A FURTHER EXAMINATION OF THE RELATIONSHIP BETWEEN CONTRACT ADMINISTRATION PROBLEMS AND CONTRACT TYPE

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ABSTRACT. In 2006 Davison and Sebastian guided by a conceptual model developed by Davison and Wright (Davison-Wright 2004), surveyed members of the National Institute of Government Purchasing (NIGP) and Institute of Supply Management   to determine if there was relationship between contract type and problems likely to occur. (Davison-Sebastian 2007). The results of the 2006 survey provided partial support for the for the perceived relationship of the occurrence of contract administration problems for the various contract types provided partial support for the conceptual model. Low response rate and the fact that the raw data collected were in reality ratings and not ranks were identified as a limitation. In 2010, using the 2006 survey instrument as a base, Davison and Sebastian surveyed members of Public Works and Government Services Canada (PWGSC) (2010) to replicate the previous study, to assess the general validity of the original findings and to expand the overall empirical base.   To address the previous limitation of using reality rankings instead of ranks, the survey instrument the question for likelihood of occurrence was posed as one of ordinal ratings instead of relative rankings. The study achieved the objective of creating a larger, cross-border pool of results. Based on the feedback from the PWGSC respondents, the 2010 survey was updated in an attempt to improve overall response rate. The survey was then sent to all of the members of the National Institute of Government Purchasing (NIGP) again in 2011. The results of the 2011 survey were compared to the results of the 2006 survey. The major findings were that the 2011 results were comparable to 2006 in the that when contract administration problems occurred, problematic consequences were more likely than no consequences for all contract types except leases and that the types of problematic consequences that were most likely depended on the type of contract and the response rate was significantly higher. The implications of the research results for procurement professionals and the limitations of the research will be discussed.

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INTRODUCTION

Background – Previous Research

Goals

The goal of the procurement of any good or service is successful contract completion. Successful contract completion is defined by the National Institute of Government Purchasing (NIGP) as successful procurement of the right item, in the right quantity, for the right price, at the right time, with the right quality, from the right source. (Thai, 2004).

Contract Administration has been described as "putting the teeth in project monitoring and control" (Reardon 2009b). The Government Accounting Office (GAO) has identified both project management and contract management as deficiencies in Department of Defense contracts (GAO, 2005). This has led to increased interest in developing tools, such as, the Contract Management Maturity Model (CIMM), to measure the contract management process capabilities of an agency and the similarities the project Management and contract management share with organizational critical success factors. (Rendo)

In their initial research Davison and Sebastian proposed that "advance knowledge of the likelihood of occurrence and the severity of consequences will allow procurement professionals to identify the likely contract administration problems for a specific contract type" (Davison and Sebastian, 2009b). From this, procurement professionals could proactively identify and prepare for known contract risks, work with suppliers throughout the contract to mitigate problems, and ultimately avoid the waste of valuable resources normally spent reacting to problems. They conclude that with this knowledge, and the ability to apply it appropriately, procurement professionals can demonstrate the "strategic value of procurement" through streamlining procurement (Davison and Sebastian, 2009b).

Risks in Procurement

While there are numerous items and services that can be purchased, each purchase of goods and services faces the same set of contractual risks that affect the successful accomplishment of any of the five "5 R's." Abi-Karam (2002) suggested that every purchase should be evaluated for six types of risks: Proposal risk, Surety and liability risks, Schedule risk, Contractual risk, Performance risk and Price risk.

Davison and Wright (2004) expanded on the definition of these risks to include their relationship to the "5 R's":

- *Proposal risk*: The legal document that defines the item or service procured (the right item), the mutual areas of agreement, and how risks will be allocated and rewarded.

- *Surety and liability risks*: Protection of the agency's financial and legal interests (the right price). The contract will define the insurance requirements, bonding requirements, and licensing that are necessary to protect the agency in the event of contract termination or to meet statutory requirements.

- Schedule risk: Ensuring timely delivery (the right time). The contract will contain clear and specific language describing the contract deliverables, delivery terms, and any penalties for late delivery.

- Contractual risk: Establishing change order procedures, dispute resolution process and termination procedures (the right price and time).The contract is a living document and allowances must be made to accommodate unforeseen conditions that may affect the purchase. The contract will specify who has the authority to make changes, how changes will be made, and what changes will be unilateral. The contract will specify how disputes will be resolved if mutual agreement cannot be reached. The contract will specify the termination process.

- Performance risk: Defining acceptance (the right quality). The contract will define the conditions under which acceptance will occur and what type of inspection will be required.

- *Price risk*: Defining payment terms (the right price). The contract will define how and when the Contractor will be paid.

Contract problems

Based on observation and communication with peers, Davison (2004) proposed that each of these 6 contractual risks is comprised of a set of contract problems that may occur each time the good or service is procured (Table 1). Each contract problem that occurs can threaten the success of the project by impacting any or all of the 5 "R's" in an adverse manner, such as, delivery of incorrect product, incorrect quantity, an increase in project costs, a delay in delivery, poor quality or the ultimate unsuccessful result, contract termination (Davison & Wright, 2004).

TABLE 1

Contract Administration Problems

Contract Problem	Examples
Wrong product	Purchase order or contract clearly identifies correct product, but vendor ships incorrect. No dispute involved
Delay	Purchase order has clearly stated completion date. Completion date delayed (any length of time) due to agency or vendor (with or without cause).
Change order	Change in the scope of work (additional work, money, time), after contract award. Can be requested by either party for any reason.
Personality conflict	Personality conflicts between agency project manager or staff and vendor project manager or employees. Disagreement between the parties that can not be easily resolved. May involve scope of work, materials supplied, payment schedules, or any other aspect of the contract.
Definition of acceptance	Completion of project is delayed due to non acceptance of final product. Example: difference in either party's definition of what was supposed to be delivered or provided
Poor performance	Contract clearly states a level of expected performance (this is not in dispute) and quality problems with vendor's performance of work occur.
Sub- Contractors	The vendor uses subcontractors not on his payroll to perform any or all of the work. Prior approval, for use of

	subcontractors, was received
Other sources	There are very few vendors that can perform the work.
Risk of failure	The project has a high risk of failure. i.e. new technology, new equipment, new vendor, Project never been done before. Tight timeline or budget
Cost	Project has a high cost.

Mapping of Goals, Risks and Contract Problems

The following table (Table 2) maps the relationship between procurement goals, risks and contract problems (Davison-Sebastian-PWGSC 2011) .

Table 2 – Mapping of Goals, Risks and Contract Problems

Goal Criteria	Risk	Contract Problem
Right Item and Right Quantity	Proposal Risk	Poor Performance; Risk of Failure; Final Acceptance
Right Price	Surety and liability risk; Contractual Risk; Price Risk	Cost; Change Order; Personality Conflict
Right Time	Schedule Risk; Contractual Risk	Wrong product; Delay; Change Order; Personality Conflict
Right Quality	Performance Risk	Final Acceptance; Poor Performance; Risk of Failure; Subcontractors
Right Source	Surety and liability risk	Cost; Subcontractors; Other Sources; Risk of Failure

Identifying Contract Types

Based on observation and communication with peers and after reviewing the set of contractual risk characteristics for the purchase of each good or service, Davison proposed that each purchase can be placed into one of seven contract types (Table 3) (Davison & Wright, 2004) and that each of these contract type shares a similar set of contractual risks and potential contract administration problems (Table 3). (Davison & Wright, 2004). This study empirically tested the validity of the conceptual framework offered in Table 4.

TABLE 3

Contract Types

Contract Type	Examples
Commodities, Small Purchases	MRO (maintenance, repair and operating supplies)
	Term contracts: i.e. office supplies, one-time orders for durable goods under $5000
Capital Outlay	Durable goods over $5000
Professional Services	Architects, consultants
Contracted Services	Custodial services, food service
Software	Custom developed and shrink-wrap
Construction	Any type and any dollar amount – New construction or remodeling
Leases	Leased space or equipment – lease without intent to own

Limitations of Previous Research

The authors identified the following limitations in their previous research: low overall response rate and raw data were in reality ratings and not ranks.

Based on feedback provided by the 2010 respondents, the low overall response rate may have been because completion of the survey turned out to be more time consuming and difficult than anticipated. For the 2011 NIGP research, the survey document was

redesigned using skip logic to reduce the number of questions presented to all respondents. All respondents were presented with three (3) demographic questions-- country, entity type, and position-- and then asked if they are involved in post-award activities, with the survey ending for those who were not. Additional skip logic was introduced for respondents who had not issued purchase orders or contracts for a particular category of goods and services (capital outlay, professional services, contracted services, software, leases, and construction), greatly reducing the number of applicable questions to answer. In addition, in recognition of the complexity of the survey and the time limitations of the target audience, respondents had the option to start, stop, and reopen the survey to finish at a later time.

Another limitation of the 2006 research was that the raw data collected were in reality ratings and not ranks. At the agency level there may be no means to collect data electronically on the contract administration problems encountered. The absence of these hard data may have contributed to the respondents' inability to rank order the frequency with which the ten types of problems occurred for each type of purchase. In addition, the survey respondents are probably more familiar with rating scales than ranking. Thus, though they did use intermediate values in their responses, they more frequently used the extreme values, 1 and 10, in particular as ratings of the perceived occurrence of the various problems. For the 2010 PWGSC and 2011 NIGP survey, the same definitions of the seven major contract purchase types and ten major contract management problems were used. Using the same definitions the 2010 and 2011 respondents were then asked to indicate the frequency with which these problems occur for each type of contract by using a rating scale.

METHOD

Subjects and Procedure

The subjects were the members of the National Institute of Governmental Purchasing, Inc. (NIGP) as extracted from the membership database on December 29, 2011 (N=14,723). Of

these, 233 records did not include email addresses and 648 had previously opted out of SurveyMonkey, resulting in 13,842 individual email addresses successfully uploaded to SurveyMonkey. An email with a link to the survey was sent through SurveyMonkey to each of these email addresses on January 5, 2012, and included the following preface:

> NIGP has partnered with Dr. Rich Sebastian, Professor Emeritus of Management, St. Cloud State University, MN and Mr. Bill Davison, CPPO, Director of Purchasing, Stearns County, MN to study the relationship between the type of items or services procured and the problems typically encountered during contract administration.

> The results may help procurement professionals anticipate the types of administration problems that are likely to occur for specific types of purchases. This information, in turn, will help procurement professionals develop plans to avoid the problems or minimize their potential negative consequences.

> The survey could take up to 20 minutes to complete, depending on how involved you are in Contract Administration. You have the option to start the survey and stop, and then reopen the survey to finish it at a later time. When answering the questions, use your experience and recollection or actual data if you have them.

> Please note that questions marked with "*" (an asterisk) require an answer to continue with the survey.

> Your responses will be tabulated by St. Cloud University support personnel and will be completely confidential and anonymous.

Of the 13,842 emails sent, 64 were undeliverable, and, upon receipt of the email invitation, another 56 people opted out of SurveyMonkey, leaving a total of 13,722 sent emails.

A reminder email was sent to all those who had not responded on January 11, 2012, announcing the closing date of January 13, 2012.

Survey Instrument

Both surveys asked a number of background questions, including, country in which the respondent worked, type of agency worked for, current position, total years in purchasing, years in current position, highest level of education, field of education, professional certifications currently held, year when most recent certification was obtained, approximate annual purchasing volume for the respondent's entire agency, approximate annual purchasing volume made by the respondent, respondent's level of purchasing authority, number of full time employees in respondent's agency, number of full time employees in respondent's purchasing unit, types of purchases respondent has current responsibility for, and the number of purchase orders or contracts issued by the respondent for the major contract categories investigated in the study—Commodities, Capital Outlay, Professional Services, Contracted Services, Software, Leases, Construction, and Other. The 2011 survey also asked if they were involved in post award activities such as monitoring performance, delay resolution, change orders, dispute resolution, final acceptance and monitoring performance and they were asked if their organization collected data on each of these post award activities.   If respondents indicated they were not involved in any of the listed post award activities, the survey was terminated at that point. A copy of the complete survey is in Appendix A.

The 2006 survey then provided definitions of the seven major contract purchase types and ten major contract management problems—Wrong Product, Delay, Final Acceptance, Change Order, Personality Conflict, Poor Performance, Sub Contractors, Cost, Other sources, and Risk of Failure. Using these definitions, respondents were then asked to rank order the frequency with which these problems occur for each type of contract. The exact instructions for this question follow:

> For purchases made within the past year, rank order the problems that apply in terms of how often they occur for each contract type with 1 being most frequent (as applicable) to 10 being least frequent (as applicable) or choose 99 for those that do not apply.   **Please use each of the ten ranks only once.**

The 2011 survey used the same definitions of the seven major contract purchase types and ten major contract management problems. The respondents were then asked select the frequency with which these problems occur for each type of contract by selecting from the following responses: Never, Rarely, Sometimes, Often, Most of the Time and Always.

Lastly, for both surveys the respondents were asked to indicate the typical consequences they experienced for each type of problem within each type of contract by selecting from the following responses: No Effect, Contract Delay < 10 days, Contract Delay >10 days, Increased Cost<10%, Increased Cost> 10%, Contract Termination.

Response Rate

The total number of respondents from 2011 was 1661 (of 13,722), for a response rate of 12.1% The total of the NIGP respondents from 2006 was 500 (of 10185) for a response rate of 5%

Comparison to 2006 response rate

The number of responses for the 2011 survey, 1661, is significantly higher than 2006, 500. Of the 3 variables, target population, method of delivery and survey instrument only the survey instrument was changed. It can be tentatively concluded that the changes in the survey tool, implemented as a result of the feedback from the PWGSC survey resulted in a greater number of responses.

FINDINGS

2011 Respondent Characteristics

The following categories were selected to provide an appreciation of the range of respondent characteristics.

Table 4 -   Demographic Data

Years in Purchasing	11+	62%	2 or less	3%
Years in Current Position	6+	46%	2 or less	20%
% With 4 year degree or more	Yes	63%	No	37%
Annual Individual Purchasing Volume	5 million	29%	20 million	23%
Annual Agency Purchasing Volume	100 million	40%		
Full time employees in Agency	1000	42%	400 or less	24%
Full time employees in Purchasing	5 or less	33%	10 or more	31%
Involved in some type of post award activity	Yes	92%		
Some type of Procurement Professional as title of position	Yes	95%		

Comparison to 2006 Respondent Characteristics

Because response categories as opposed to open ended responses were used in the 2011 survey it is impossible to make a direct comparison to the 2006 survey, but it can be said the 2011 respondent characteristics are similar to available NIGP demographics and suggest that the sample is representative of the population.

Reported occurrence of contract problems for each contract type

Initially, means were computed for the respondents' ratings of the indicated likelihood of occurrence of the contract problems for each of the contract types. These means were then rank ordered from most likely to least likely for each type of contract. The 2011 and 2006 results are reported in Table 6.

TABLE 5

Comparison of 2011 v. 2006 The Relationship between Perceived Occurrence of Contract Administration Problems and Contract Type, Table sorted by Contract Problem Rank

Year	Contract Type	1	2	3	4	5	6	7	8	9	10
2011	Supplies and Small Purchases	Change Order	Other Sources	Delay	Poor Perform	High Cost	Risk of Failure	Wrong Product	Defn of Accept	Conflict	Subcontract
2006	Supplies and Small Purchases	Delays	Cost	Poor Perform	Change Order	Wrong Product	Other Sources	Conflict	Defn of Accept	Risk of Failure /Termination	Subcontract
2011	Capital Outlay	Change Order	Other Sources	Delay	High Cost	Risk of Failure /Termiantion	Poor Perform	Defn of Accept	Wrong Product	Conflict	Subcontract
2006	Capital Outlay	Delays	Cost	Change Order	Poor Perform	Other Sources	Conflict	Subcontract	Defn of Accept	Risk of Failure /Termination	Wrong Product
2011	Professional Services	Change Order	Other Sources	Delay	High Cost	Poor Perform	Risk of Failure	Defn of Accept	Conflict	Wrong Product	Subcontract
20	Professi	Change	Delay	Cost	Conflict	Defn of Accept	Poor	Subcontract	Other Source	Risk of Failure	Wrong

0 6	onal Services	Order	s				Pe rfo rm		s	/Termi nation	Pro duct
2 0 1 1	Contract ed Serv ices	Chang e Order	Po or Pe rfo rm	Delay	Oth er Sou rces	Defn of Accept	Wr on g Pr od uc t	Conflic t	High Cost	Risk of Failure /Termi nation	Sub cont ract
2 0 0 6	Contract ed Serv ices	Risk of Failure /Termi nation	De fn of Ac ce pt	Chang e Order	Oth er Sou rces	Conflic t	Co st	Subco ntract	Cost	Poor Perfor m	Del ays
2 0 1 1	Soft war e	Other Source s	Ch an ge Or de r	Risk of Failure /Termi nation	Hig h Cost	Delay	Po or Pe rfo rm	Defn of Accept	Conflic t	Subco ntract	Wro ng Pro duct
2 0 0 6	Soft war e	Cost	Ot he r So ur ce s	Delays	Def n of Acc ept	Chang e Order	Po or Pe rfo rm	Conflic t	Risk of Failure /Termi nation	Wrong Produc t	Sub cont ract
2 0 1 1	Lea ses	Other Source s	Ch an ge Or de r	Poor Perfor m	Hig h Cost	Delay	Ri sk of Fa ilu re	Conflic t	Defn of Accept	Wrong Produc t	Sub cont ract
2 0 0 6	Lea ses	Cost	Ot he r So ur ce s	Delays	Poo r Perf orm	Defn of Accept	Ch an ge Or de r	Conflic t	Risk of Failure /Termi nation	Subco ntract	Wro ng Pro duct
2 0 1 1	Con stru ctio n	Chang e Order	De lay s	Defn of Accept	Poo r Perf orm	High Cost	Co nfl ict	Risk of Failure /Termi nation	Subco ntract	Wrong Produc t	Oth er Sou rces

2006	Construction	Change Order	Delays	Cost	Subcontract	Conflict	Defn of Accept	Poor Perform	Risk of Failure /Termination	Wrong Product	Other Sources

Reported occurrence of contract problems over all types of contracts

To determine which types of contract problems were reported to be most common across all types of contracts column means were computed for each type of problem. The overall mean for each type of problem was determined by computing the weighted mean of the seven contract type means.

Change orders were the most common contract administration problem while wrong product was the least common. The means for the contract problems in rank order are displayed in Table 7.

TABLE 6

Perceived occurrence of contract administration problems over all types of contracts

2011 Survey

Contract administration problem	2011 Mean
Change Order	2.69
Other Sources	2.39
Delays	2.36
Poor Performance	2.23
Cost	2.17
Risk of Failure	2.11
Definition of Acceptance	2.10
Conflict	1.98
Subcontractors	1.76
Wrong Product	1.47

Reported occurrence of contract problems over all types of problems

To determine which type of contract had the greatest reported occurrence of problems, row means were computed for each type of contract. That is, the overall mean for each type of contract was determined by computing the weighted mean of the ten contract problem means. Overall, Supplies and Small purchase contracts were reported as most likely to have contract problems whereas Software were reported as least likely to have contract problems. The means for the seven types of contracts are displayed in Table 8 ordered from most problematic to least.

TABLE 7

Perceived occurrence of contract administration problems by type of contract

Contract type	2011 Mean
Supplies, Small Purchases	2.34
Construction	2.28
Capital Outlay	2.18
Professional Services	2.15
Contracted Services	2.11
Leases	1.71
Software	1.64

Comparison of 2011 and 2006 Reported Occurrence of Contract problems over All Types of Contracts

Rankings from 2011 and 2006 on which problems are experienced most frequently show 3 of the top 4 problems were the same. In 2011, Other Sources identified as the 2nd most common problem whereas in 2006 it is the 7th most common problem. The respective ranking of contract problems is illustrated in Table 8. The correlation between the 2011 and 2006 ranks is .64 which is a strong correlation. A strong correlation means that the two sets of ranks are quite similar.

Table 8

Comparison of 2011 and 2006 Reported Occurrence of Contract Problems Over All Types of Contracts

2011		2006	
Contract problem	**Rank**	**Contract problem**	**Rank**
Change Order	1	Change Order	3
Other Sources	2	Other Sources	7
Delays	3	Delays	1
Poor Performance	4	Poor Performance	4
Cost	5	Cost	2
Risk of failure	6	Risk of Failure	9
Definition of Acceptance	7	Definition of Acceptance	5
Conflict	8	Conflict	6
Subcontractors	9	Subcontractors	8
Wrong Product	10	Wrong Product	10

Comparison of 2011 and 2006 Reported occurrence of contract problems by type of contract

Rankings from the 2011 and 2006 surveys of which type of contracts experienced problems most often show very different results. The results are summarized in Table 9. The significant findings are that 2011 respondents reported more problems in Supplies and Small

Purchases contracts and fewer problems in Contracted Services contracts than the 2006 respondents. The correlation between the 2011 and 2006 ranks is .11 which is a very weak positive correlation, suggesting that the ranks are minimally associated.

Table 9

Comparison of 2011 and 2006 Reported Occurrence of Contract Problems by Contract Type

2011		2006	
Contract Type	Rank	Contract Type	Rank
Supplies, Small Purchases	1	Supplies, Small Purchases	6
Construction	2	Construction	1
Capital Outlay	3	Capital Outlay	5
Professional Services	4	Professional Services	3
Contracted Services	5	Contracted Services	2
Software	7	Software	4
Leases	6	Leases	7

Consequences of problems for contract types

These results reflect the respondents' reported consequences of problems by contract type. Table 10 summarizes the frequency and the computed percentage of six consequences for each contract type: no effect; delays of less than 10 days; delays of more than 10 days; cost increase of less than 10%; and cost increase of more than 10%. The percentage for each type of consequence is based on the total frequency of consequences for each type of contract, found in the final column labeled Row Frequency Total. With the exception of professional services and contracted services the results can be summarized by observing that when contract problems occurred, the respondents reported that for most contract types no consequences were more likely than problematic consequences. In the 2011 survey problematic consequences were most likely for construction contracts, occurring 74.70% of the time, and – least likely for lease contracts, occurring 41.10% of the time.

Comparison of Summary of Problematic Consequences in 2011 and 2006

Both surveys show a majority of the contracts experience a greater percentage of problematic consequences than no consequence. In 2011 respondents reported fewer problematic consequences for Contracted Services and Software.

Table 10 - Comparison of summary of Problematic Consequences in Canada and United States

Contract Type	2011 Problematic Consequences	Rank	2006 Problematic Consequences	Rank	2011 No Consequence	2006 No Consequence
Construction	74.70%	1	68.90%	1	25.30%	31.10%
Supplies and Small Purchases	66.00%	2	62.90%	4	34.00%	37.10%
Capital Outlay	64.20%	3	59.20%	6	35.80%	40.80%
Professional Services	64.00%	4	64.20%	3	36.00%	35.80%
Contracted Services	58.10%	5	64.40%	2	41.90%	35.60%
Software	48.20%	6	60.30%	5	41.80%	39.70%
Lease	41.10%	7	45.50%	7	58.90%	54.50%

SUMMARY, CONCLUSIONS AND IMPLICATIONS

The major findings were that the 2011 response rate was significantly higher than 2006, the overall results for problematic consequences were comparable to 2006 , in the that when contract administration problems occurred, problematic consequences were more likely than no consequences for all contract types except leases, and that the types of problematic consequences that were most likely depended on the type of contract. The overall results of 2011 and 2006 reported occurrence of contract problems by type of contract had a low correlation. In 2011 Other Sources was listed as the 2nd most frequently occurring problem while in 2006 Other Sources was the

7th most frequently occurring problem (Table 8) . This could be attributed to the decline in economic conditions possibly resulting in fewer suppliers available for each type of contract. In 2011 Supplies and Small Purchases was listed as the contract having the most problems (Table 9)and in 2006 Supplies and Small Purchase was the 6th most problematic contract. Historically, Supplies and Small purchase contracts typically had numerous providers. However, the same economic decline may have led to fewer available vendors, thereby increasing the potential for opportunism and more problems with the remaining vendors.

MANAGERIAL IMPLICATIONS

This new information supports the 2006 premise that information is available to procurement professionals that allows them to utilize a traditional risk management process to develop a risk mitigation plan; First identify which problems are likely to occur, determine how serious the consequence is if the problem does occur and then determine an overall risk factor for each problem. The procurement professional can then develop proactive risk mitigation plans that are based on eliminating or reducing each of the previously identified risks, or problems that have been identified as high combined risk. The contracting officer can perform a risk analysis to identify causal risk factors, such as poor specifications, project manager, time frame, etc, and then utilize the proactive contract administration planning tools, that were discussed earlier in this paper, to avoid or minimize the consequences of any contract administration problems instead of wasting valuable resources reacting to problems. The procurement process, especially the pre award activities, can be viewed as a critical component of any risk mitigation plan. With knowledge of the existing procurement process and information on potential problems, the procurement official can develop a risk mitigation plan by selecting the best option at each stage of the procurement process to achieve the overall goal of successful project completion--receiving the correct product at the correct time at the correct price without delays or cost overruns. This will allow procurement officials to

demonstrate they are providing value (contract and project management) to the project beyond traditional bid and award function and are contributing to project savings by avoiding future costs (fewer delays and cost overruns), thereby demonstrating the strategic value of procurement.

Practical Uses of Data

Table 11 lists the data collected on the consequences of the most frequently reported problem (change order) on each type of contract. From the table the reader can ascertain that for Construction contracts, if a change order occurs, it will have a consequence 94.3% of the time and would result in increased costs 57.7% of the time and in contract delays 45.4% of the time. These could be very useful data when developing a risk mitigation plan. The procurement department could identify the potential root causes for change orders (incomplete specifications, unknown site conditions, changing market, managerial oversight) and reduce or eliminate them by developing better specifications and vendor qualification requirements.

Table 11 - Consequences of Change Order (Highest Reported Occurring Problem) by Contract Type

	No effect		Contract Delay < 10 days		Contract Delay > 10 days		Increased Cost < 10%		Increased Cost > 10%		Termination		Row Freq. Total
Type of Contract	%	#	%	#	%	#	%	#	%	#	%	#	#
Supplies and Small Purchases	14.9%	265	17.1%	305	22.1%	393	24.0%	428	19.8%	353	2.1%	37	1781
Capital Outlay	17.6%	211	17.5%	210	21.9%	263	22.0%	264	18.7%	224	2.3%	27	1199
Professional Services	14.2%	168	15.9%	188	23.8%	282	22.5%	267	22.4%	266	1.3%	15	1186
Contracted Services	21.8%	166	18,1%	138	17.2%	131	24.1%	184	15.7%	120	3.1%	24	763

Software	25.6 %	17	15.5 %	108	20.8 %	145	19.1 %	133	16.4 %	114	2.6%	18	696
Lease	38.7 %	145	15.2 %	57	14.7 %	55	19.2 %	72	10.9 %	41	1.3%	5	375
Construction	5.7%	51	19.7 %	177	25.7 %	231	24.8 %	223	22.9 %	206	1.1%	10	898

FUTURE RESEARCH

The data collected on frequency of contract problem occurrence and severity of consequences could be used as a benchmark against which to measure progress in procurement and vendor performance. For example, it would be possible to use the data for developing tools for Vendor Performance Measurement by using typical contract administration problems and consequences as baselines and monitoring vendor performance to see if problems occur or don't, If Construction contracts experience contract delays 45.4% of the time, a performance incentive could be provided if a vendor exceeds that performance. The same would be true for measuring the Procurement department's performance in a specific contract that meets or exceeds the baseline. The Procurement department could also use the data to develop risk mitigation plans for specific contracts and problems that are most problematic. The data could be used to establish validity of using existing contract management tools identified in private sector for managing contracts to the public sector, such as, incorporating the use of Critical Success Factors (CSF) and Integrated Risk Management into contract management. Future research could examine the effects of experience, certifications, education, size of purchasing unit, etc. on the types of problems experienced and types of contracts that are problematic.