | We started with a numbers of alternative options and gradually cut down to three options  
We evaluated these three options from the point view of cost and an impact of surrounding properties  
"Yes or No"  
The scale of concrete structure material is not compatible with the surrounding land use  
Landscape is be maintained  
Quantitative architecture and landscape treatments bring highway infrastructure into the surrounding communities |
| 3. Was your vision achieved finally?                                     |                                                                                                                                                                                                 |


### Civil Engineer Two to the question were sorted into

<table>
<thead>
<tr>
<th>Questions</th>
<th>Civil Engineer Two to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should take the vision of the architects, the project architect and TxDOT, developing those into sub-plans that can be constructed</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We were developing a lot of the engineering requirements at the same time the architects were trying to develop a vision. We worked very close with architects on their vision. We did a complex of construction sequencing and traffic control plans</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;... was partly achieved&quot; Achieved the vision of the architect as far as what was built, but did not achieve the lifelong vision the project</td>
</tr>
</tbody>
</table>
### Response Thirteen

<table>
<thead>
<tr>
<th>Questions</th>
<th>Landscape Architect Three to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should become a project</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>I was not actually involved in the day to day design</td>
</tr>
</tbody>
</table>
| 3. Was your vision achieved finally?                                      | "...was achieved primarily"
Narrow medians were not buying out additional right of way, but it still accommodate the traffic requirements |
## Response Fourteen

<table>
<thead>
<tr>
<th>Questions</th>
<th>Construction Engineer One to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should make sure the contractors implemented it according to the plans</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We consisted mainly of executing the construction, working with the stakeholders, and then taking the details from the construction plans and making sure the contractors implemented that according to the plans. Maintenance of Traffic plan (MOT) was designed to improve the flow of traffic during the construction. Intelligent Transportation Systems (ITS) was deployed that we had operators used remote control cameras to look at the condition of the highway to where we could deploy police and fire response for the accidents.</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>“Yes” Sets the precedent for how all the other projects are planned. Have a very pedestrian-friendly environment system</td>
</tr>
</tbody>
</table>
### Response Fifteen

<table>
<thead>
<tr>
<th>Questions</th>
<th>Project Manager from TxDOT to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should be a community based design</td>
</tr>
<tr>
<td></td>
<td>It should provide look and an identifiable appearance treatment for entire the corridor</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We had the workshop, looking at the hardscape and the softscape standpoints in order to find the greenery in the freeway</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td></td>
<td>Colors and features of expressway repeat the same which make it as a clear break with Hight-five interchange</td>
</tr>
</tbody>
</table>
### Response Sixteen

<table>
<thead>
<tr>
<th>Questions</th>
<th>Urban Designer One to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should make the freeway compatible with the surrounding community and commercial areas</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We took a national tour of freeways that in order to get more ideas about aesthetic involvement treatments</td>
</tr>
<tr>
<td>3. Was your vision achieved finally?</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td></td>
<td>Reflected the neighborhood style and features</td>
</tr>
</tbody>
</table>
**Response Seventeen**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Stakeholder Two to the question were sorted into</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was your vision for the project?</td>
<td>It should make the highway functional but make it beautiful and appreciated by the people of Dallas area&lt;br&gt;It should last a lifetime and it should not become outmoded</td>
</tr>
<tr>
<td>2. What steps did you take to achieve this vision?</td>
<td>We created the North Central Task Force that were representatives from business organizations and neighborhoods</td>
</tr>
</tbody>
</table>
| 3. Was your vision achieved finally?          | "...very upset that the landscaping that the highway department ran out of funding"
Achieved the vision of the mobility improvement, but did not archived the lifelong vision of the project                                                                       |
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BIOGRAPHICAL INFORMATION

Xiwen Feng was born in Beijing, China. In 2010, she completed her bachelor degree from the Program in Landscape Architecture, at Shanghai Ocean University in Shanghai, China. She joined the School of Architecture at The University of Texas at Arlington in 2010, pursuing a master degree. She studied at the Program in Landscape Architecture for two and half years and her research and design area covered urban planning, people and environment relationships, and urban revitalization. After completing the master’s degree, she will search for a job associated with landscape architecture and urban planning that would benefit the society.