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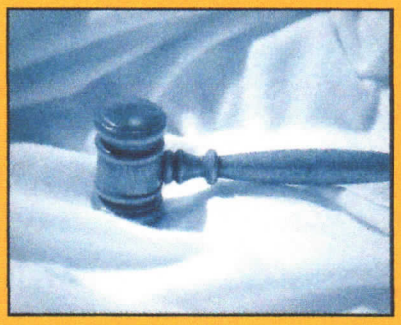

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Scholarly Paper

Analysis of Construction Dispute Review Boards

Duzgun Agdas, Ph.D., P.E., M.ASCE[1]; and Ralph D. Ellis, Ph.D., P.E., M.ASCE[2]

Abstract: The construction industry has long been burdened with inherent adversarial relationships among the parties and the resulting disputes. Dispute review boards (DRBs) have emerged as alternatives to settle construction-related disputes outside courts. Although DRBs have found support in some quarters of the construction industry, the quantitative assessment of the impact of DRBs has not been adequately addressed. This paper presents the results of a research project undertaken to assess the impact of DRBs on the construction program of a large-scale highway agency. Three dimensions of DRB impact were assessed: (1) influence on project cost and schedule performance, (2) effectiveness of DRBs in preventing and resolving construction disputes, and (3) costs of DRB implementation. The analyses encompass data from approximately 3,000 projects extending over a 10-year period (2000–2009). Quantitative measures of performance were developed and analyzed for each category. Projects that used DRBs faced reduced costs and schedule growth (6.88 and 12.92%, respectively) when compared to non-DRB projects (11.53 and 28.96%). DRBs were also found to be effective in avoiding and settling disputes; the number of arbitration cases reduced consistently after DRB implementation, and DRBs have a success rate of 97% in settling disputes for which DRBs were used. Moreover, costs of DRBs were found to comprise a relatively small fraction (i.e., approximately 0.3%) of total project budgets. It was concluded that DRBs were effective dispute prevention and resolution alternatives with no significant adverse effects on project performance. **DOI: 10.1061/(ASCE)LA.1943-4170.0000118.** © *2013 American Society of Civil Engineers.*

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Introduction

Construction disputes can arise from many factors: inadequate planning, changes in commodity prices, unexpected conditions at the work site, differing interpretations of contract language, and lack of communication among parties involved in the project; these can affect project performance and ultimately lead to litigation. Although there have been many studies elaborating on the cost of construction litigation (Gebken and Gibson 2006), a comprehensive assessment of the actual costs of construction litigation is an elusive goal. Immediate damages consist of legal expenses, and increased project costs can provide an assessment of the short-term damages; however, they fail to capture the true long-term impacts of litigation on overall construction processes. Opportunities lost because of invested capital and time, reduced employee morale, and decreased repeated work are some of the important adverse effects of escalated adversarial disputes and litigation that cannot be directly measured. Perhaps one of the best summarizing quotes about the costs of settling disputes at courts, as originally cited by Harmon (2003b), comes from 15th Chief Justice of the US Warren E. Burger: "I was trained, as many of you were, with that a generation of lawyers taught that the best service a lawyer can render a client was to keep away from the courts" (Burger 1982).

[1]Lecturer, Engineering School of Sustainable Infrastructure and Environment, Dept. of Civil and Coastal Engineering, Univ. of Florida, Gainesville, FL 32611 (corresponding author). E-mail: duzgun@ufl.edu

[2]Associate Professor, Engineering School of Sustainable Infrastructure and Environment, Dept. of Civil and Coastal Engineering, Univ. of Florida, Gainesville, FL 32611. E-mail: relli@ce.ufl.edu

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Dispute Resolution in Construction

Alternative dispute resolution (ADR) procedures have emerged as the alternative mechanisms to resolve construction disputes outside courts (Gebken and Gibson 2006). The basic premise of ADR approaches such as arbitration and mediation has been the timely and cheap solution of disputes when compared to litigation at courts (Harmon 2003b). Unlike court cases, ADR procedures are exclusive to professionals with significant technical capacity and experience to assist in settling the adversarial disputes between project participants. The proposed benefits of ADR procedures over litigation have been cited as reduced process costs, the possibility to maintain reasonable relationships among disputing parties, and greater flexibility in the design of the ADR procedure to better fit the projects (Cheung 1999).

However, there is also literature that cites the negative perceptions and impacts of traditional ADR solutions. Harmon (2003b) discussed that the impact of timing of the ADR solutions can negate the proposed benefits. The author argued that ADR solutions are generally put into place well after the projects are completed. Thompson et al. (2000) described ADR procedures are time consuming and rather costly to implement, in addition to the apparent problems concerning the timing of these solutions.[1]

Dispute Review Boards

There are some variations to the structure and functionality of dispute review boards (DRBs); however, a three-member impartial board is the most common structure. Typically, the three-person committee of industry experts, collectively determined by the owner and the contractor, assists the owner and the contractor in addressing construction-related disputes (Menassa and Peña Mora 2010). Each party, the owner and the contractor, designates an impartial member. Later, in tandem, they decide on the third member

that generally serves as the chairperson [Dispute Resolution Board Foundation (DRBF) 2007]. One of the more unique properties of a DRB is the neutral stance of the members, regardless of the source of their appointment. The neutral nature of the DRB process should foster improved communication among parties, which may be the key to successfully settle disputes and to create a psychological edge to prevent most disputes from becoming adversarial in nature (Groton 2009).

DRBs should be constituted following the contract execution and as early as possible through the construction process (DRBF 2007). DRB members attend project meetings and visit sites to familiarize themselves with the project, because the functionality of DRBs is not dependent on the actual occurrence of disputes and either party (owner or contractor) may refer a dispute to the DRB. Upon receipt of a hearing request, the DRB schedules an informal hearing in which both parties are given the opportunity to present their positions. The DRB provides a nonbinding recommendation based upon a determination of fact and the applicable contract provisions.

Where DRBs fit within the larger ADR umbrella is not clear. Menassa and Peña Mora (2010), Yates and Duran (2006), and McMillan (2000) suggested that DRBs are a subset of the greater ADR family. On the other hand, Harmon (2003a, b) and Thompson et al. (2000) did not consider DRBs to be ADR solutions and focused on the early constitution and preventive nature of the DRBs compared to traditional ADRs. It is debatable whether there is a line between the traditional ADR solutions and DRB procedures; however, there are substantial fundamental differences between approaches. The timing of the constitution, the composition of the expert committees, and the obligatory stance of outcomes are some of the major differences. Perhaps the most important promise made by DRB implementation is the possibility of preventing issues from turning into adversarial disputes by resolving emerging disagreements before the effects are substantiated (Thompson et al. 2000).

Effectiveness of DRBs

The effectiveness of DRB implementation, which can be defined as its success in resolving or preventing further escalation of disputes when implemented, has been the primary focus of literature pertaining to DRBs. Yates and Duran (2006) presented a successful DRB application in a metro tunnel project; however, the authors also discussed the possible skew in the assessment caused by the lack of focus on possible problems associated with DRB implementation. Harmon (2003a) conducted a survey to measure the level of satisfaction of construction professionals in terms of DRB success, which indicated almost unanimous agreement about the beneficial nature of DRBs. The author argued that there might be an inherent bias in the perception, because the surveys were distributed during the DRBF annual meeting. Menassa and Peña Mora (2010) provided a quantitative assessment of the effectiveness of DRB implementation in preventing disputes and resolving adversarial disputes by using the number of disputes heard per project and the number of disputes settled per project/number of disputes heard per project. The authors analyzed a comprehensive data set and determined DRBs to be effective in preventing disputes from becoming adversarial and as dispute settlement mechanisms with an almost perfect success rate for a variety of project types.

On a different note, Harmon (2009) conducted an effectiveness study of DRBs on a central artery/tunnel project (i.e., Big Dig), which portrays a different story than the rest of the literature. Not only were DRBs found to not have performed well in addressing the disputes, they were also found to not improve the bid cost savings (negative deviations from the original owner estimates of project costs), which has been one of the proposed advantages of DRBs (DRBF 2007). The details of the findings of the study are not contained within this article; however, overutilization of DRBs (total DRB/nonDRB project budget totals were \$8.4/\$0.5 billion) and deviations from some of the best practices in DRB implementation, e.g., early formation of the committee, might have contributed to the undesired outcomes. Harmon published another paper on DRBs in 2011, in which the author supported the argument that DRB costs can be substantial and impact project success, and thus should be an important consideration before adoption (Harmon 2011).

DRBs in the US and Regional Differences in Dispute Boards

According to the DRBF (2007) the first implementation of DRBs in the US dates back to 1975; since then, they have become increasingly popular. Currently, DRBs are utilized by many owner organizations: state highway agencies, public transit authorities, and higher education institutes. DRB is a common term used in the US and Canada, and there are some international variants to DRBs that are designed to serve similar purposes. DRBF cites dispute resolution boards and dispute adjudication boards as two of these variants; their use is advocated by the International Federation of Consulting Engineers (FIDIC), the International Chamber of Commerce (ICC), the World Bank, and the UK Institution of Civil Engineers.

Research Motivation and Significance

Although the recent literature has provided insight into the effectiveness of DRB implementation, there is a research gap in the analysis and understanding of the overall effects of DRB implementation on construction projects. A critical analysis of the dynamics of DRBs suggests that there are three primary research questions to be simultaneously answered to truly justify the use of DRBs in construction projects:

1. How does the presence of a DRB affect the performance of a project in terms of cost and schedule?
2. How effective are DRBs in avoiding and resolving disputes?
3. What are the costs of DRBs?

Disputes are recognized as having negative effects on the working relationship between the owner and contractor project personnel. Harmon (2003a) briefly elaborated the possible positive impacts of successful DRBs on projects to include reduced costs and increased morale. How does the presence of a DRB influence project performance metrics such as time and cost growth? Time and cost growth can be defined as approved additional payments made to the contractor from the quantity of the winning bid and additional time required to complete the projects from the original schedule, respectively.

Do DRBs contribute to dispute prevention in addition to assisting in resolving disagreements? The basic premise of DRBs is to provide unbiased, timely, and merit-based recommendations when disagreements take place. Thus, as suggested by Menassa and Peña Mora (2010), an alternative DRB effectiveness criterion (preventive effectiveness), in addition to effectiveness in settling disputes, can provide more insight into the overall advantages of DRBs on construction work programs. Issues will occur in almost any project, regardless of the scope and size; however, not all disputes become highly problematic and necessitate the use of DRB hearings or any other form of ADR methods. The true benefit of DRBs will, perhaps, be not only resolving disputes that became problematic, but also improving the culture and preventing issues from becoming disputes and affecting project performance.

Irrespective of the substantial potential benefits, DRBs add costs to projects and an adequate analysis is necessary to analyze and justify the additional spending. How do DRB costs compare to the overall project budget? Is it feasible to quantify possible savings when DRBs are used?

Research Outline

To answer the identified research questions, a study was designed around a Florida Department of Transportation (FDOT) construction work program. The FDOT work program is a good candidate because the number of projects completed each year is relatively consistent, there are substantial data available for analysis, DRBs have been implemented for over a decade, and the agency has one of the largest DRB programs in the US (DRBF 2007).

FDOT DRB Program

The FDOT DRB specifications are similar to the universal descriptions of DRB implementations, with significant emphasis on the impartiality of the board and the nonbinding, informal nature of DRB recommendations.[2] One critical aspect of the FDOT process is the differentiation between issues and adversarial disputes, and the encouragement to address issues to the full extent of the project partnering process before referral to the DRB. In the case of adversarial disputes that cannot be resolved through partnering efforts, FDOT contractors are required to seek resolution of these through the DRB process before seeking any other resolution option. Subsequent to the DRB hearing, contracts may refer disputes to the State Arbitration Board, a condition precedent to litigation for most disputes.

FDOT introduced DRBs to its construction program in 1994 on a trial basis for select projects.[3] Generally, DRBs were assigned to larger projects of $10 million in contract size as a common threshold. This selective assignment of DRBs to projects continues today; not all projects are assigned a project DRB (currently, a threshold of $15 million is in effect in most cases). However, in 2002, regional DRBs were formed. The regional DRBs are not assigned to specific projects, but are available to hear disputes for any project without a project DRB, essentially providing DRB access to all FDOT construction projects. In 2004, the agency formed the Statewide Board for warranties and material acceptance issues following project completion. This board is available to almost all projects undertaken by the agency.

Analysis

DRB Influence on Project Performance

During the years 1999, 2000, and 2001, DRBs were introduced into the FDOT work program. This provides a time frame in which projects with DRBs and projects without DRBs were performed in a similar project environment, permitting valid comparison. Although there were projects with DRBs in 1999, none were reported to have been completed in that year. Since 2002, following the implementation of the regional DRB concept, DRBs were made available to all projects. Project performance was analyzed to determine the difference, if any, between the projects with DRBs and the projects without DRBs. Project cost growth and project time growth from the initial contract values were examined as indicators of the impacts on project performance.

Table 1 provides the results of the cost growth comparison. The average project cost growth during the 1999 to 2001 period for projects without DRBs was 11.92%. The average project cost growth during the 2000 to 2001 period for projects with DRBs was 8.05%. On average, the DRB projects had less cost growth. Although attributing the reduced additional payment to DRB implementation is premature, it is evident that DRB implementations have not inflated the overall project expenditures. These classifications were made on the basis on the start time of the projects (i.e., projects that have started in 2000 with DRB hearings had a cost growth of 6.88%, whereas the projects that were initiated in 2000 that were not assigned DRBs had a cost growth of 11.53%. After 2002, DRBs were made available to virtually any project the agency has undertaken). Table 2 provides the results of the time growth comparison. Similar to cost growth observations, DRB projects seemed to have less time growth than nonDRB projects. The average project time growth during the 1999 to 2001 period for projects without DRBs was 28.96%. The average project time growth during the 2000 to 2001 period for project with DRBs was 12.92%.

Table 1. Cost Growth on FDOT Projects

Year	DRB projects (%)	NonDRB projects (%)
1999	NA	12.35
2000	6.88	11.53
2001	9.22	11.89
Average (1999–2001)	8.05	11.92
2002	6.16	

Table 2. Time Growth on FDOT Projects

Year	DRB projects (%)	NonDRB projects (%)
1999	NA	27.92
2000	9.25	27.27
2001	16.58	31.68
Average (1999–2001)	12.92	28.96
2002	15.92	

Additionally, the improved performance in terms of both time and cost in 2002 is not completely attributable DRBs (i.e., DRB projects constitute a relatively small component of the overall program, approximately 9% for the data set analyzed) because it is safe to assume that the agency employed additional proactive measures to improve the project performance in addition to adopting DRBs.

DRB Effectiveness in Avoiding and Resolving Disputes

To address the question of effectiveness of DRBs in avoiding and resolving disputes, the number of projects with DRB costs and the number of disputes heard at the State Arbitration Board were used. DRBs are praised for their contribution in improving the dynamics of the traditionally adversarial owner-contractor relationship, in addition to settling adversarial disputes (Groton 2009). FDOT construction contracts make the DRB hearing a condition precedent to access to any further dispute resolution alternatives. Similarly, the State Arbitration Board is a condition precedent to access to litigation for most contract disputes. Therefore, the analysis of the number of cases submitted to the FDOT State Arbitration Board over a period of time is an indicator of the effectiveness of the DRBs in both dispute avoidance and resolution.

Fig. 1 presents the number of State Arbitration Board cases per year from 1998 to 2008.[4] No arbitration case information was found after 2007, and to be conservative, 2009–2011 were excluded from the analysis. The number of disputes heard by the FDOT State Arbitration Board significantly reduced after the

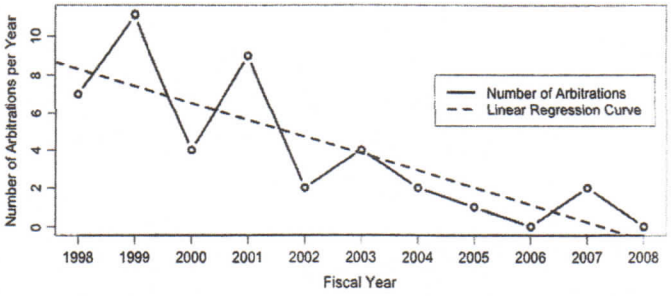

Fig. 1. FDOT State Arbitration Board cases (1998–2008)

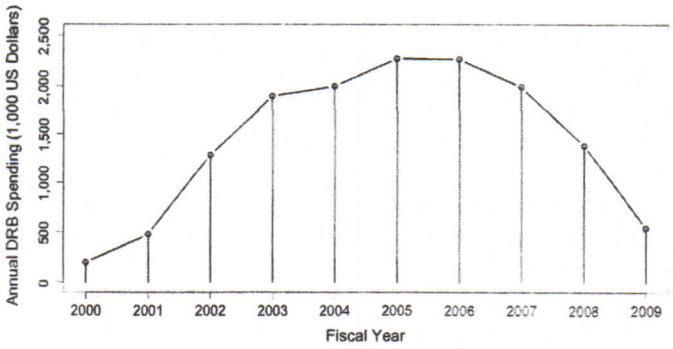

Fig. 2. Total DRB spending per fiscal year

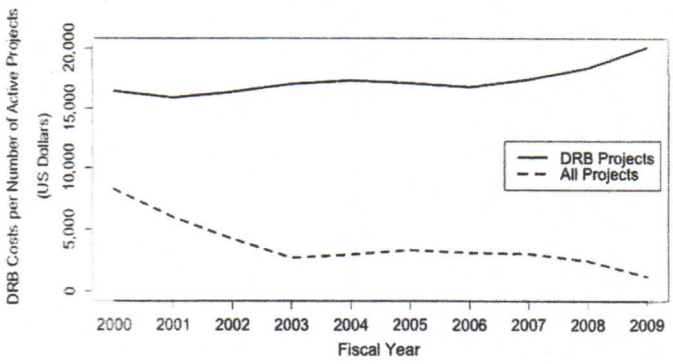

Fig. 3. FDOT DRB costs per project

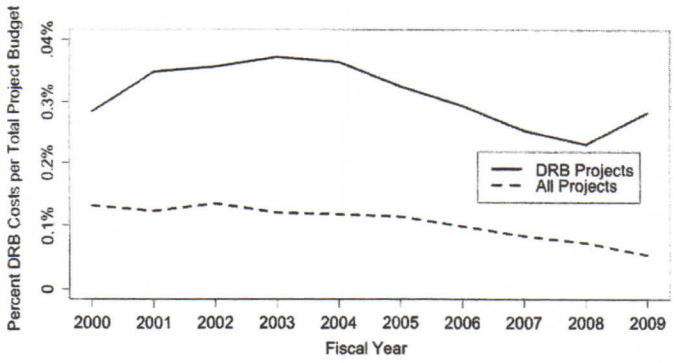

Fig. 4. Percent DRB spending

implementation of the DRBs in the FDOT program. A simple linear regression analysis was run to analyze the trend in reduced arbitration cases. The resulting coefficients were 8.3 (intercept) and −0.9 (slope) ($R^2 = 0.66$, $p_{\text{model}} = 0.002$, and both p_{int} and $p_{\text{slope}} < 0.05$. indicating a relatively good fit), implying that nearly one less arbitration case, on average, was to be expected with every passing year.[5] Although the model is susceptible to sample size concerns. the trend is a clear indicator of reduced arbitration cases and adversarial disputes.

While assessing the effectiveness of DRBs in resolving the existing disputes, the number of projects with DRBs was compared to the number of arbitration hearings. The data used in the analysis showed that 259 projects with completion dates between 2003 and early 2010 used DRBs. Assuming no lag between project completion date and arbitration hearings in the case of escalated disputes, a total of nine arbitration orders were processed from 2003–2010. Comparing the nine escalated disputes to 259 projects that have used DRBs indicates a success rate of 97%. This is an approximate figure because the arbitration hearing timing can vary substantially. There is a time lag between project initiation and arbitration hearing for the escalated disputes. Before disputes can be referred to the arbitration board, DRBs and other administrative processes need to be completed. This lag, coupled with the time elapsed for disputes to arise, will induce a time gap between the project initiation and arbitration hearing. Another assumption was made, and disputes and disagreements were not differentiated. Two hundred fifty-nine is the number of projects that have used DRBs (i.e., part of the budget was spent on DRBs), not necessarily projects that have had adversarial disputes or a number of DRB hearings. This is an alternative effectiveness measure to that proposed by Menassa and Peña Mora (2010), because their analysis focused on the number of resolved disputes after being heard in front of the DRB committees.

Cost of DRBs

The viability of DRBs as a dispute resolution and avoidance mechanism is a plausible preposition; however, the question of how much DRBs cost remains a concern. An analysis of the FDOT program provides a clear quantification of their cost experience. Figs. 2–4 depict the cost information related to DRB usage in FDOT work projects from 2000 to 2009. The cost date included projects completed between 2003 and early 2010 and the earliest DRB cost figures were from 1998; however, there were very few projects with DRBs in 1998, 1999, and 2010. Thus, these years were excluded from the cost analyses to not to skew the results.

In describing the DRB expenses for a given fiscal year, a similar approach to that of Menassa and Peña Mora (2010) was used and a distribution pattern was assumed to be consistently applicable for DRB and project related expenses. The stored project data can be stratified with respect to many project-related demographics, including the start and end date of the project. However, clustering costs using the start date of the will not provide the actual spending for different fiscal years (i.e., if different work program years have discrepancies in the average length and cost of projects, using the project start date classification will inflate the program budget and DRB costs for the years with higher project budgets and longer durations, because it is more likely to have more substantial DRB spending for large projects). To overcome this issue, a simple yet robust assumption of the linear distribution of project and DRB costs through the active project years was assumed to be accurate. For instance, if a project is constructed between 2000 and 2004, with a budget of $5 million and a DRB cost of $50,000, the following assumptions were made: (1) the project started on the first day of 2000 and was completed on the last day of 2004, (2) both project budget and DRB expenses were uniformly distributed through 2000–2004. Thus, this project became a row of entry in the study's database with a capital spending of $1 million/year and DRB spending of $10,000/year through 2000–2004.

Fig. 2 shows the trend in total annual DRB spending for the overall construction program (mean = $1.43 million, SD = $782,173, minimum = $197,752, maximum = $2.28 million). Although the numbers seem to be high, they are insignificant when compared to the overall work program; however, not all projects will bear DRB costs. The graphical analysis also suggests an interesting trend: the annual DRB cost appears to decrease toward the later parts of the analysis interval (DRBs were made available to all projects in 2002), despite the probable increases in unit DRB costs (i.e., cost of a hearing). One possible explanation is the reduced number of available project data (the data used in the analysis includes projects completed by early 2010, and it is likely that major projects take longer than a year to complete. Also, the DRB spending was prorated throughout the active project years). Another possible explanation is improved DRB process efficiency. A third consideration may be the FDOT expansion of the regional DRB option. Regional DRBs, which meet only when a hearing is requested, are less expensive than a project-specific DRB, which requires regular meetings of DRB personnel, irrespective of the actual occurrence of the disputes. Unfortunately, the available data are not conclusive to favor any of these possibilities for the unexpected data trends.

To further clarify the cost picture, DRB costs per active DRB projects and total program portfolio were analyzed. Fig. 3 displays average DRB costs per number of projects that have used DRBs and average DRB costs per total number of active projects in a given fiscal year. The average DRB cost for projects that used DRBs was $17,308 (SD: = $1,190, minimum = $15,931, maximum = $20,094). The numbers were less significant, which was expected because of the anticipated utilization rate of DRBs, when the DRB spending was averaged over the total number of projects active for a given year (mean = $3,741, SD = $1,999, minimum = $1,230, maximum $8,240). Both trends are rather stable and the slight increase in the solid line, representing the average DRB costs per number of active DRB projects, can be attributed to the expected increase in unit DRB costs. Interestingly, the dashed curve, representing the average DRB costs per number of active DRB and nonDRB projects, indicates a decrease in DRB spending per total number of active projects. Two possible explanations are reduced DRB utilization rate and improved DRB process efficiency with increased DRB experience.

Fig. 4 depicts the average DRB costs as a percentage of project costs that use DRBs and overall program budget for a given year. On average, DRB costs are 0.3% of the DRB project budgets (SD = 0.05%, minimum = 0.2%, maximum = 0.4%); as expected, the numbers were lower when the total program budget for a fiscal year was used (mean = 0.10%, SD = 0.03%, minimum = 0.05%, maximum = 0.13%). The dashed curve, representing DRB costs as a percentage DRB and nonDRB projects budget for a fiscal year, is similar to the dashed line in Fig. 3 for similar reasons mentioned previously. However, the solid line, representing DRB costs as percentages of DRB project budgets, has an unexpected decreasing trend except for 2009, a fiscal year that is susceptible to having a smaller number of active DRB projects because of data availability. The decrease in DRB costs as percentages of DRB project budgets can be explained by two distinct factors: increased average project size and budget or improved efficiency of DRBs in dispute resolution.

Conclusions

The FDOT's introduction of DRBs to its construction work program has provided an opportunity to analyze the impacts of DRBs on a large work program. The FDOT work program is one of the largest work programs that utilizes DRBs in virtually all of its projects when needed. The available data allowed a simultaneous assessment of DRB implementation questions: how DRBs affect project cost and schedule, how effective DRBs are in preventing and resolving disputes, and how significant are DRB costs.

The implementation of DRBs and their impacts on project performance (cost and schedule) have not been addressed in adequate detail in recent literature. The unique transition phase witnessed by the FDOT program provided an opportunity to present a realistic assessment of the impact of DRBs on project performance. Projects with DRBs seem to have lower schedule and cost escalations than nonDRB projects. Although this improvement cannot be directly attributed to the DRB implementation, there is enough evidence to confirm that the implementation of DRBs does not adversely impact the cost and schedule of a project.

DRBs in the FDOT program appear to have been effective in resolving adversarial disputes and preventing their occurrence. A conservative analysis indicates a success rate of 97% in addressing disputes. This ratio was computed by using the number of projects that had DRB cost items in their budget and the number of disputes that escalated to arbitration cases that were heard at the FDOT State Arbitration Board. In assessing the preventive effectiveness of DRBs, the number of arbitration cases over an 11-year time frame was used. The number of arbitration hearings has declined steadily following the implementation of DRBs within the work program. Another indicator of the impact of DRBs in reducing adversarial disputes was the reduced normalized DRB spending over time. Both DRB spending per number of active projects in the work program and percent DRB spending per program budget allocated for fiscal years have declined in later parts within the time frame of the research. The reduced DRB utilization rate is a plausible answer to this trend; combined with the reduced arbitration hearings, it is safe to conclude that DRBs encourage the contractor and the owner to settle issues internally, with no external intervention.

Another interesting research question has been the costs of DRBs. The analysis indicated that the DRB costs, both in actual cost and as percentages of the project budget and program portfolio, represent a small fraction of overall budgets (0.3 and 0.1%, respectively). Although DRB implementation is an additional cost to the projects, the benefits are likely to outweigh the increased spending. The average cost growth differential for DRB projects to nonDRB projects during 2000 and 2001 is approximately 4% in favor of DRB projects, and although the data are not conclusive to suggest that DRBs were the primary factor for the improved performance, the potential contributions of DRBs to cost savings are too substantial to ignore. Also, the potential costs of arbitration and litigation were not included in the analysis. Prorating the legal expenses of additional ADRs, and ultimately, the litigation, are likely to further increase the benefit cost ratio of DRB implementation.

DRBs are proactive approaches to construction disputes; considering the low levels of capitalization of firms and strict schedules, preventing costly escalations is imperative for successful project completion. Although DRBs are not the only dispute avoidance and settling mechanism, they are a viable alternative to effectively settle disputes without adversely affecting project performance.

Acknowledgments

The authors would like to acknowledge the support of FDOT in data acquisition process; however, the opinions expressed are those of authors and do not necessarily reflect the views of FDOT.

Endnotes

[1]Readers are suggested to refer to Harmon (2003b) for further detail regarding ADR methods used in the construction industry.

[2]FDOT DRB practices are highlighted on their website: http://www.dot.state.fl.us/construction/CONSTADM/drb/DRBMain.shtm.

[3]The brief history of FDOT DRB implementation was derived from a lecture given by Dr. Ralph Ellis and is available at http://www.dot.state.fl.us/structures/DesignConf2006/Presentations/Session6/Final-6Ellis.pdf.

[4]Arbitration data were compiled from the FDOT State Arbitration website.

[5]The statistical analysis and plots were compiled by using *R* statistical program.

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