ENTERPRISE RISK MANAGEMENT IN GOVERNMENT-AFFILIATED ORGANIZATIONS

By

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Enterprise Risk Management in Government-Affiliated Organizations

Abstract

The development of enterprise risk management (ERM) has led organizations to adopt an integrated approach to risk management that aims to recognize risks as both opportunities and threats and focus on optimizing their risk. This paper compares ERM implementation in firms that are government-affiliated and those that are not, finding that publicly affiliated organizations on average are less prepared to appropriately manage risk and seize opportunities related to their objectives. This study also finds that there are significant differences in ERM implementation between industries, firms that face competition are associated with higher risk maturity whether government-affiliated or not, and government entities on average have lower risk maturity.

Keywords

enterprise risk management, government-affiliated, publicly affiliated firms, risk, competition

INTRODUCTION

All organizations, whether private, public, or governmental, face some levels of risk. Environmental changes occur frequently, and organizations are often exposed to both new opportunities and threats. Companies, for example, are currently coping with rapid changes in technology and market trends, increasingly compressed product life cycles, and greater production complexities.[1] Risks can be very difficult to quantify, but enterprise-wide risk management (ERM) frameworks have been developed to measure, control, and manage the unavoidable risks that come from these environmental changes.

Although ERM was formulated in the mid-1990s, the use of ERM practices gained favor following the tragic attacks on September 11, 2001 in New York and the 2008 economic crisis.[2] Historically, risk was looked at mainly in relation to safety and insurance, but over time this transactional approach has given way to a strategic approach through ERM.[3] Risks were viewed as threats, and traditional practices focused on avoiding unfavorable events and managing risk separately within silos.[4] As ERM has developed, organizations are now adopting an integrated approach to risk management that aims to recognize risks as both opportunities and threats, embed risk concerns in their operations, and focus on optimizing their risk.[5] Under ERM, risk is no longer a separate function managed within silos, but rather managed holistically at the highest

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[1] Choi, Y., Ye, X., Zhao, L., & Luo, A. C. (2015, February 10). Optimizing enterprise risk management: a literature review and critical analysis of the work of Wu and Olson. Retrieved from https://link.springer.com/article/10.1007/s10479-015-1789-5.

[2] Wu, D. D., & Olson, D. L. (2010c). Introduction to special section on "Risk and technology". *Technological Forecasting and Social Change*, *77*(6), 837–839.

[3] Choi, Y., Ye, X., Zhao, L., & Luo, A. C. (2015, February 10). Optimizing enterprise risk management: a literature review and critical analysis of the work of Wu and Olson. Retrieved from https://link.springer.com/article/10.1007/s10479-015-1789-5.

[4] Hardy, K. (2010). Managing Risk in Government: An Introduction to Enterprise Risk Management. Retrieved from https://enterrasolutions.com/media/docs/2013/09/RiskinGovernment.pdf.

[5] Gatzert, N., Martin, M. (2015). Determinants and Value of Enterprise Risk Management: Empirical Evidence from the Literature. Risk Management and Insurance Review, Vol. 18 (1), pp. 29-53.

levels of authority with top-down planning and control.[6] ERM practice takes into account operational, financial, strategic, and reputational risks.[7] Wu et al. show that these different types of risks are cyclically interrelated, proving that the origin of these enterprise risks could be external, internal, or procedural. The impacts of these risks are also interdependent.[8]

This paper will aim to answer two related questions through empirical analysis of how government-affiliated firms structure their ERM. This paper will use the terms government-affiliated firms and publicly affiliated firms interchangeably. Firstly, is there a significant difference in the adoption and success of ERM practices between publicly affiliated firms and non-publicly affiliated firms? Secondly, within the category of government-affiliated organizations, how does the adoption of ERM practices vary with environmental factors?

This study will have three important contributions. Although previous studies have examined how shareholder pressure and institutional ownership is associated with the degree of ERM implementation, there is a gap in the literature regarding empirical research on ERM practices in general given that access to accurate and large-scale data is limited.[9] The first contribution of this study will be to address this gap with a sample of 1,202 non-publicly affiliated firms and 163 government-affiliated firms. Additionally, previous large-sample cross-sectional studies on ERM have focused on the adoption of a certain ERM framework rather than under what conditions the framework was implemented. Based on survey responses, this study

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[6] Hardy, K. (2010). Managing Risk in Government: An Introduction to Enterprise Risk Management. Retrieved from https://enterrasolutions.com/media/docs/2013/09/RiskinGovernment.pdf.

[7] Hardy, K. (2010). Managing Risk in Government: An Introduction to Enterprise Risk Management. Retrieved from https://enterrasolutions.com/media/docs/2013/09/RiskinGovernment.pdf.

[8] Wu, D. D., & Olson, D. L. (2010c). Introduction to special section on "Risk and technology". *Technological Forecasting and Social Change*, 77(6), 837–839.

[9] Choi, Y., Ye, X., Zhao, L., & Luo, A. C. (2015, February 10). Optimizing enterprise risk management: a literature review and critical analysis of the work of Wu and Olson. Retrieved from https://link.springer.com/article/10.1007/s10479-015-1789-5.

will delve into the organizational and environmental contexts that determine the successful implementation of ERM processes by those who coordinate the risk management processes in their organizations.

The second will be to provide analysis on ERM specificities in different sectors based on their industry. Limited ERM research has been conducted that compares firms within each sector, and this study will provide an additional level of analysis of firms within specific industries, including Oil and Gas, Education, Aviation, and Pharmaceuticals.

The third contribution will be to provide analysis on ERM specificities and implementation in firms of different ownership. By comparing government-affiliated firms with those that are not, this paper will show the impact of different incentives and management structure on risk management. The analysis will also uniquely contribute to research on ERM by examining ERM practices within government-affiliated organizations, focusing on how funding sources and competitive pressures can affect risk management.

LITERATURE REVIEW

Several frameworks have been developed that provide principles, a structure, and a

process for risk management. The International Organization for Standardization (ISO) and the

Committee of Sponsoring Organizations of the Treadway Commission (COSO) have put forth

two of the most widely used frameworks that align an organization's strategy and objectives with

its ERM and establish accountability and incentives for risk management.[10] COSO in particular

emphasizes that ERM encompasses "aligning risk appetite and strategy, enhancing risk response

decisions, reducing operational surprises and losses, identifying and managing multiple and

cross-enterprise risks, seizing opportunities, and improving deployment of capital."[11]

Applying the concepts from the frameworks is said to put the firm in a position to

identify, manage, and respond to all types of risk, given that the processes are integrated across

functions and decision contexts. The U.S. Government and Accountability Office (GAO) also

released an ERM framework in 2016 tailored specifically for implementing ERM in federal

agencies, though it relies on the same basic principles as the other two frameworks.[12] The annual

Federal ERM Survey has reported for the past four consecutive years, however, that there is

limited capability maturity in several areas of Federal ERM due to persisting structural and

cultural barriers.[13]

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[10] International Standards Organisation (2009) *Risk management — principles and guidelines. ISO 31000:2009.* Geneva: International Standards Organisation.

[11] COSO. (2004). *Enterprise risk management – Integrated framework*. New York: Committee of Sponsoring Organizations of the Treadway Commission.

[12] U.S. GAO. (2016, December 1). Enterprise Risk Management: Selected Agencies' Experiences Illustrate Good Practices in Managing Risk. Retrieved from https://www.gao.gov/products/GAO-17-63.

[13] Association for Federal Enterprise Risk Management, & Guidehouse. (2018). Federal Enterprise Risk Management 2018 Survey Results. Retrieved from https://1uddzv3jilfm3ce6g3u2j7b1-wpengine.netdna-ssl.com/wp-content/uploads/2018/10/GH-073d_WP-ERM-Survey-Report-2018.pdf.

The current literature on ERM mainly falls into one of three categories: examining the factors that influence ERM adoption, the effects of ERM adoption on firm performance, or ERM practices in specific organizational settings. Beasley et al. (2005) found that ERM is more likely to be implemented when there is a Chief Risk Officer (CRO), the CEO and CFO are in support of adoption, and the board is independent. Based on data from 123 firms, they also found a positive correlation between ERM implementation and firm size and firms in education, banking, and insurance.[14] Gordon et al. (2009) analyzed data from the U.S. Securities and Exchange Commission on 112 firms and concluded that firm performance when using ERM is dependent on whether the firm chose a suitable ERM based on firm size and complexity, environmental uncertainty, industry competition, and monitoring from the board of directors.[15] Paape and Speklè (2012) conducted a study using data from 825 companies from the Netherlands, both public and private sector, and shows empirical evidence that the extent to which a certain company implements ERM is influenced by internal factors, ownership structure, the regulatory environment, and firm and industry characteristics.[16]

Pagach and Warr (2011) used the existence of a CRO in an organization as a proxy for ERM implementation, and from a sample of 138 firms found that large companies with volatile cash flows and risky stock returns are more likely to have adopted ERM practices.[17] Liebenberg and Hoyt (2003) find that shareholder pressure is a primary motivator for ERM adoption, but that if ownership is dispersed then executives may find it easier to neglect shareholder preferences

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[14] Beasley, M. S., Clune, R., & Hermanson, D. R. (2005). Enterprise risk management: An empirical analysis of factors associated with the extent of implementation. *Journal of Accounting and Public Policy*, *24*(6), 521–531.
[15] Gordon, L. A., Loeb, M. P., & Tseng, C. Y. (2009). Enterprise risk management and firm performance: A contingency perspective. *Journal of Accounting and Public Policy*, *28*(4), 301–327.
[16] Paape, L., & Speklè, R. F. (2012). The adoption and design of enterprise risk management practices: An empirical study. *European Accounting Review*, *21*(3), 533–564.
[17] Pagach, D., & Warr, R. (2011). The characteristics of firms that hire chief risk officers. *Journal of Risk and Insurance*, *78*(1), 185–211.

while pressure from institutional investors is more likely to be considered.[18] Farrell and

Gallagher (2015) conclude that the valuation premium in relation to ERM is driven mainly by

the risk culture as well as the degree of integration of ERM practices within the organization. It

is also driven by the degree to which the board considers ERM an essential element in strategy

development and planning.[19] Ittner and Keusch (2016) analyze the influence of risk management

value creation objectives on the incorporation of risk considerations in planning and control

systems. They find that organizations that focus mainly on minimizing budget risks or lowering

total cost of risks tend to use ERM less effectively and achieve lower firm value than

organizations that holistically consider both the opportunities and threats present in risk.[20] Ittner

and Michels (2017) use detailed survey results and publicly available earnings forecasts from

publicly-traded companies to provide empirical support for the conclusion that overall more

sophisticated risk-based forecasting and planning is associated with more accurate management

earnings forecasts.[21]

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[18] Liebenberg, A. P., & Hoyt, R. E. (2003, June 10). The Determinants of Enterprise Risk Management: Evidence From the Appointment of Chief Risk Officers. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/1098-1616.00019.

[19] Farrell, M., & Gallagher, R. (2014, March 10). The Valuation Implications of Enterprise Risk Management Maturity. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/jori.12035.

[20] Ittner, C., & Keusch, T. (2016). Incorporating risk considerations into planning and control systems: The influence of risk management value creation objectives. In P. Linsley & M. Woods (Eds.), *The Routledge Companion to Accounting and Risk*. London: Routledge forthcoming.

[21] Ittner, C.D. & Michels, J. Rev Account Stud (2017) 22: 1005. https://doi.org/10.1007/s11142-017-9396-0

DATA AND METHODS

Sample Selection

The sample is drawn from respondents to Aon's Risk Maturity Index (RMI) survey. Aon is a leading global professional services firm that provides a wide range of insurance brokerage, risk management, and human resource services. Aon designed the Risk Maturity Index so that organizations could self-evaluate and gauge the effectiveness of their enterprise risk management compared to a benchmark. Aon, working with scholars and industry risk experts, developed the RMI survey, which was then pre-tested with risk management executives to ensure that respondents could clearly understand the questions and response anchors as well as confirm the questions could be answered accurately. The RMI survey also encompasses the principal components of the Committee of Sponsoring Organizations of the Treadway Commission's enterprise risk management framework.

The RMI survey is targeted towards C-suite executives and those in high-level risk management positions who are actively involved in the risk management practices of their organizations. Participants are recruited through contacts with Aon clients or at industry and professional events. To preserve data integrity and ensure the questions can be answered accurately, potential survey respondents must first contact Aon to verify that they possess the necessary knowledge of the organization's risk management activities. Provided the participant is eligible and has the requisite knowledge, Aon sends an invitation e-mail with a unique password that grants access to the online survey and acts as the organization's identifier. The respondent is able to collect additional information when necessary to answer a question as the

survey does not need to be completed in one sitting, and all respondents are informed that survey responses will be used by Aon and for academic research purposes.[22]

The analyses of this paper will focus on 163 publicly affiliated organizations and 1,202 non-publicly affiliated organizations that completed the survey between 2011, when the survey was launched, and 2017. Respondents enter the sample during the fiscal year they complete the survey and completes the survey only once. Therefore, the analyses of this paper assume the sophistication of an organization's enterprise risk management processes, relative to other organizations in the sample, remains reasonably constant after the survey is completed.

Variable Definitions

Aon provided the Risk Maturity Index survey participants' identities on a confidential basis. In the following sections, the variables that were constructed from survey responses are defined and the methods of analysis are described.

Variable	Definition
Risk Maturity Score (RMS)	Score of 0-200 assigned to each organization independently by Aon based on completed survey responses. A higher RMS indicates more mature ERM practices.
Publicly Affiliated (PA)	Indicator for whether an organization is government-affiliated or not
Industry	Categorical variable to describe the industry an organization belongs to

[22] Ittner, C.D. & Michels, J. Rev Account Stud (2017) 22: 1005. https://doi.org/10.1007/s11142-017-9396-0

Publicly Affiliated Risk Maturity Score (PA RMS)	Risk Maturity Scores for only those organizations that are categorized as publicly affiliated
Publicly Affiliated Industry (PA Industry)	Categorical variable to describe the industry for only those organizations that are categorized as publicly affiliated
Competition	Indicator for whether a publicly affiliated firm faces competition or not. Firms that are wholly owned by the government and face no competition in the market or for funding are marked as 0.
Government Entity (Gov_Ent)	Indicator for whether the firm is a pure government entity or not. Entities such as a city, council, or port authority that receives appropriations or tax revenue are marked as 1.

Methods

Descriptive statistics will be produced for Risk Maturity Scores (RMS) overall, within the category of publicly affiliated (PA), and across each industry. A t-test will be conducted to determine if there is a statistically significant difference between the RMS means of publicly affiliated and non-publicly affiliated organizations. Analysis of Variance tests, followed by Tukey's HSD to control the familywise error rate, will be conducted to determine whether there are significant differences in RMS means between industries and which pairs are significant.

This will be done for the sample overall, as well as for only publicly affiliated firms categorized by industry. If there is a significant difference in RMS means by industry, t-tests will be conducted within each industry to determine whether the RMS means of publicly affiliated and non-publicly affiliated organizations in that given industry are significantly different.

Publicly affiliated organizations will be coded for Competition with a 1 to indicate that it faces competition and a 0 to indicate that it does not. Similarly, they will be coded for Government Entity with a 1 to indicate that it is a government entity and a 0 to indicate that it is not. T-tests will be conducted to determine whether these two variables can explain any of the variation in RMS within the publicly affiliated category.

RESULTS

This paper analyzes whether the Risk Maturity Scores (RMS) of publicly affiliated (PA) organizations are significantly different from other organizations. This analysis is followed by a discussion of what factors explain the variance in RMS within the category of publicly affiliated organizations. The results center around the three factors of industry, the presence of competition, and the classification of the publicly affiliated organization as a government entity.

RMS in Publicly Affiliated Organizations Compared to Others

Organizations that are not publicly affiliated have a mean RMS of 99.9 while publicly affiliated organizations have a mean RMS of 92.7. This difference in means of Risk Maturity Score between organizations that are publicly affiliated and those that are not is statistically significant at the 5% alpha level. As Figure 1 shows, publicly affiliated organizations on average have lower RMS. This leads to the question of why this difference in RMS is significant, which can in part be answered by analyzing the factors that explain the variance in RMS within the publicly affiliated category.
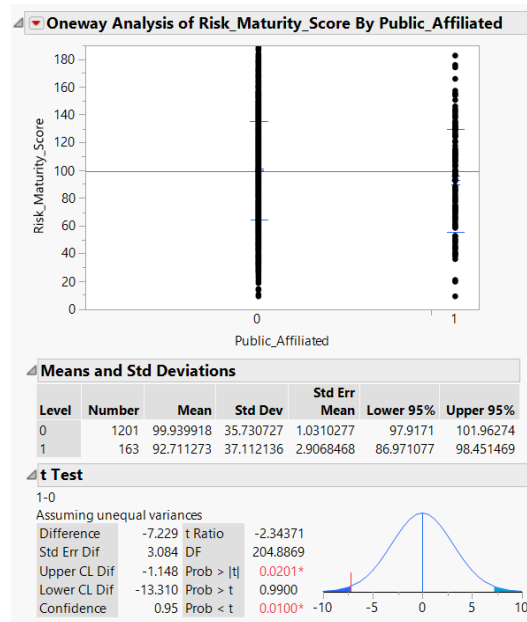

Figure 1*: Analysis of RMS by Publicly Affiliated.*

Explaining the Variance within Publicly Affiliated RMS

Industry

Each organization that filled out the survey self-identified their industry, and the mean

Risk Maturity Scores and their standard deviations for each industry overall are shown below in

Figure 2. Conglomerates, Insurance, Oil and Gas, Retail, and Utilities have the highest mean

RMS. Education, Government, Media/Entertainment, Public Entities, and particularly Non-

Profits have the lowest mean RMS.

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Agribusiness	38	94.871711	29.891022	4.848964	85.046776	104.69664
Aviation	18	99.853472	30.293145	7.1401627	84.789046	114.9179
Chemical	32	93.696429	27.450127	4.8525427	83.799602	103.59325
Conglomerate	12	119.92361	29.230632	8.4381567	101.35135	138.49587
Construction	60	95.355556	39.094481	5.0470758	85.25638	105.45473
Consumer Goods	20	98.198214	34.748791	7.7700658	81.93528	114.46115
Education	98	89.59375	34.342403	3.4691066	82.708534	96.478966
Financial Services (Banking, Investments)	87	99.987428	38.042317	4.0785645	91.87951	108.09535
Food Processing & Distribution	48	102.97396	38.326718	5.5319853	91.845039	114.10288
Government	33	79.475379	33.213612	5.7817477	67.698344	91.252414
Healthcare	80	100.35312	34.312219	3.8362227	92.717311	107.98893
Hospitality	19	91.296053	35.519586	8.1487519	74.17616	108.41595
Insurance	61	113.49111	35.51301	4.5469749	104.39581	122.58642
Manufacturing	189	101.63591	34.212273	2.4885767	96.726791	106.54504
Media / Entertainment	25	88.9075	29.023434	5.8046869	76.927215	100.88778
Mining	28	91.22619	27.308036	5.1607337	80.63724	101.81514
Non-Profit (Other)	28	71.616071	36.094429	6.8212059	57.620113	85.61203
Oil & Gas	73	106.71121	36.483814	4.2701074	98.198903	115.22351
Other	17	110.32353	42.166223	10.226811	88.643658	132.0034
Pharmaceutical / Biotechnology	35	93.840357	34.628687	5.8533164	81.944987	105.73573
Professional Services	50	104.00042	35.4217	5.0093849	93.933681	114.06715
Public Entity	2	64.5	35.001786	24.75	-249.9786	378.97857
Real Estate	30	112.25486	34.045144	6.2157644	99.542195	124.96753
Retail	55	104.30977	37.841697	5.1025734	94.079731	114.53982
Technology	47	101.10106	34.909458	5.0920678	90.851263	111.35086
Telecommunication	28	94.272321	39.867954	7.5343351	78.813143	109.7315
Transportation / Logistics	54	91.742494	40.444159	5.5037529	80.703364	102.78162
Utilities	69	108.24091	35.880504	4.3195051	99.621469	116.86035
Wholesale Trade	15	99.061111	35.027363	9.0440262	79.663604	118.45862

Figure 2: Means and Standard Deviations of RMS by Industry

This paper first analyzes whether there is a significant difference between the mean RMS across industries. The Analysis of Variance test conducted in Figure 3 shows that there are statistically significant differences between industry RMS means (p<0.0001). The graphic shows box plots in red, standard deviations from the means of each industry in blue, and the 95% confidence intervals of the mean in green.

Oneway Analysis of Risk_Maturity_Score By Industry

▷ **Quantiles**

▲ **Oneway Anova**

▲ **Summary of Fit**

Rsquare	0.055835
Adj Rsquare	0.035837
Root Mean Square Error	35.36916
Mean of Response	99.13436
Observations (or Sum Wgts)	1351

▲ **Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Industry	28	97799.7	3492.85	2.7921	<.0001*
Error	1322	1653792.7	1250.98		
C. Total	1350	1751592.4			

***Figure 3:** Oneway ANOVA of RMS by Industry (significant with p<0.0001)*

Tukey's Method was then used to determine which industries displayed significant differences in means. Keeping the family-wise error rate at 0.05, Figure 4 shows that the significant differences were between industries with the largest mean RMS and organizations that identified as either a Non-Profit or Government organization.
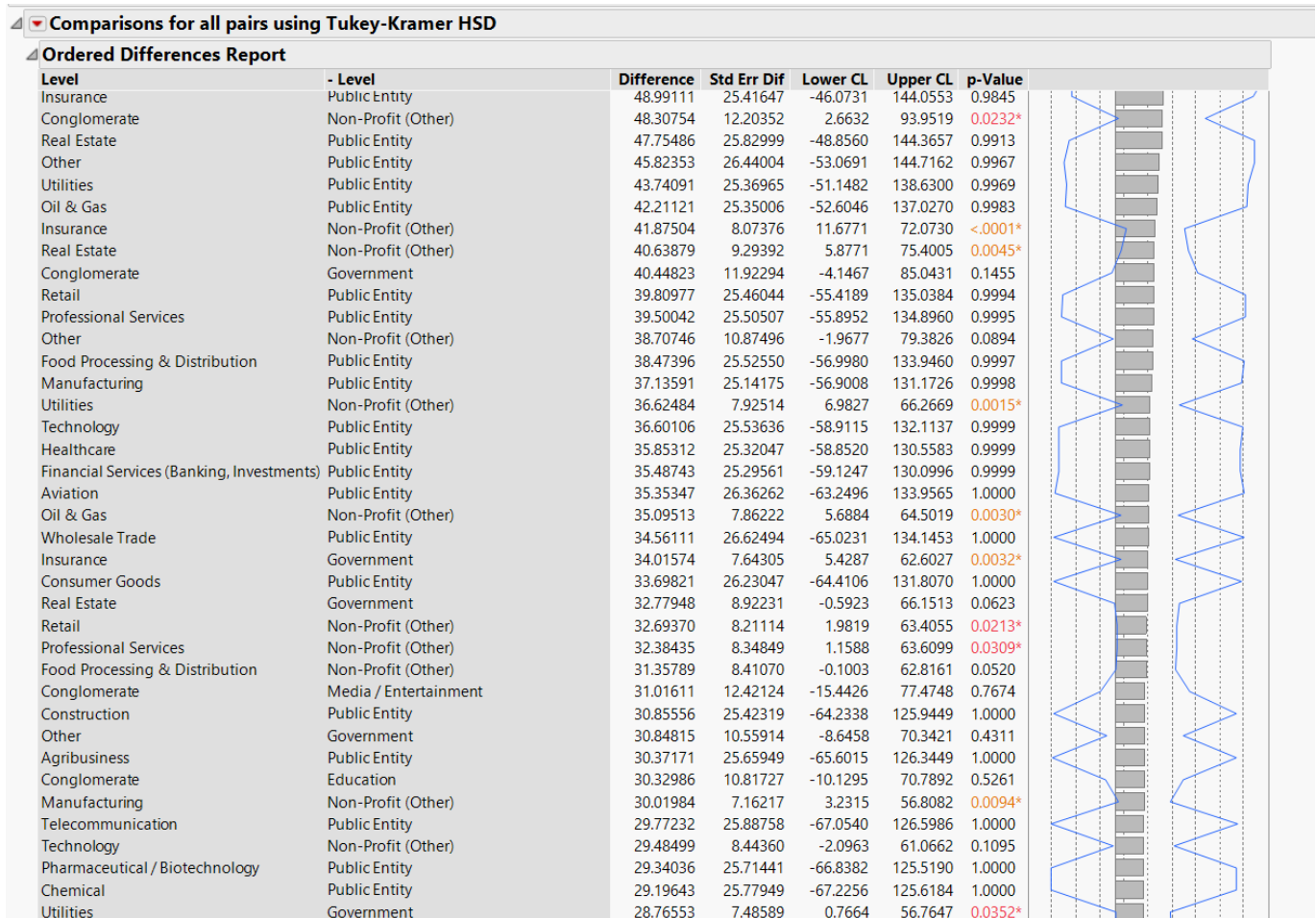
▲ ▼ Comparisons for all pairs using Tukey-Kramer HSD
▲ Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
Insurance	Public Entity	48.99111	25.41647	-46.0731	144.0553	0.9845
Conglomerate	Non-Profit (Other)	48.30754	12.20352	2.6632	93.9519	0.0232*
Real Estate	Public Entity	47.75486	25.82999	-48.8560	144.3657	0.9913
Other	Public Entity	45.82353	26.44004	-53.0691	144.7162	0.9967
Utilities	Public Entity	43.74091	25.36965	-51.1482	138.6300	0.9969
Oil & Gas	Public Entity	42.21121	25.35006	-52.6046	137.0270	0.9983
Insurance	Non-Profit (Other)	41.87504	8.07376	11.6771	72.0730	<.0001*
Real Estate	Non-Profit (Other)	40.63879	9.29392	5.8771	75.4005	0.0045*
Conglomerate	Government	40.44823	11.92294	-4.1467	85.0431	0.1455
Retail	Public Entity	39.80977	25.46044	-55.4189	135.0384	0.9994
Professional Services	Public Entity	39.50042	25.50507	-55.8952	134.8960	0.9995
Other	Non-Profit (Other)	38.70746	10.87496	-1.9677	79.3826	0.0894
Food Processing & Distribution	Public Entity	38.47396	25.52550	-56.9980	133.9460	0.9997
Manufacturing	Public Entity	37.13591	25.14175	-56.9008	131.1726	0.9998
Utilities	Non-Profit (Other)	36.62484	7.92514	6.9827	66.2669	0.0015*
Technology	Public Entity	36.60106	25.53636	-58.9115	132.1137	0.9999
Healthcare	Public Entity	35.85312	25.32047	-58.8520	130.5583	0.9999
Financial Services (Banking, Investments)	Public Entity	35.48743	25.29561	-59.1247	130.0996	0.9999
Aviation	Public Entity	35.35347	26.36262	-63.2496	133.9565	1.0000
Oil & Gas	Non-Profit (Other)	35.09513	7.86222	5.6884	64.5019	0.0030*
Wholesale Trade	Public Entity	34.56111	26.62494	-65.0231	134.1453	1.0000
Insurance	Government	34.01574	7.64305	5.4287	62.6027	0.0032*
Consumer Goods	Public Entity	33.69821	26.23047	-64.4106	131.8070	1.0000
Real Estate	Government	32.77948	8.92231	-0.5923	66.1513	0.0623
Retail	Non-Profit (Other)	32.69370	8.21114	1.9819	63.4055	0.0213*
Professional Services	Non-Profit (Other)	32.38435	8.34849	1.1588	63.6099	0.0309*
Food Processing & Distribution	Non-Profit (Other)	31.35789	8.41070	-0.1003	62.8161	0.0520
Conglomerate	Media / Entertainment	31.01611	12.42124	-15.4426	77.4748	0.7674
Construction	Public Entity	30.85556	25.42319	-64.2338	125.9449	1.0000
Other	Government	30.84815	10.55914	-8.6458	70.3421	0.4311
Agribusiness	Public Entity	30.37171	25.65949	-65.6015	126.3449	1.0000
Conglomerate	Education	30.32986	10.81727	-10.1295	70.7892	0.5261
Manufacturing	Non-Profit (Other)	30.01984	7.16217	3.2315	56.8082	0.0094*
Telecommunication	Public Entity	29.77232	25.88758	-67.0540	126.5986	1.0000
Technology	Non-Profit (Other)	29.48499	8.44360	-2.0963	61.0662	0.1095
Pharmaceutical / Biotechnology	Public Entity	29.34036	25.71441	-66.8382	125.5190	1.0000
Chemical	Public Entity	29.19643	25.77949	-67.2256	125.6184	1.0000
Utilities	Government	28.76553	7.48589	0.7664	56.7647	0.0352*

Figure 4: RMS by Industry Tukey-Kramer HSD Using a q* of 3.74026 to maintain 0.05 significance level

Another ANOVA test was conducted to determine whether there was a significant difference in publicly affiliated RMS means by their industries. That is, only organizations that were publicly affiliated were part of the sample and their mean Risk Maturity Scores were compared by industry. Their means and standard deviations are displayed in Figure 5, which

follow the same pattern of the means in Figure 2. Publicly affiliated Insurance, Oil and Gas, Retail, and Utilities continue to have the highest mean RMS. Insurance, Oil and Gas, and Retail even have higher mean RMS than when publicly affiliated organizations were combined with the others. Education, Government, Media/Entertainment, and Non-Profits still have low mean RMS. Interestingly, however, the mean RMS of some industries with previously mid-range mean RMS have dropped even lower than Non-Profits. These industries include Financial Services, Healthcare, and Telecommunications. Figure 6 displays these differences in means and standard deviations of Risk Maturity Scores by industry in a bar graph format.

◢ Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Aviation	11	107.4875	32.36652	9.7588729	85.743376	129.23162
Construction	1	80.25	.	.	.	.
Education	47	92.191489	33.137968	4.8336694	82.461818	101.92116
Financial Services (Banking, Investments)	9	67.472222	25.610192	8.5367307	47.786486	87.157959
Government	32	78.802734	33.515919	5.9248334	66.718957	90.886512
Healthcare	5	82.65	35.321116	15.796083	38.793042	126.50696
Insurance	4	130.625	24.334903	12.167451	91.902739	169.34726
Manufacturing	3	135.25	3.1917863	1.8427787	127.32116	143.17884
Media / Entertainment	3	88.416667	43.463586	25.093713	-19.55287	196.3862
Non-Profit (Other)	2	88.875	15.379572	10.875	-49.30498	227.05498
Oil & Gas	9	112.56713	42.655386	14.218462	79.779297	145.35496
Retail	2	121.125	13.611806	9.625	-1.172221	243.42222
Technology	1	83	.	.	.	.
Telecommunication	5	69.7	46.967542	21.004523	11.382094	128.01791
Transportation / Logistics	10	89.0625	50.398594	15.937435	53.009518	125.11548
Utilities	19	106.60044	38.637921	8.8641471	87.977557	125.22332

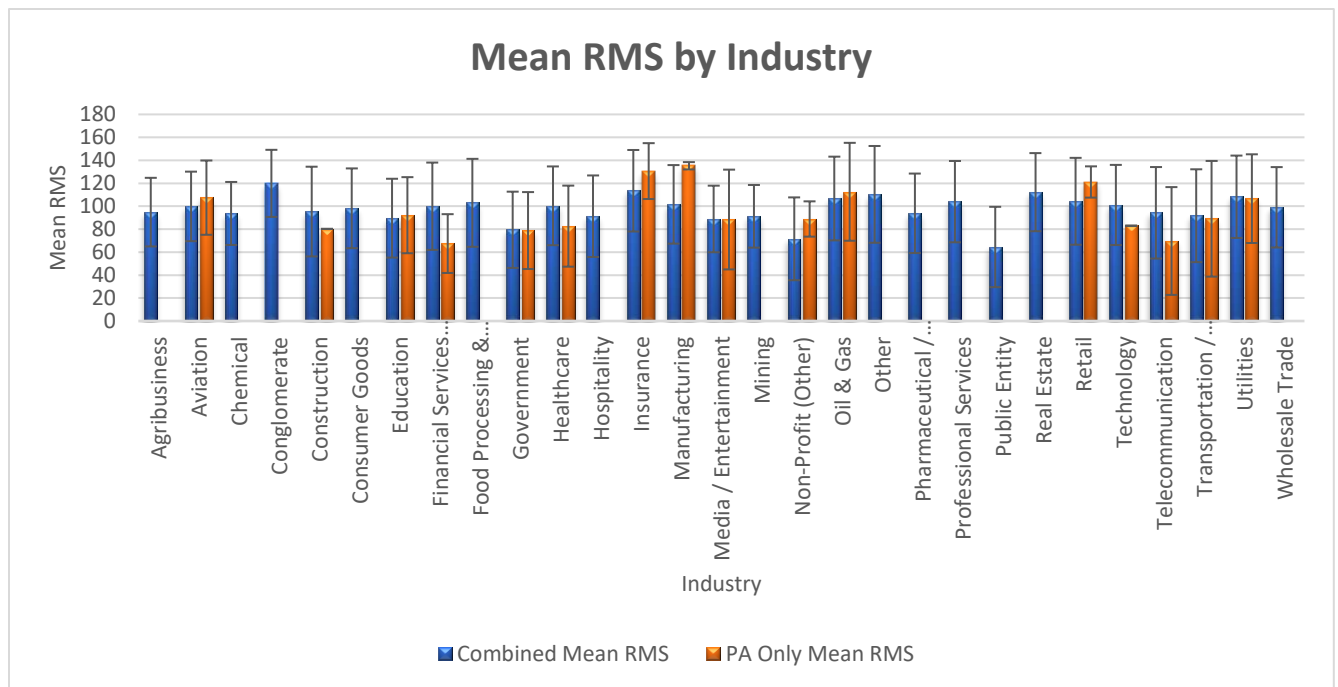*Figure 5: Means and Standard Deviations of RMS by Industry (Publicly Affiliated)*

Figure 6: *Means and Standard Deviations of RMS by Industry (Combined and PA Only)*

The results of the ANOVA test (Figure 7) were found to be significant ($p < 0.0181$), meaning that there is a statistically significant difference between industry RMS means of organizations that are publicly affiliated. The pairs of industries that are significantly different, however, cannot be accurately determined with the data collected as Tukey's test was conducted to control the family-wise error rate and delivered no significant pairings. In sum, this paper found that RMS means are significantly different between industries when analyzing all organizations as well as only those that are only publicly affiliated. Therefore, industry explains

at least some of the variance of mean RMS within the category of publicly affiliated organizations.
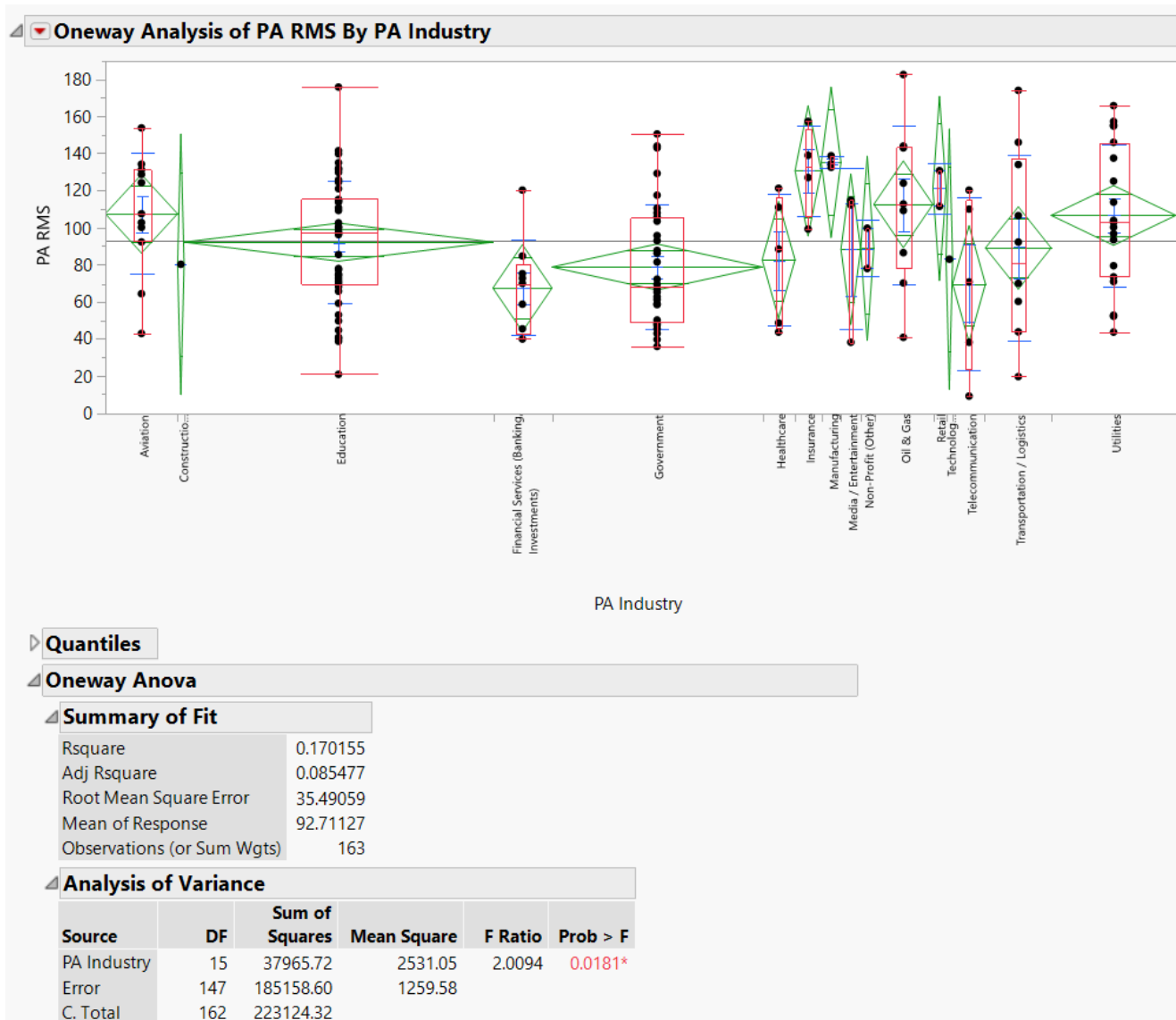
Figure 7: Oneway ANOVA of PA RMS by PA Industry (significant with p<0.0181)

Following these conclusions, the next question becomes within any given industry, does whether an organization is publicly affiliated or not have an impact on RMS? T-tests were conducted within each industry with a large enough sample size of both publicly affiliated and non-publicly affiliated organizations. Figure 8 shows the t-tests conducted for the Education, Transportation and Logistics, and Utilities industries, from left to right. None of the tests show

any statistically significant results, meaning there is no significant difference in RMS means between publicly affiliated and non-publicly affiliated organizations in the same industry. This indicates that within a given industry, whether you are publicly affiliated or not does not influence RMS.
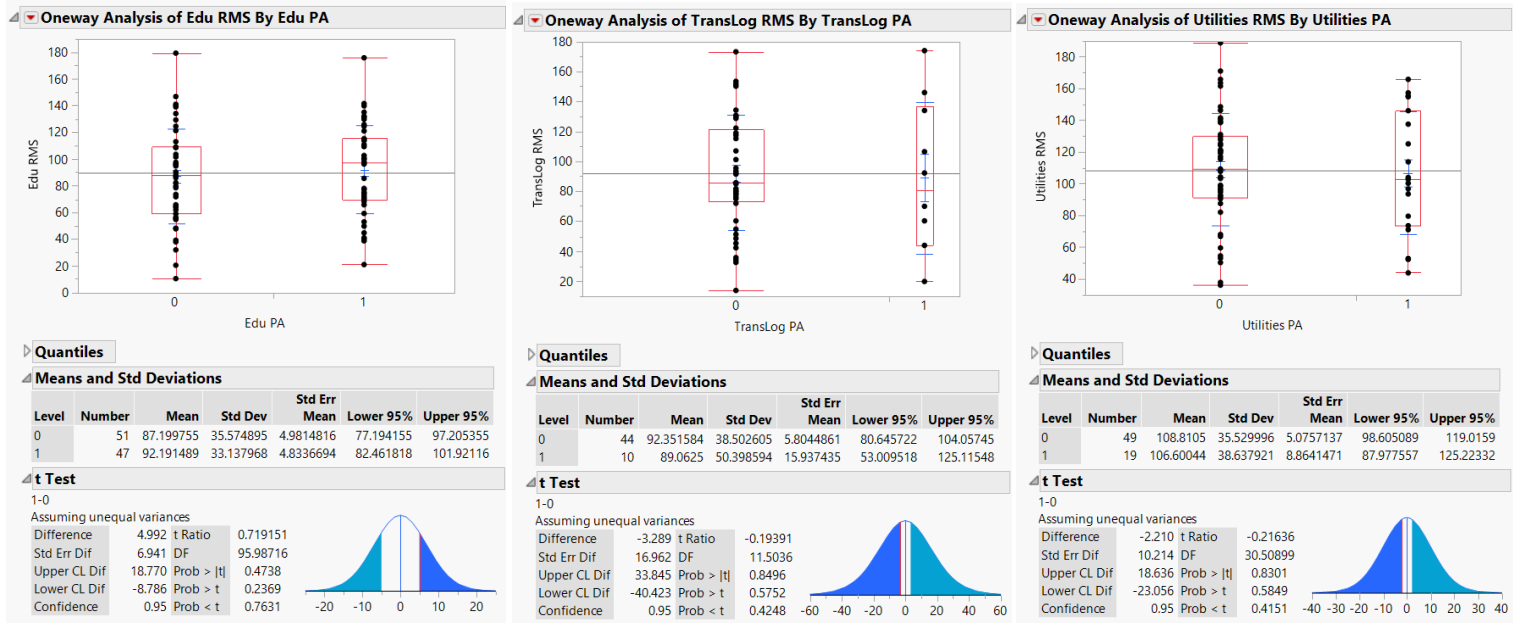
Figure 8: *Analysis of Education, Transportation/Logistics, and Utilities (no significant differences in RMS means between PA and non-PA organizations within a given industry)*

Competition

This paper next analyzed whether the presence of competition could explain the variation in RMS within the category of publicly affiliated organizations. The t-test in Figure 9 shows the highly significant results (p<0.0001) that the mean Risk Maturity Scores are different between these two groups. The results suggest that when firms face competition, they are likely to have a significantly higher Risk Maturity Score than those organizations that do not face competition.
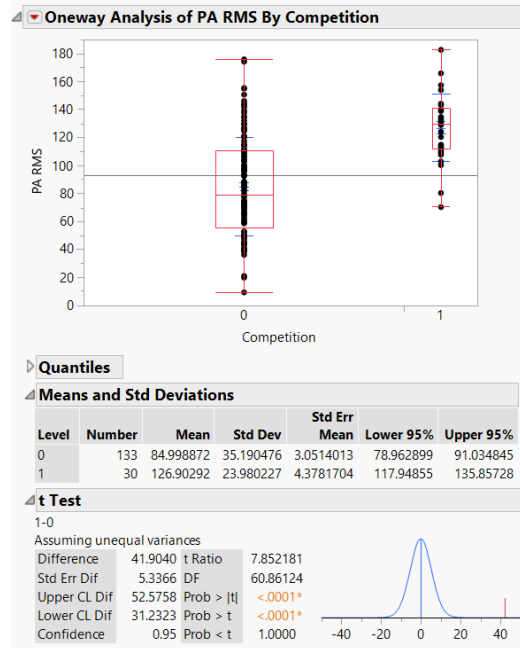
Figure 9: *Analysis of PA RMS by Competition (significant with p<0.0001)*

Government Entity

The next variable considered was whether the organization was a government entity such as a city or port authority or an organization that provided a good or service. Figure 10 shows the statistically significant result that government entities have a lower mean RMS than other organizations.
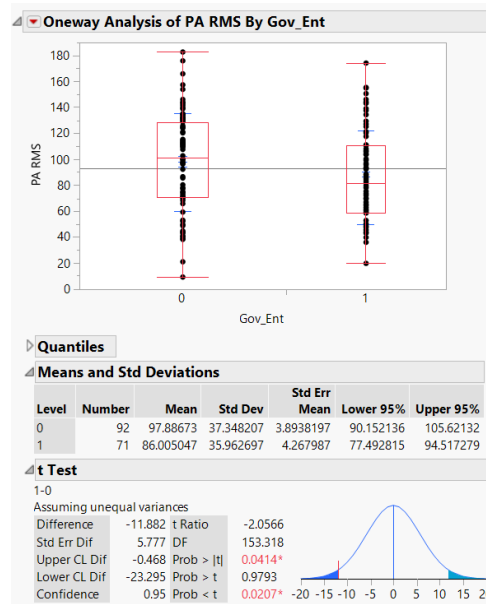

Figure 10: *Analysis of PA RMS by Government Entity*

CONCLUSION AND FURTHER RESEARCH

The results of this paper lead to four conclusions. Firstly, there is a significant difference in enterprise risk management processes between organizations that are publicly affiliated and those that are not. Publicly affiliated organizations on average are less prepared to appropriately manage risk and seize opportunities related to their objectives.

Next examining industry, this paper finds that there are significant differences in ERM between industries, both publicly affiliated and otherwise. While this in part explains the variance of Risk Maturity within the publicly affiliated category, the results also show that within a given industry, being a publicly affiliated organization does not significantly affect Risk Maturity. This analysis, however, was restricted by sample size to only a few industries. An opportunity for further research lies in analyzing the ERM practices in industries that seem to be more affected by being publicly affiliated. For example, some industries like Insurance have a higher mean Risk Maturity Score when a sample of only publicly affiliated firms is examined, while industries such as Financial Services have much lower publicly affiliated RMS than non-publicly affiliated Financial Services firms. It would be interesting to examine further how industry practices help determine success in enterprise risk management and confirm whether certain industries are more affected by being publicly affiliated than others.

After examining the need to compete as an explanation for the variance in publicly affiliated Risk Maturity, this paper finds that publicly affiliated organizations that face competition have significantly higher Risk Maturity. Given that non-publicly affiliated organizations all face competition, this implies that the presence of competition indicates a higher Risk Maturity for any organization and a lack of competition can result in complacency when it comes to ERM. Further research should be done to determine how publicly affiliated

firms can structure their risk management to mimic organizations that face competition so that they can seize important opportunities. Other variables to potentially consider are board roles and responsibilities for risk management, risk culture, risk ownership and accountability, key external stakeholder involvement, and strategic planning.

The last variable this paper examined was whether a publicly affiliated organization was a pure government entity such as a city or agency or a firm that provided a good or service. The results show that government entities have a significantly lower Risk Maturity on average than other organizations. This points to the importance of incentives when structuring and implementing ERM. Government entities have either guaranteed revenues or appropriations and do not have to compete for funding, likely leading them to have less developed enterprise risk management.

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