Risk Management Measurement Models of UAE Public Hospitals using Confirmatory Factor Analysis (CFA)

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ABSTRACT

Studies found that UAE public hospitals faced with issues derive from risk such failure in monitoring and managing risk. A study was conducted to develop structural equation model of relationship of risk management practices factors affecting business community for TAWAM Hospital in UAE. The identified risk management practices factors were clustered into three groups namely Risk Management Culture (RMC); Risk Management Governance (RMG); Risk Management Process (RMP). The study adopted quantitative approach where data was collected through questionnaire survey. The collected data from the survey was used to develop the model using AMOS-SEM software. However for this paper, it presents only the development and assessment of measurement model of RMC, RMG and RMP using confirmatory factor analysis (CFA) which involved processes like Specification of the model; Model identification; Estimation of parameters; Assessment of goodness-of-fit and finally Re-specification of the model until achieved fitness. Analysis of these three models has achieved its goodness of fit criteria. These fit models can be used in the development of structural model that consists independent and dependent variables.

Keywords
Risk Management, Business continuity, Public hospitals, UAE.

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Introduction

An Effective Risk Management (ERM) is a necessity and is widely recognized as a growing best practice in the public sector organisations. Leaders across the government sectors anticipate that the amount of resources deployed to support ERM will increase in both the near-term and the foreseeable future [1-2]. A common practice for successful risk management programs is to focus the risk management of the organization. This will enable risk innovators to break down organizational silos and encourages thoughtful risk analysis in major decision-making processes [3]. The situation in the UAE public sector is not different with what is obtained in other developing nations. This study is out to explore the effect of risk management practices on UAE health public sector business continuity.

Risk management is currently being practices across the business world and also the government sector. Wellbeing, security, disaster management, business congruity, protection and inner review are suggested to as "risk management." It is absolutely authentic that these capacities frame some portion of the more extensive subject of risk management. Yet, the term 'risk management' implies a consider concentrate on all risks of a foundation. The possibility of public sector risk management has turned into a well-known method for portraying the use of risk management all through the organization instead of just in whose business ranges.

Risk management is a management that trains with its own particular methods and standards [4-5]. It is a perceived management science and has been formalized by universal and national codes of training, principles, directions, and enactment. Risk management frames some portion of management's centre obligations and is a necessary piece of the inside procedures of an establishment [6]. This exploration will utilize the less difficult term 'risk management' and will clarify the capacity in wide terms, demonstrating how the different specialized orders related with risk frame some portion of this more extensive field [4-5].

Risk management is an important issue [7] which should be given utmost importance while it comes to the public sectors. However, there are endless occasions and conditions that may frustrate or debilitate the accomplishment of any organization's objectives, paying little heed to whether it works in the private or the public sector, and in addition the ideal structure and execution of its exercises. Risk management, in the long run, works its way through the whole organization so all levels of management take part in its procedures [8]. Besides, most such levels can be anticipated, their conditions and effect can be evaluated, and organizations can get ready for their event or alleviation [9].

Risk management in UAE organisations

The United Arab Emirates (UAE) public sector has been set up numerous decades prior as a built up and ensured sector by the nation. Nonetheless, UAE public sector should be all around prepared in term of most recent risk management abilities and operational systems to withstand the difficulties postures by the current financial system condition. Recognizing how these organizations deal with the characteristic risk of UAE government administrations could go far in guaranteeing a manageable development and survival of the whole sector. To have a better way of handling the situation, there is a need to have the academic research which is currently not much available.

For organizations in the public domain, risk management is a current organizational administration device that tries to upgrade the consequence of business choices. However, there is no scholarly and pragmatic research has been led in UAE, which is a genuine gap regarding public organizations in the United Arab Emirates (UAE). These elements may likewise assume a part in how the risk observation and risk management state of mind of a bureaucratic organization's pioneer creates. Reprehensibly, not a significant number of researches have been directed on this as far as United Arab Emirates (UAE) point of view.

In addition, the analysis and appraisal of risks at public sector organizations assume a key part basically in the determination of the fitting control exercises [10-11]. Any control system can just react appropriately to the risks for which it was made. In this way, as risks change should control systems are custom-made to the conditions experiencing changes. The risk management handling is likewise portrayed by the benchmarks and rules of public organizations and government establishments [4]. Unfortunately, these issues are not being tended to appropriately in UAE public sector. In this way, the gap of learning identifying with risk management in the UAE is an extraordinary issue confronted by the business administrators to plan the work to win the difficulties ahead. Since the arrangement has not been made, along these lines this is another professionals' gap in UAE.

All things being considered, risk analysis [10] is coordinated at mapping the ranges and procedures that bear the most serious risk, and at recognizing and evaluating risks show in organizations that can be inspected. Where analysis includes a populace with an incredible number of components, the key objective of risk analysis is to sort the components as per the predefined risk criteria, such as setting up a sort of risk "positioning" in light of a legitimate concern for choosing the riskiest components [12-13].

Fundamentally, risk management is a natural piece of dependable organizational management; as far as deciding its objectives, characterizing risk, and identifying risks, notwithstanding, public sector foundations have special attributes that vary from those of organizations in the corporate domain. Now the question arises whether the public sectors in UAE, particularly public Hospitals realize the importance of this and execute the plan well. The lack of plan and lack of research on this important area create the discrepancy within the public sectors in UAE. Thus, there is a need for a research which will drill out the situation and show the way of improving as this regard. Public sectors in UAE need to have that understanding, which will solve the existing problem. But the question arises on how they would solve the problem without realizing the heat of the problem. Therefore, the aim of this research is to explore the effect of risk management practices and business continuity in the TAWAM Hospital UAE.

Methodology

This research study was within the domain of positivist approach rather than interpretivist approach. This research study was conducted to explore the effect of risk management practices and business continuity in TAWAM Hospital UAE. Thus, the total population in this research is 3,100 staff of TAWAM Hospital and the sample was generated using Krejcie and Morgan Table, the sample size is 341. Questionnaire was distributed to collect data from the staff of TAWAM Hospital and SPSS and AMOS software were used to analyse the collected data.

Analysis and Result

Confirmatory Factor Analysis was used to analyse the measurement model. Three measurement models were identified which are Risk Management Culture (RMC); Risk Management Governance (RMG); Risk Management Process (RMP). The analysis used Confirmatory Factor Analysis (CFA) technique of the AMOS-SEM software for every measurement model until the model achieved the fitness criteria. The analysis began with specification of the model; model identification; estimation of parameters; assessment of goodness-of-fit and finally model re-specification. This procedure was repeatedly followed in the assessment of the measurement models until the model achieved the goodness of fit criteria. The fitness of the models was evaluated based on the established criteria for CB-SEM evaluation [14, 15, 16].

3.1 Measurement model for RMC

In Risk Management Culture (RMC), it has nine items/factors. Fig.1 shows the graphical presentation of the initial measurement model for the RMC construct. As shown in the Fig.1 indicators, RMC6 and RMC7, have factor loading and Square Multiple Correlation (SMC) values lower than the required minimum of 0.50 and 0.30 respectively, which is an indication that the model re-specification is required.

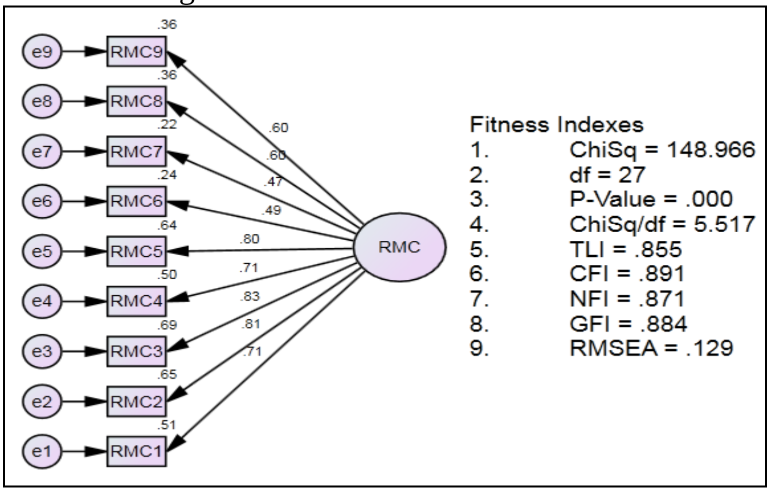

Fig.1 - Initial measurement model for **RMC**

Based on fig 1, the results from initial model were tabulated in Table 1. The results based on factor loading and SMC criteria, only seven (7) items meet the acceptance level. Two indicators failed to meet the acceptance criterion which suggests model re-specification. The respective indicators are RMC6 and RMC7with factor loadings and SMC values of 0.49; 0.24 and 0.47; 0.22 respectively. Moreover, RMSEA, CFI and NFI all reported poor fit statistics which suggests the need for model re-specification.

Table 1: Initial measurement model of RMC results

Factor Loading								
Indicators		Construct	Estimate	S.E.	C.R.	P	SMC	Recommended level
RMC1			0.711			***	0.505	achieved
RMC2			0.808	0.090	12.538	***	0.653	achieved
RMC3			0.832	0.113	12.879	***	0.692	achieved
RMC4			0.705	0.112	10.992		0.498	achieved
RMC 5	←	**RMC**	0.798	0.085	12.387	***	0.637	achieved
RMC6			0.491	0.102	7.678	***	0.**241**	**not achieved**
RMC7			0.467	0.110	7.309	***	**0.218**	**not achieved**
RMC8			0.601	0.105	9.381	***	0.361	achieved
RMC9			0.603	0.102	9.418	***	0.364	achieved
Goodness-of-fit criteria								
Model identification						Model fit statistics		

Observed variables	=	9	X^2	=	148.966	CFI	=	0.891
Estimated parameter	=	18	X^2/df	=	5.517	RMSEA	=	0.129
Degree of freedom	=	27	P-value	=	0.000	NFI	=	0.871
Decision	Model not fit							

Re-specification was conducted on the model to improve its fitness criteria. Indicators RMC6 and RMC7 were deleted and the final model arrived as shown in Fig.2. The final model indicated that all the criteria for model fit were achieved. The factor loading of the retained indicators and the model fit statistics are presented in Table 2.

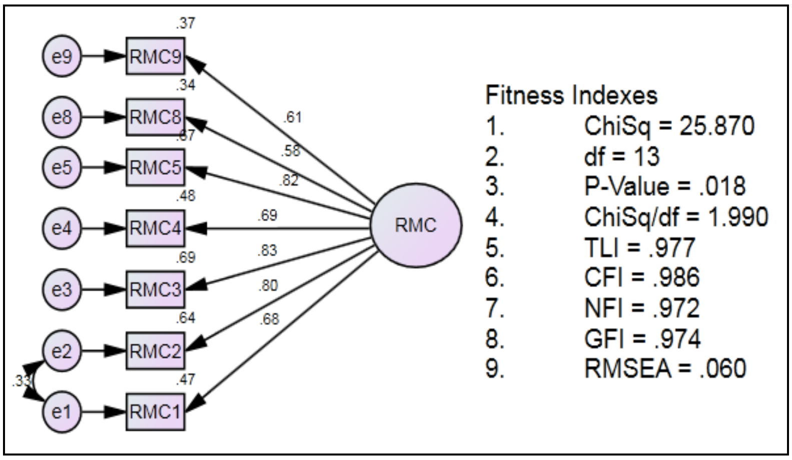

Fig.2 - Final measurement model fo**r RMC**

Based on fig 2, the results from initial model were tabulated in Table 2. The factor loadings of the retained items were all above the 0.50 threshold. Similarly, all the model fit statistics indicated that the measurement model is valid therefore suggesting that the seven (7) indicators can conveniently be used in the overall measurement model assessment.

Table 2 - Final measurement model of RMC results

Factor Loading								
Indicators		Construct	Estimate	S.E.	C.R.	P	SMC	Recommended level
RMC1			0.683			***	.467	achieved
RMC2			0.797	0.082	14.107	***	.636	achieved
RMC3			0.828	0.127	11.851	***	.686	achieved
RMC4	←	**RMC**	0.692	0.124	10.195	***	.479	achieved
RMC 5			0.821	0.096	11.777	***	.675	achieved
RMC8			0.584	0.114	8.741	***	.341	achieved
RMC9			0.608	0.112	9.072	***	.370	achieved

Goodness-of-fit measures								
Model identification						Model fit statistics		
Observed variables	=	9	X^2	=	25.870	CFI	=	.986
Estimated parameter	=	15	X^2/df	=	1.990	RMSEA	=	.060
Degree of freedom	=	13	P-value	=	.018	NFI	=	.972
Decision	**Model is fit**							

3.2 Measurement model of RMG

In Risk Management Governance (RMG), it has ten items/factors. Fig.3 shows the graphical presentation of the initial measurement model for the RMG construct. As shown in the Fig.1 some of the fitness criteria are lower than the required minimum value and this is an indication that the model re-specification is required.

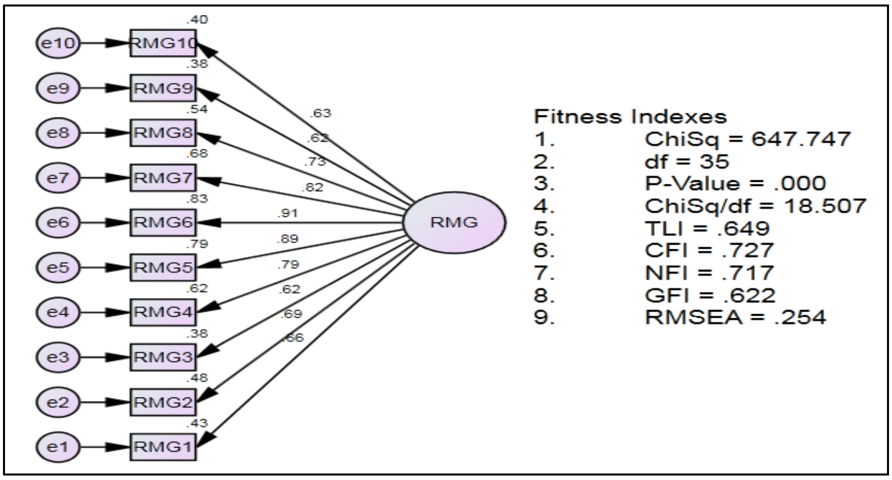

Fig.3 - Measurement model for RMG

As shown in Table 3 all the factor loadings and the corresponding R^2 values for the ten (10) measurement items for the RMG had achieved the acceptance value. On the other hand, in respect of model fit statistics, the analysis indicated that some of the goodness-of-fit criteria were not satisfied. For instance, both CFI and NFI generated values less than the recommended criteria value of 0.90. Also RMSEA generated value is greater than the recommended value of 0.08. Generated value of X2/df is greater than 5. Hence, it required model re-specification process in-order to achieve a good-fit model.

Table 3: Initial measurement model of RMG

Factor Loading								
Indicators		Construct	Estimate	S.E.	C.R.	P	SMC	Recommended level
RMG1	←	**RMG**	.658			***	.433	achieved
RMG2			.694	.089	10.352	***	.481	achieved
RMG3			.618	.079	9.361	***	.382	achieved
RMG4			.789	.078	11.547	***	.622	achieved
RMG5			.891	.075	12.739	***	.794	achieved
RMG6			.914	.078	12.986	***	.835	achieved
RMG7			.825	.079	11.979	***	.680	achieved
RMG8			.732	.076	10.848	***	.536	achieved
RMG9			.616	.071	9.324	***	.379	achieved
RMG10			.634	.069	9.564	***	.401	achieved
Goodness-of-fit measures								
Model identification						Model fit statistics		
Observed variables	=	10	X^2	=	647.747	CFI	=	.727
Estimated parameter	=	20	X^2/df	=	18.507	RMSEA	=	.254
Degree of freedom	=	35	P-value	=	.000	NFI	=	.717
Decision	Model not fit							

Fig.4 shows the final measurement model of RMG construct after re-specification process. The generated results in the fig. 4 graphical display and in Table 4, the model has achieved its entire model fit statistics and validity requirements after deleting some parameters.

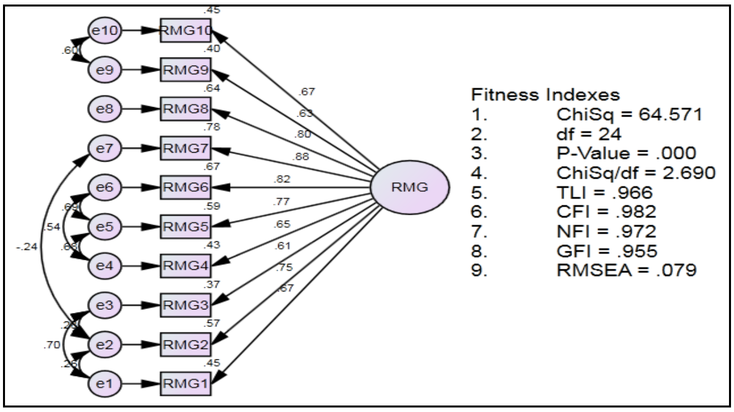

Fig.4 - Final measurement model for RMG

The results of factors loading and goodness-of-fit criteria of the model RMG after the final specification are summarised in table 4

Table 4 - Final measurement model of RMG

Factor Loading								
Indicators		Construct	Estimate	S.E.	C.R.	P	SMC	Recommended level
RMG1	←	**RMG**	.671			***	.451	achieved
RMG2			.752	.080	12.130	***	.565	achieved
RMG3			.606	.044	16.250	***	.368	achieved
RMG4			.653	.078	9.279	***	.426	achieved
RMG5			.768	.073	11.186	***	.591	achieved
RMG6			.818	.076	11.789	***	.669	achieved
RMG7			.883	.080	12.423	***	.780	achieved
RMG8			.800	.076	11.545	***	.640	achieved
RMG9			.633	.070	9.487	***	.401	achieved
RMG10			.669	.068	9.955	***	.447	achieved
Goodness-of-fit measures								
Model identification						Model fit statistics		
Observed variables	=	10	X^2	=	64.571	CFI	=	.982
Estimated parameter	=	31	X^2/df	=	2.690	RMSEA	=	.079
Degree of freedom	=	24	P-value	=	.000	NFI	=	.972
Decision	Model accepted							

Results in Table 4 indicate that the factor loadings and the R^2 values for the ten (10) items of the final measurement model for RMG had satisfied the recommended criteria of acceptance. Specifically, RMSEA=0.079, CFI=0.982, NFI=0.972, X2/df=2.690 and p<0.05 which is an indication of good-fit model.

3.3 Measurement model for RMP

Relationship between RMP construct and its associated indicators is presented in Fig.5. The fitness and the validity of the model was tested by running the initial CFA without imposing any co-variation on the parameters. The CFA analysis of the initial RMP model failed to achieve the suggested criteria for model fitness. Three indicators, RMP8, RMP9 and RMP10 reported SMC and R2 values less than the required minimum levels. Similarly, evaluation on the goodness-of-fit criteria found that the model cannot be accepted. Both CFI and NFI reported values are below the recommended level 0.90 while X2/df and RMSEA also reported values greater than the required levels of acceptance. The model was then re-specified to correct the problem.

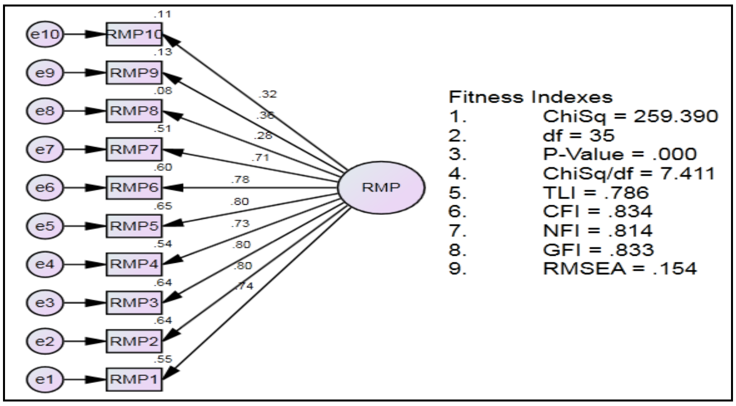

Fig.5 - Initial measurement model for (RMP) construct

The results of factors loading and goodness-of-fit criteria of the model RMP after the initial specification are summarised in table 5

Table 5 - Initial measurement model for RMP

Factor Loading								
Indicators		Construct	Estimate	S.E.	C.R.	P	SMC	Recommended level
RMP1			.744			***	.554	achieved
RMP2			.802	.104	13.301	***	.643	achieved
RMP3			.797	.110	13.226	***	.636	achieved
RMP4			.735	.086	12.099	***	.540	achieved
RMP5	←	**RMP**	.804	.096	13.350	***	.647	achieved
RMP6			.778	.095	12.872	***	.605	achieved
RMP7			.711	.095	11.687	***	.506	achieved
RMP8			.283	.100	4.491	***	.080	not achieved
RMP9			.356	.111	5.674	***	.127	not achieved
RMP10			.324	.100	5.157	***	.105	not achieved
Goodness-of-fit measures								
Model identification						Model fit statistics		
Observed variables	=	10	X^2	=	259.390	CFI	=	.834
Estimated parameter	=	20	X^2/df	=	7.411	RMSEA	=	.154
Degree of freedom	=	35	P-value	=	.000	NFI	=	.814
Decision	**Model Not accepted**							

Results from Table 5 indicates that factor loadings and the SMCs of RMP8, RMP9 and RMP10 failed to meet up with the required thresholds for model acceptance. In addition, some of the model fitness indicators were also outside the acceptance threshold which suggests the need for model re-specification to ensure the attainment of goodness-of-fit and model acceptance.

Upon examining the modification index of the initial measurement model, re-specification was conducted until attaining the final measurement model. Three problematic items were deleted. This led to the attainment of desirable result for model fit as Fig.6 which display in graphical form.

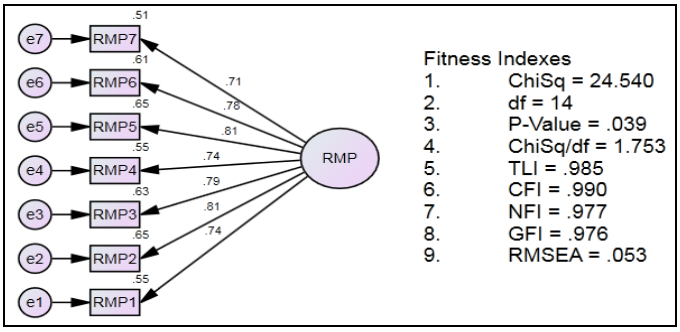

Fig.6 - Final measurement model for RMP

The results of factors loading and goodness-of-fit criteria of the model RMP after the final re-specification are summarised in table 6

Table 6 - Final measurement model for RMP

Factor Loading								
Indicators		Construct	Estimate	S.E.	C.R.	P	SMC	Recommended level
RMP1	←	**RMP**	0.741			***	0.549	achieved
RMP2			0.805	0.105	13.267	***	0.648	achieved
RMP3			0.794	0.111	13.079	***	0.631	achieved
RMP4			0.741	0.086	12.131	***	0.549	achieved
RMP5			0.806	0.097	13.276	***	0.649	achieved
RMP6			0.782	0.096	12.856	***	0.611	achieved
RMP7			0.714	0.095	11.667	***	0.510	achieved
Goodness-of-fit measures								
Model identification						Model fit statistics		
Observed variables	=	10	X^2	=	24.540	CFI	=	0.990
Estimated parameter	=	14	X^2/df	=	1.753	RMSEA	=	0.053
Degree of freedom	=	14	P-value	=	0.039	NFI	=	0.977
Decision	Model accepted							

Table 6 shows the results of the final measurement model of RMP. Out of the ten indicators seven were retained to be used in further analyses. Both the measures of construct validity and model fit statistics meet the recommended thresholds for model acceptance. The entire factor loadings and the SMCs for the seven indicators meet the acceptable limits. The model has achieved all fitness criteria values. RMSEA reported a value of 0.053, CFI = 0.990, NFI = 0.977, X2/df = 1.753 and p=0.039.

However, based on the analysis above, it is clearly shown that risk management is very important on business continuity of not only public hospital but any business organization. Thus an effective risk management should be adopted for business continuity in any organisation.

Conclusion

This paper has presented a study to develop structural equation model of relationship of risk management practices factors affecting business community for TAWAM Hospital in UAE. The identified risk management practices factors were clustered into three groups namely Risk Management Culture (RMC); Risk Management Governance (RMG); Risk Management Process (RMP). The study adopted quantitative approach where data was collected through questionnaire survey. The collected data from the survey was used to develop the model using AMOS-SEM software. However for this paper, it presents only the development and assessment of measurement model of RMC, RMG and RMP using confirmatory factor analysis (CFA) which involved processes like Specification of the model; Model identification; Estimation of parameters; Assessment of goodness-of-fit and finally Re-specification of the model until achieved fitness. Analysis of these three models has achieved its goodness of fit criteria. These fit models can be used in the development of structural model that consists independent and dependent variables.

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References

[1] Hayford, O. (2006), "Successfully allocating risk and negotiating a PPP contract", Proceedings of the 6th Annual National Public Private Partnerships Summit: Which Way Now for Australia's PPP Market? Rydges Jamison, Sydney, 16-17 May

[2] PricewaterhouseCoopers & AFERM (2015). Enterprise Risk Management in the Public Sector. Survey Results. https://www.pwc.se/sv/pdf-reports/enterprise-risk-management-in-the-public-sector.pdf

[3] Hornai, G. (2001): Risk and Risk Management. (MVM Hungarian Electricity Company Disclosures. 2001/04).

[4] Reim, W. , Parida, V. and Lindström, J. (2013), "Risks for functional products – empirical insights from two Swedish manufacturing companies", Procedia CIRP , Vol. 11, pp. 340-345.

[5] Reim, W., Parida, V. and Örtqvist, D. (2015), "Product-service systems (PSS) business models and tactics – a systematic literature review", Journal of Cleaner Production , Vol. 97, pp. 61-75. ,

[6] IRM (2012) Risk Culture: Resources for Practitioners, Institute of Risk Management, London, UK.

[7] Thomas, A.V., Kalidindi, S.N. and Ananthanarayanan, K. (2003), "Risk perception analysis of BOT road project participants in India", Construction Management and Economics, Vol. 21 No. 4, pp. 393-407.

[8] Stoughton, M. and Votta, T. (2003), "Implementing service-based chemical procurement: lessons and results", Journal of Cleaner Production , Vol. 11 No. 8, pp. 839-849.

[9] Wallin, J., Parida, V. and Isaksson, O. (2015), "Understanding product-service system innovation capabilities development for manufacturing companies", Journal of Manufacturing Technology Management , Vol. 26 No. 5, pp. 763-787.

[10] Rejda, G.E. (2005), Risk Management and Insurance , Person Education Inc, New York, NY.

[11] Sakao, T., Rönnbäck, A.Ö. and Sandström, G.Ö. (2013), "Uncovering benefits and risks of integrated product service offerings – using a case of technology encapsulation", Journal of Systems Science and Systems Engineering , Vol. 22 No. 4, pp. 421-439.

[12] Nordin, F. , Kindström, D. , Kowalkowski, C. and Rehme, J. (2011), "The risks of providing services: differential risk effects of the service-development strategies of customisation, bundling, and range", Journal of Service Management , Vol. 22 No. 3, pp. 390-408

[13] Steven, M. (2012), "Risk management of industrial product-service systems (IPS2) – how to consider risk and uncertainty over the IPS2 lifecycle?", Leveraging Technology for a Sustainable World , Springer, Berlin and Heidelberg, pp. 37-42.

[14] Hair, J. F. (2010). Black, Wc, Babin, Bj, & Anderson, Re (2010). Multivariate data analysis, 7.

[15] Byrne, B. M. (2013). Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming. Psychology Press.

[16] Kline, R. B. (2011). Convergence of structural equation modeling and multilevel modeling. na.

[17] Wheaton, B., & Muthen, D. F. (1977). ALWIN, and GF SUMMERS (1977)"Assessing reliability and stability in panel models," pp. 84-136 in DR Heise (ed.).

[18] Browne, M.W., & Cudeck, R. (1993). Alternative Ways of Assessing Model Fit. In Bollen, K.J., & Long, J. (Eds), Testing Structural Equation Models pp.136-162, Newbury Park, CA:Sage.

[19] Jorekog, K.G., & Sorbom,D. (1988). LISREL VII: Analysis of Linear Structural Relationships by Maximum Likeihood, INstumental Variables and Least Squares Methods. Mooresville, In. Scientific Software, Inc.

[20] Tanaka, J.S., & Huba, G.J. (1985). A Fit Index for Covariance Structure Models under Arbitrary GLS Estimation. British Journal of Mathematical and Statisticalology, 38, 197-201. [89,290]

[21] Bentler ,P.M. (1990). Comparative Fit Indexes in Structural Models, Psychological Bulletin, 107.46

[22] Marsh, H. W., & Hocevar, D. (1985). Application of Confirmatory Factor Analysis to the Study of Self-Concept: First-and Higher Order Factor Models and Their Invariance Across Groups. Psychological Bulletin. 97(3), 562-582.

[23] Hair, J. F., Ringle, C. M., &Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. Journal of Marketing theory and Practice, 19(2), 139-152.