

PARTNERED PROJECT PERFORMANCE IN TEXAS DEPARTMENT OF TRANSPORTATION

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ABSTRACT: Partnering traditionally refers to strategic alliances or agreements between private sector owners and construction contractors to work together for extended periods of time to deliver completed facilities. Private sector partnering typically begins before the preproject planning phase of a project. The public sector is constrained by laws that ensure the presence of fair competition in all contract awards and prohibits establishment of long-term relationships. Therefore, public sector partnering usually begins after the bid has been awarded for construction. Despite the existence of these constraints, the Texas Department of Transportation has been successful when partnering on a project-by-project basis. Quantitative data are presented that indicate partnering is having a positive effect on completion times, dispute resolution, and project team relations. Subjective data from nearly 900 participants are also provided that further support an emergence of partnering as a viable contract administration alternative for public sector infrastructure projects. Finally, based on the results of the analysis, conclusions and recommendations are presented to serve as benchmarks for future studies of the use of partnering on infrastructure projects.

INTRODUCTION

The intent of this paper is threefold: (1) To present the evolution of construction project partnering within the Texas Department of Transportation (TxDOT); (2) to present an analysis of project performance for partnered construction projects compared with a similar sample of nonpartnered projects; and (3) to discuss the results of a subjective survey documenting perceptions about the partnering process.

Although other department of transportation (DOT) partnering initiatives exist, such as those found at Arizona DOT (ADOT) and Florida DOT, this paper focuses on TxDOT. The research documents a study commissioned by TxDOT in 1995 to analyze the success of its early partnering implementation efforts. The results presented can serve as a benchmark to assess the success of partnering initiatives that have since matured. The reader is invited to review the progress of their partnering initiatives in light of the data presented in this paper.

Throughout TxDOT's 25 district offices, project level partnering has been embraced and implemented with varying degrees of success. Monitored by the TxDOT Continuous Improvement Office, partnered project data are being collected and documented. However, no study has attempted a department-wide analysis of the information. Within TxDOT's divisions, reports have been written documenting individual partnered project successes (Hernandez 1994). Consequently, these reports provided only a small glimpse of TxDOT's partnering performance. Furthermore, at the time of this study little had been published quantitatively measuring the success of DOTs in this area. This paper evaluates whether partnered TxDOT projects performed better on average than a similar,

large sample of nonpartnered projects during the first 4 years of partnering use.

BACKGROUND

Industry Trends

The engineering and construction industry is a highly competitive and risky venture for even the most seasoned companies. The industry's cyclical nature challenges every business. Industry analysts argue, however, that it is not setbacks in the marketplace that damage the industry, but rather the litigation that has erupted from adversarial relationships (McManamy 1994). In many instances, the perception of conflicting objectives among the parties involved in a construction project has led to adversarial, confrontational, and unrewarding relationships (Hernandez 1994). Such relationships jeopardize the main objective of producing a quality product in a timely and cost-effective manner.

It may be suggested that the 1980s marked a time in the construction industry when risk shifting, finger pointing, and expensive litigation to recover losses were industry norms. In contrast, the 1990s mark an industry transformation from the reactive claims practices of the 1980s to a more proactive ideology of claims prevention. The industry has discovered that proactive measures such as alternative dispute resolution techniques lead to lower costs, reduced claims, better long-term relationships, and successful projects.

The concept of "partnering" is a proactive approach that is being embraced in both the private and public construction industry sectors. The application of the partnering concept began in the middle of the 1980s as an effort to improve relationships between the different parties involved in the construction process (Hernandez 1994). The U.S. Army Corps of Engineers (USACE) was one of the leading public agencies to utilize partnering in the late 1980s (USACE 1990). Of the federal agencies, the USACE and the U.S. Naval Facilities Engineering Command (NAVFAC) are utilizing the most mature public partnering programs (Schmader and Gibson 1995).

The 1990s marked the emergence of formal partnering programs in public agencies that since has grown steadily over the past decade. By 1999, all 37 domestic USACE districts and 47 state DOT agencies were using formal partnering programs in the execution of their projects to reduce adversarial circumstances. Of the state agencies, ADOT, Florida DOT, and TxDOT seem to be utilizing the most mature partnering programs based on published materials. Each of these DOTs has

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aggressively instituted a formal partnering process since the early 1990s. ADOT's director, Larry S. Bonine, reports that after partnering \$300,000,000 in projects, it has saved \$5,000,000 and has halved the 5% contingency allowance (McManamy 1994).

Partnering and Team Building Defined

With so many organizations implementing partnering and team-building programs, it is important to understand the nuances in terminology often associated with the term "partnering." Partnering in its current usage in the industry should not be confused as a legal partnership with the associated joint liabilities. Partnering and team building are similar but not identical forms of collaboration among owners, designers, and contractors. Considerable overlap is present in both the content and processes of these two ideas. Each is a form of collaboration and, in the industry, partnering and team building are sometimes used synonymously [Project Team Building Task Force (PTBTF) 1993].

Partnering may be thought of as a broader concept utilized for a more extended period of time than team building. Often it is associated with strategic alliances and does not focus on one particular project; however, a single project (particularly in the public sector) can be a format to initiate a partnering relationship (PTBTF 1993). Likewise, team building for a single project may be one component of a partnering arrangement.

In 1991, the Construction Industry Institute (CII) published *In search of partnering excellence* to report the opportunities of partnering and to further its use as a means to reduce adversarial relationships. It provided the following definition of partnering (Partnering Task Force 1991).

... a long term commitment between two or more organizations for the purpose of achieving specific business objectives by maximizing the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services.

In contrast to partnering, team building is viewed as a short-term process implemented on a specific project. A formal contractual team building agreement is usually not the industry norm (PTBTF 1993). Typically a special provision in the contract will request the voluntary participation of the parties at the beginning of construction, with no formal written agreement. This type of provision is the standard for most public agencies that must maintain equal and fair contracts by law. The objective of the team-building process is simply to build and develop effective interorganizational teams. In contrast to partnering, the project team typically ceases to exist and the team-building process stops once the project is completed. The CII Team Building Task Force offers the following definition for the team building process (PTBTF 1993):

... a project-focused process that brings together key stakeholders in the project outcome, usually representatives of the project owner, designer and contractor. It seeks to resolve differences, remove roadblocks, and build and develop trust and commitment, a common mission statement, shared goals, interdependence, accountability among team members and problem solving skills.

For the majority of public agencies such as USACE and NAVFAC, the team-building definition is more applicable to

what they have been calling "partnering." Although each term has its unique points, the blurring of the two is unavoidable as each is intertwined to support the other. Today, there is a trend in the industry to call this process "project partnering." The term means essentially the same as the team-building definition, but it is often linked with the expectations present in the partnering definition. In this article, the term "partnering" will be used interchangeably with the term "project partnering" to describe the voluntary partnering activities conducted on a project-by-project basis within a continuous improvement framework.

Public Sector Constraints

Although the CII definition of partnering applies well to the private construction sector, its scope is somewhat limited in the public sector. Public sector construction contracts for infrastructure projects, for example, are usually low bid, fixed price contracts. The very nature of the public sector bidding process as open, competitive, low bid contracting offers little opportunity to negotiate the contract. Thus, public agencies such as TxDOT are not permitted to establish long-term, contractual relationships considered critical in the private sector partnering agreements. Public sector contracting may be the arena, however, where "project partnering" can have its greatest impact (Anderson 1993). The contracts developed in the public sector are usually bound by strict budget constraints that often limit innovation and cost efficiency. With public agencies under the watchful public eye, these agencies must maintain accountability to their constituents. The regulations to assure accountability of a public agency has created a forum for adversarial relationships between contracting agencies and contractors. Changes in the contract are sometimes perceived as a contractor's attempt to exploit the public. Likewise, the strict contracting policies of a public agency are often perceived by the contractor as a means for bureaucrats to stifle profit (Anderson 1993).

Project partnering recognizes and attempts to accommodate the expectations of all parties involved with a project. The project partnering framework enables a contractor to understand the public agency's need to be accountable. Likewise, the contractor's position will be enhanced as the public agency recognizes the contractor's need to be efficient and competitive to earn a fair profit.

TxDOT Partnering

Despite these constraints, TxDOT, like other public agencies using project partnering, is achieving positive results. It has recognized that many of its primary goals in administering construction projects reflect those of its contractors. Each project participant seeks a quality project that is safely completed, on schedule, and within budget. These goals extend the search for methods to streamline the contractual processes as well as promote quality innovation and better constructability. Partnering is seen as the method to jointly pursue these common objectives within a framework that fosters open communications, mutual trust and a "win-win" working environment for all participants.

Evolution of TxDOT Partnering

With these common goals recognized, TxDOT and the Associated General Contractors (AGC) began planning to develop a partnering process that would enhance their working relationships. Early in 1991, TxDOT recognized their efforts to reduce claims had been focused on resolving problems rather than preventing their occurrence. After attending a series of partnering conferences and hearing of the successes by

USACE, TxDOT initiated a formal partnering program in April of 1992. The successes of five pilot projects and the enthusiastic support of the AGC enabled TxDOT to effectively implement its program on a statewide basis.

Fig. 1 illustrates a noticeable reduction in claims for TxDOT since partnering began in 1992. The figure contains both partnered and nonpartnered projects; however, at the time of the study in 1995, partnered projects had no claims. The reason for the increase in claims dollars for 1993 is a result of two high cost claims that accounted for \$21,000,000 of the total claims cost (M. Lehmann, personal communication, March 30, 1995). Data collected since that time has verified this trend (Gransberg et al. 1999).

The initial partnered projects showed several benefits resulting from the process. The first formally partnered project was a \$7,000,000 road expansion for U.S. Highway 87 in the San Angelo district. The contractor used 93% of the time to complete 100% of the project's work. During the final stages of the project, a close-out partnering workshop was held to determine the successes and failures of the project. From the workshop, the project participants noted such benefits as better cooperation, no claims, timely completion, increased respect for each other, and significantly improved working environment. Similar results were experienced on the other pilot projects.

With the successes of the pilot projects well established, TxDOT partnered an additional 15 projects in 1992, 74 projects in 1993, and 116 projects in 1994. The success of TxDOT's partnering efforts is the primary reason its use continues to expand quickly throughout the state. As of January 1995, TxDOT had partnered 210 projects with a combined contract award total of \$2.5 billion dollars. The 210 partnered projects represented approximately 20% of the combined total of partnered and nonpartnered projects executed during the study's time frame. A survey of TxDOT districts was conducted to examine the status of partnering activity within the state. Table 1 shows the current status of partnering in each district.

Column 1 lists the 25 districts, and Columns 2–4 show the progression of partnering activity in each district by year. Column 5 shows the total number of projects partnered for each district as of January 1995. It should be noted that the Laredo District was not established until late 1993. For this reason, the district's first opportunity to partner was in 1994. In 1992, eight districts were partnering. By 1994 the entire department, 25 districts, were formally engaged in the partnering process (TxDOT 1995).

Currently, each TxDOT district is using a formalized, voluntary partnering agreement. All the districts have partnered with construction contractors and other types of contract consultants. Some of the districts have partnered with interagency divisions, such as Materials and Test and Construction Maintenance; whereas others have partnered with the Federal Highway Administration and city municipal utility districts. The scope, size, and complexity of a project often determines the

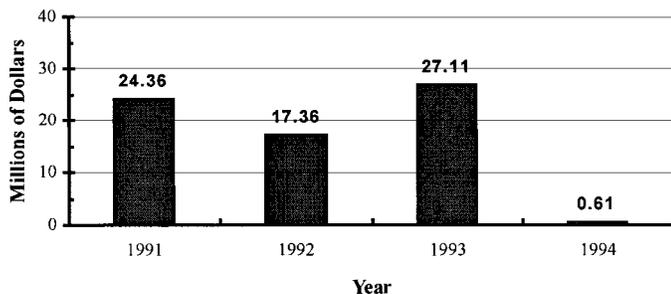


FIG. 1. TxDOT Claims and Disputes after Partnering

TABLE 1. TxDOT Partnering Status as of January 1, 1995 (Completed and In-Progress)

District (1)	1992 (2)	1993 (3)	1994 (4)	Total (5)
Abilene	0	2	2	4
Amarillo	0	3	4	7
Atlanta	0	1	3	4
Austin	0	3	5	8
Beaumont	1	2	5	8
Brownwood	0	2	2	4
Bryan	0	3	2	5
Childress	0	4	3	7
Corpus Christi	0	3	5	8
Dallas	5	9	10	24
El Paso	0	7	3	10
Fort Worth	0	7	7	14
Houston	9	10	15	34
Laredo	n/a	n/a	2	2
Lubbock	0	0	4	4
Lufkin	0	1	3	4
Odessa	0	1	4	5
Paris	1	1	1	3
Pharr	1	2	2	5
San Angelo	1	1	3	5
San Antonio	1	3	8	12
Tyler	1	2	5	8
Waco	0	3	5	8
Wichita Falls	0	1	10	11
Yoakum	0	3	3	6
Total	20	74	116	210

Note: n/a = data not available.

number and type of parties that will enter into a partnering arrangement. As of 1995, TxDOT districts had rarely entered into a partnering arrangement with design firms, but as the partnering program matures, these types of agreements may become more common, particularly as design services are increasingly out-sourced.

In 1995, the AGC awarded four TxDOT partnered projects with Texas Project Awards that recognize TxDOT and contractor personnel who have effectively executed projects under adverse conditions. One of the recognized projects was a \$3,500,000 road reconstruction project on U.S. 180 involving asphalt stabilization and rerouting of sewer lines. Partnering was instrumental in placing the project 50% ahead of schedule despite 200 m of unanticipated bedrock. With open communications already established between TxDOT and the contractor during the partnering workshops, the project costs were kept to a minimum (Roderiguez 1995). Another recognized project was a \$44,000,000 road expansion project in downtown San Antonio. Partnering helped the construction of new elevated lanes and the reconstruction of lower lanes on I-10 to be completed 16 months ahead of schedule. This highly congested project was also executed without claims or disputes arising between the department and the contractor (Roderiguez 1995).

With anecdotal success stories such as these, partnering may be construed as an answer to all contractual woes. This paper addresses this perspective with a research investigation to statistically determine the extent of partnering project success within TxDOT during the first 4 years of its program, as discussed in succeeding sections of this paper.

RESEARCH METHODOLOGY

Subdivision of TxDOT includes 25 district offices throughout the state. Each district office has jurisdiction over a number of counties and is responsible for maintaining the roadways of those counties. At the time of the study, all the districts had used partnering on at least one project. However, only 23 districts had completed a partnered project when this study was

performed in the spring of 1995. To ensure the data would be balanced between partnered and nonpartnered projects from each district, a decision was made to only examine districts that had completed a partnered project by the deadline. With this in mind, data collection was executed in two phases. The first phase obtained objective project data from searches conducted within TxDOT's contract information systems. The second phase obtained subjective data through a combination of personnel interviews and a formal written survey. By acquiring both objective and subjective data, a better assessment of partnering performance was achieved.

Using a list provided by the TxDOT Partnering Office, an examination was made of the partnered project data for any anomalies or inconsistencies. From the original 65 completed partnered projects as of January 1, 1995, 54 projects were selected for the study. Eight projects were deleted because each had scope changes producing skewed completion dates, and three projects were deleted because they initiated partnering after construction was already under way. The cost range of the 54 projects was from \$300,000 to \$27,000,000, with a mean cost of \$4,050,425 and a median cost of \$2,862,575. Additional subjective data were collected on these projects from project reports and follow-up and close-out workshops. The individual project information is not shown in the interest of brevity.

From the database search, 700 completed nonpartnered projects were identified as possible candidates for the study. To acquire the best sample of nonpartnered project data to mirror the partnered project data, the following selection criteria were used: (1) Completion date; (2) cost; (3) project type; and (4) district origin. Using these criteria, 107 nonpartnered projects were randomly selected. The contract award price for the nonpartnered projects ranged from a low of \$392,766 to a high of \$27,269,180, with a mean cost of \$4,502,484 and a median cost of \$2,418,555. As shown in Table 2, the numbers of nonpartnered projects selected from each district were based on a similar proportion and size range of partnered projects from each district. The individual project data again are not shown in the interest of brevity but can be found in the thesis utilized as the basis of this article (Grajek 1995).

TABLE 2. Partnered and Nonpartnered Sample Projects by District

District (1)	Partnered (2)	Nonpartnered (3)
Abilene	3	6
Amarillo	2	4
Atlanta	1	3
Austin	0	0
Beaumont	1	4
Brownwood	2	3
Bryan	1	3
Childress	5	3
Corpus Christi	0	0
Dallas	3	14
El Paso	4	5
Fort Worth	2	9
Houston	5	11
Laredo	0	0
Lubbock	0	0
Lufkin	1	0
Odessa	2	5
Paris	3	6
Pharr	3	6
San Angelo	4	3
San Antonio	2	3
Tyler	3	3
Waco	0	0
Wichita Falls	5	10
Yoakum	2	6
Total	54	107

The seven project evaluation criteria used for measuring project performance in this study were (1) cost change; (2) change order cost; (3) net change order cost; (4) number of change orders; (5) duration change; (6) liquidated damages cost; and (7) claims cost. All the criteria were normalized as a percentage of either original contract award price or original schedule duration except for the number of change orders. The third criterion, net change order cost, was defined as the cost of change absent the change costs related to quantity variations (most projects are bid on a unit price basis and subject to some quantity variations).

These criteria were used to develop a comparison between partnered and nonpartnered projects using the mean value of each criterion. The intent of the statistical analysis activity was to enhance the credibility of the conclusions drawn between the two types of projects. A z-test analysis of means was used to verify if statistical validity had been achieved. A statistical analysis of variances (F-test) and a histogram comparison analysis were also used in the study (Grajek 1995). These tests of means take into account the variable nature of the data set.

To complement the objective data, a written survey was jointly developed by TxDOT and the AGC of Texas. Nearly 900 responses were received from an initial mailing of 3,000 potential candidates. The survey responses originated from 699 TxDOT personnel and 195 contractor personnel. The survey questioned all levels of project participants including field personnel, support staff, and upper management. The purpose of the questionnaire was to identify the positive and negative aspects of the current partnering process. This analysis was important to assess the validity of the partnering relationships established.

COMPARISON OF PARTNERED AND NONPARTNERED PROJECTS

Table 3 presents a comparison of mean criterion values of partnered versus nonpartnered projects and examines the significance of the differences using an analysis of means test. The results tend to show that partnered projects are performing better than nonpartnered projects in the categories of schedule duration and claims cost for the samples used in the study. Table 3 also seems to indicate that partnering does not significantly impact cost change, change order costs, or net change order cost; however, the partnered project values are slightly lower than the nonpartnered project values. In six out of seven criteria, partnered project mean values were slightly lower (better) than nonpartnered projects. The average project size is fairly closely mirrored by the samples as well.

The largest difference of -4.05% appears in the mean duration change value. Partnered projects are completed 4.05% ahead of schedule relative to nonpartnered completion times.

TABLE 3. Mean Value Project Performance Comparison

Mean criterion (1)	Partnered N = 54 (2)	Nonpart- nered N = 107 (3)	Difference between columns 2 and 3 (4)
Mean cost change (%)	4.12	4.51	-0.39
Mean change order cost (%)	3.67	4.19	-0.52
Mean net change order cost (%)	3.09	3.21	-0.12
Mean total change orders (#)	11.69	12.24	-0.55
Mean duration change (%)	-13.73	-9.68	-4.05 ^a
Mean liquid damage cost (%)	0.08	0.02	0.06 ^b
Mean claims cost (%)	0.00	0.013	-0.013 ^a
Mean award price (\$)	4,050,425	4,502,484	-452,059

^aSignificant to 0.10.

^bSignificant to 0.05.

Liquidated damages are defined as loss of opportunity costs charged to a contractor for late completion of a project. The amount assessed per day is usually computed based upon a project's award price and type. For the partnered sample, 15 projects or 28% were assessed liquidated damages ranging from \$100 to \$30,000 in total penalties. The nonpartnered sample posted seven projects or 7%, with liquidated damages ranging from \$800 to \$24,000 in total penalties. For unknown reasons, the partnered project's sample had a higher percentage of its projects assessed with liquidated damages. However, partnered projects have a better schedule completion percentage on average than nonpartnered projects.

Claims are defined as any action where the contractor received or is seeking equitable adjustment under the disputes clause (M. Lehmann, personal communication, March 30, 1995). The TxDOT claims division only documents those claims that are not resolved at the district level. A project may have had a claim that is considered a dispute, but the resolution of the claim at the district level has prevented its formal documentation as an official claim. This may explain why the difference between partnered projects and nonpartnered projects is so small. Documents of TxDOT show that on average only 2% of its total number of projects involve filing of a dispute or claim (M. Lehmann, personal communication, March 30, 1995). The nonpartnered sample reported one claim and one dispute, and the partnered sample reported zero claims.

Statistical Analysis of Sample Means

It may not be possible to determine if the sample of nonpartnered projects is representative of the average TxDOT project; however, the sample of partnered projects represents 83% (54 of 65) of the completed projects as of January 1, 1995, and is considered representative. The nonpartnered sample was randomly selected from a pool of 700 completed projects that were within the same districts, time frame, cost range, and project type as the partnered projects. The nonpartnered sample was selected according to these criteria to mirror the partnered sample. With all other factors essentially the same, the samples' only difference is the existence of partnering.

A z-test analysis of means was used to determine whether the differences in sample means were statistically significant. The level of significance is necessary to judge the merits of any conclusions made when comparing the performance criteria of each sample set. The test gives the probabilities of a Type I or Type II error, namely, the probabilities of erroneously rejecting or accepting a hypothesis (Miller and Freund 1977).

The z-test results lead to the conclusion that the differences in sample means are significant for duration change, liquidated damages cost, and claims cost. Likewise, the differences in sample means are not significant with respect to percent cost change, change order cost, net change order cost, number of dollar cost change orders, total change orders, and award price.

These results indicate that the mean values for duration change and claims are significant and may indicate that partnering is having a positive impact on these criteria. The mean liquidated damages value did show a negative significance for partnered projects. The reason for this result is unclear.

Summary of Statistics

The analysis indicates that partnering is having a positive impact on schedule duration and claims costs. As stated previously, partnered projects posted a 4% average schedule savings above nonpartnered projects. The partnered 4% savings is consistent with Weston's reported 7.55% schedule savings

for partnered projects as well as Schmader's study that reported a 12.39% schedule savings for the USACE and NAVFAC, respectively (Weston and Gibson 1993; Schmader and Gibson 1995). Additionally, Thomas R. Warne, deputy director of ADOT, reported a 12.26% schedule savings for partnered projects (Warne 1993). Furthermore, as of 1995 partnering had zero claims.

To estimate the cost savings attributed to an average schedule reduction of 4%, data were obtained from the TxDOT Contract Office and Claims Office. To calculate a schedule savings value, it was assumed that the best schedule completion deadlines are derived from average partnered project performances. Therefore, it can be said that nonpartnered projects are exceeding their schedule by 4%. A cost figure can therefore be determined from knowing 4% of the total number of contract days and the associated liquidated damages for an average project award price. The Contract Office provided a weighted cost saving number of \$800/day (K. Persad, personal communication, April 17, 1995). The savings value is 4% of the 220,000 contract days in a given year multiplied by \$800/day. The schedule savings value, if TxDOT were to partner all its projects, is estimated at \$7,040,000/year. Although this is a rather simplistic mathematical calculation, the fact remains that delivering projects in a more expeditious manner can lead to savings. The savings are probably greater when considering the opportunity costs and dollars lost in commerce, because roadways are not completed as quickly as possible.

Subjective Survey

To better understand the objective data, a formal, confidential written survey was conducted encompassing approximately 900 respondents. The respondent types included area engineers, record keepers, lab personnel, foremen, superintendents, and CEOs. The nine page questionnaire consisted of "Likert Scale" questions, rank order items, and written requests. The majority of the survey asked quantitative-type questions that sought to examine what elements of the partnering process were being utilized and by whom. The quantitative questions are too numerous to formally illustrate in this article, but the results are briefly summarized below (Grajek 1995):

- The majority of TxDOT and contractor personnel had partnered one to three projects.
- The most beneficial elements of a partnering workshop were problem solving "rocks in the road," issue escalation, and a relaxed environment.
- The least beneficial elements of a partnering workshop were videos, game playing, and personality profiles.
- The most utilized partnering tools were issue escalation tactics and problem-solving techniques.
- Nearly 85% of the contractor personnel perceive partnering as enhancing their business relationships with TxDOT. Likewise, 65% of TxDOT personnel perceive partnering as improving their business relationships with contractors. However, a low percentage of TxDOT and contractor personnel perceived partnering as improving relationships with subcontractors, suppliers, or TxDOT internal divisions.
- The survey revealed that 70% of TxDOT and contractor personnel did not know about follow-up and close-up workshops, did not know they were available, or did not know the purpose of these workshops.
- Only 20% of TxDOT and contractor personnel indicated they had attended a follow-up workshop, and only 5% indicated they had attended a close-out workshop.
- Of the 20% who had experienced follow-up and close-out

workshops, all rated these workshops as beneficial to extremely beneficial.

- The top four partnering benefits as ranked by both TxDOT and contractor personnel were better communication, better teamwork, increased trust, and stronger relationships.
- A 70% majority from TxDOT and contractor personnel gave TxDOT's partnering support staff a good to excellent rating for services provided.

Briefly, the most beneficial elements of the partnering workshop were addressing "rocks in the road," identifying issue escalation steps, and enhancing a relaxed environment. "Rocks in the road" may be defined as a series of discussions between TxDOT and contractors to identify potential problems associated with a project. By addressing those issues early, strategies can be developed to address the problems before they become costly claims or issues between the two groups. Issue escalation is a series of prescribed steps utilized and agreed to by both TxDOT and contractors to seek a solution to a specific project problem. The two organizations use these procedures to ensure all possible resources have been exhausted before a claim is filed as a last resort.

Written comments, in addition to the quantitative questions, were also solicited. Approximately 25% (225 people) wrote comments (Grajek 1995). The statements that follow are actual responses to two questions that contributed the greatest number of written comments and are from the perspective of improving the partnering experience. After reviewing the comments, similar responses were categorized and grouped. The issues presented in the following tables represent the top three trends for each question. These top three trends collectively represent approximately 65% of the responses received for each question. Table 4 summarizes three key issues generated from a question that solicited ways to improve partnering workshops.

The comments to improve the workshops were qualitatively categorized and show three general issues that are shared by the majority of respondents. The first issue addresses the respondents' wish to spend more time problem solving rather than learning of the other's personality type. The second issue stresses the need to better preassess potential problems before the workshop begins. The respondents seem to want a more concise and well-planned workshop where the participants

TABLE 4. Improving Partnering Workshop

Issues (1)	Type (2)	Example comments (3)
Reduce time allocated for games and personality profiles	TX	Less time on touchy feel activities and more time spent on problem solving (inspector)
	TX	Stay away from personal profiles and spend more time on anticipated problems (area engineer)
Use preassessment activities to focus partnering meetings	C	Use a prepartnering questionnaire to expose concerns before the workshop begins (field engineer)
	TX	Change orders can be "rocks in road," spend time explaining process to contractors regarding submission (director of construction)
Implement mandatory follow-up and close-out meetings	C	We need the follow-up workshops . . . it is really important to the partnering process (foreman)
	C	Need more involvement from district and construction engineers at follow-up levels (vice president)

Note: Answers are for the question, "How could workshops be made more beneficial/productive for you?" TX = TxDOT personnel; C = contractor personnel.

TABLE 5. Other Issues of Partnering Workshop

Issues (1)	Type (2)	Example comments (3)
Partnering addresses the lack of bidder qualification measures	TX	TxDOT needs contractor bidder qualification criteria to sort out marginal contractors; partnering acts as a way to minimize the current absence of qualifications (area engineer)
Commitment to the partnering process is key to its success or failure	C	Have had problems with chief inspectors who say they will follow the process but later do not follow the agreed upon issues (foreman)
	C	50% have been a success; success or failure is dependent upon the level of trust between the contractor and TxDOT (vice president)
Partnering can be a contract weapon, a waste of time and money	TX	Let us do our work and save money that is spent on partnering (inspector)
	TX	Contractors use partnering as a weapon; TxDOT gets a less durable product (director of construction)

Note: Answers are to the question, "Are there any issues that have not been addressed? Please list." TX = TxDOT personnel; C = contractor personnel.

have thoughtfully recognized potential problems and solutions prior to the workshop. The final issue raises the important question of how to achieve a sense of closure for the partnering process. The majority of the respondents want mandatory follow-up and close-out workshops as part of the process. The current partnering process uses voluntary follow-up and close-out workshops as requested by the project teams.

Table 5 summarizes three key issues generated from a question that sought to explore other aspects of partnering workshops.

With public low bid award practices, contracts are sometimes granted to marginal contractors who later default on their contract obligations. Partnering acts as a method to identify potential problems with contracting parties before the project begins and may help develop measures to mitigate serious difficulties later in the project.

The lack of follow through by the partnering participants was stated as a second issue. All levels of TxDOT and contractor personnel stated that the party was not fulfilling its responsibilities to the partnering agreement. Likewise, the respondents indicated that when the partnering team was strongly committed to the agreement, the project and process were viewed as a success. These types of comments reinforce the importance of a sincerely committed project team if partnering is to have a positive effect.

Finally, some comments suggested that partnering is being used as a contract weapon to reduce state requirements and quality. Members of TxDOT perceive an apparent erosion of their authority to enforce project specifications and requirements. By partnering with the contractor before the project begins, the perception is a reduction in TxDOT control. This view, however, is not the prevalent perception of partnering, but it does deserve attention to better the process.

CONCLUSIONS AND RECOMMENDATIONS

The partnering program of TxDOT is entering its eighth year. By January 1995, TxDOT had formally partnered 210 projects and was planning to partner an additional 200 for the 1995 fiscal year, with more to follow. Completed projects showed that partnering was having a positive effect on completion times, dispute resolution, and project team relations. Partnering was saving millions of dollars not only for TxDOT, but also for the taxpayers of Texas in executing infrastructure projects. Specific conclusions include

- All 25 TxDOT districts were utilizing partnering on their construction projects, with Houston, Dallas, and Fort Worth districts leading in the number of partnered projects initiated under a formal partnering agreement.
- Partnering was having a statistically significant effect on schedule duration for TxDOT projects. The partnered projects posted a -13.73% average duration change, as opposed to -9.68% by nonpartnered projects. The schedule savings associated with the 4% value would be significant if TxDOT were to partner all of its projects.
- Partnering was having an apparent effect in reducing the number of claims and disputes on projects.
- A comparison of the subsamples showed that partnering was not having a statistically significant effect on cost change, change order cost, or net change cost.
- From the survey of approximately 900 participants, the most beneficial elements of a partnering workshop were identification of problem-solving techniques and issue escalation tactics. Nearly 85% of contractor and 65% of TxDOT personnel perceived partnering as enhancing their business relationships, and the top four benefits of partnering were better communication, better teamwork, increased trust, and stronger relationships.
- The survey also indicated that the level of commitment to the process determines the level of partnering success. When participants did not execute their partnering agreements, partnering was considered a waste of time and unsuccessful. However, when the process was executed as promised by each group, partnering was considered a great success.

TxDOT executes billions of dollars worth of projects every year in the state of Texas. Partnering's positive impact on schedule adherence, claims reduction, and improved communication between project participants leads to better quality projects in a more timely and efficient manner. Furthermore, there appears to be little cost and risk associated with the process, which makes partnering an attractive contract administration alternative for TxDOT projects.

The partnering process is one tool that can be used to improve the performance of the project delivery system. However, it is not the answer to all project problems. As out-sourcing of project services becomes more prevalent in the next few years in public agencies, partnering should be considered as a means of enhancing the myriad of new relationships that will occur.

This paper provides a benchmark of the first four years of partnering at TxDOT, from inception to mature usage. The results from this investigation were reported to TxDOT and it subsequently funded a research study to continue evaluation of the partnering process (Gransberg et al. 1999).

The results of this study indicate that TxDOT has been successful in implementing partnering on its highway projects. To further this effort, the following recommendations are offered:

- TxDOT not only should continue to apply its partnering program to those projects whose award price is within this study's range of \$300,000 to \$27,000,000, but also apply partnering to more expensive and complex projects. The benefits are likely to be more easily realized for these project types. Other public agencies should also vigorously implement partnering on their projects as a tool to enhance communication and reduce disputes.
- A better follow-up and close-out workshop method should be established by TxDOT to attain maximum benefits from the partnering process. The follow-up workshops serve to reinforce the initial workshop. Similarly, the close-out workshops provide a forum for a lessons-learned discussion and overall evaluation of the process. Data collected from these workshops could be used to continuously improve the project delivery system.

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