https://doi.org/10.20965/jdr.2016.p0691

Paper:

Modifying Business Continuity Plan (BCP) Towards an Effective Auto-Mobile Business Continuity Management (BCM): A Quantitative Approach

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[Received October 8, 2015; accepted May 17, 2016]

Traditionally BCP consists of two main aspects, being Business Impact Analysis (BIA) and Risk Assessment (RA) [3, 8]. However, this approach doesn't seem to be sufficiently addressing the complex and elaborate nature of supply chain network in the automobile industry. To address this insufficiency, we replace RA with Risk Ranking (RR) and introduce a new term Supply Chain Cooperation (SCC) to our BCP. A quantitative study was carried on 75 automobile parts markers in disaster prone regions (Asia and North America) and the results were analyzed by adopting this modified BCP concept and using Smart PLS 2.0 as our statistical analysis tool. We realized that SCC has a positive total significant effect on manmade risk rankings, natural risk ranking and BCM. Though risk ranking affects BCM, recovery time and competitive advantages positively, the relationships were not significant. In this study, we realized that BIA is the single most important part of BCP as it had the strongest positive total effects on other BCP factors (SCC, manmade risk ranking and natural risk ranking), BCM and evaluation factors (competitive advantages and recovery time).

Keywords: business continuity plan (BCP), business continuity management (BCM), supply chain cooperation, business impact analysis (BIA), risk ranking (RR)

1. Introduction

BCP needs to be reviewed, modified, and improved regularly in order to cope with the ever increasingly demanding nature of supply chain in a global village, particularly in the automobile industry. This is particularly essential since the formulation of BCM is dependent upon the BCP report. The Great East Japan Earthquake (GEJE) exposed a lot of vulnerabilities on the traditional BCP concept [10], as it Toyota took Toyota corporation about 1 month to totally grasp the locations and situations of the damaged suppliers at the second tier and lower signaling a failing BCP.

1.1. Background of the Study

Identification of scenarios leading to severe impacts on the company's reputation, assets or financial position is very important [18]. As a way of responding to this need, the study introduces the term risk ranking (RR) as a cost effective and efficient way to fulfill this aspect. On the other hand, Global business interconnectedness and dependence (globalization) makes Supply Chain Risk Management (SCRM) even more complex and therefore, the development of countermeasure activities were identified as very crucial [7], hence SCC.

1.2. Aim of Study

(1) This study intends to: Presents a BCM framework suited for a complex automobile supply chain by modifying the BCP.

(2) Evaluate each BCP component and reveal its interaction with other crucial BCM framework factors.

1.3. Profile of Surveyed Companies

A total of 151 survey questionnaire were sent to companies between June 2014 and May 2015. Ninety two companies replied, a response rate of 61%.The majority 62%of the surveyed companies were from Asia, with 38% of the companies from North America: Canada, the United States and Mexico see **Table 1** Of the 92 companies which responded to the 151 questionnaire sent to both Asian and North American companies, A total number of 75 responses were valid, giving a validity rate of 50%.The reason for choosing these specific areas are continually experiencing significant exposure to hazards. Data indicates that over the last decade, China, the United States, Indonesia, the Philippines and India constitute the top five countries most frequently hit by natural disasters. In 2013, China experienced its highest number of natural disasters in the last decade [11].

2. Conceptual Model and Hypotheses

In order to provide an in-depth analysis, this section defines and discusses operationalization of the factors in our

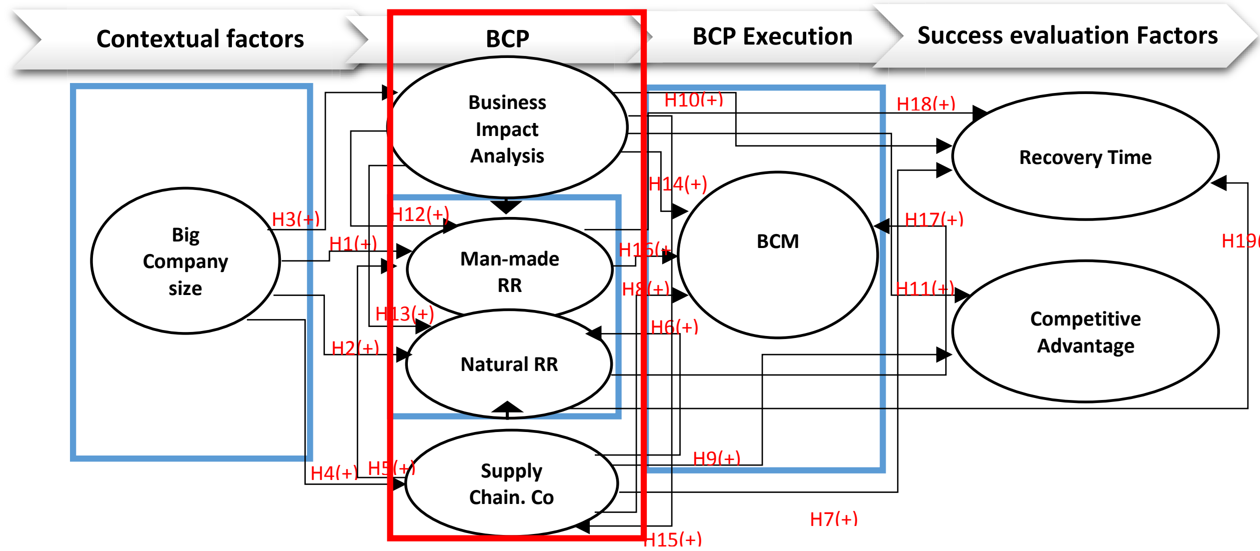

Fig. 1. Conceptual model/ hypotheses.

Table 1. Surveyed companies' origins.

Continent	Country	Percentage (%)
(ASIA)	Japan	24
	China	24
	Myanmar	5
	Korea	2
	Indonesia	2
	Singapore	2
	Thailand	1
(North America)	US	33
	Canada	3
	Mexico	3
	Total	100

conceptual model. The proposed conceptual model provides a holistic approach towards BCM framework and covers four phases in the process, being; contextual factors, BCP, BCP execution and success evaluation factors. This framework was adopted from [13], but strikes a significant variation from the standard. It also has limited similarity with the one by [19].

In this framework, the first thing to consider is what we term as contextual factors. Once the contextual factors have been identified and established, the framework introduces the second phase, which is BCP. The logic is that, no effective plan can be realized until a thorough command of the 'contextual factors' is established. We noted that the relationship between BIA and RA is crucial because the results of BIA and RA are merged to develop a suitable BCP. This significantly shaped what constitute our BCP, being BIA, RR and SCC. BIA was directly adopted from [3] and RA was modified into RR. The reason for this modification was that, while we appreciate the value of RA in BCP, we realized it could be made cost effective. We are of the view that RR can be defined as the common ground between companies' ambitions of maximizing profit and inventory consideration to ensure continued supply (customer satisfaction) during and after disruption. The last component under this phase is SCC. This is a new term we think has great potential in informing the final BCP outcome. As is common knowledge, companies are part of huge supply chain networks and developing an effective BCP should take into consideration this view.

Studies by [9, 15] highlighted the integral significance of supply chain networks during disruptions. We therefore, referred to that in our BCP. Given the importance of supply chain networks in the flow of goods, services and information through the chain particularly in the automobile industry the study is of the view that introducing SCC is pivotal in BCP **Fig. 1**.

2.1. Evaluation Factors

The framework adopted two BCM success evaluation factors; 'recovery time' and 'competitive advantages'. Recovery effort starts within an enterprise and reaches out to the entire community. Another evaluation factor is competitive advantages. In this study, these will be defined as a number of circumstances/ conditions that puts a company in a favorable or superior business position relative to competitors, such conditions includes quick recovery time after disaster strikes, increase of sales share and profits before, during and after a disaster event and companies' image before, during and after disruption.

Sets of competitive advantages indicators from the questionnaire are; Q32: Will formation of BCP and execution of BCM lead to establishment of competitive advantages of your company? and Q34: When the answer to Q32 is 4 or 5, will you review the direction such as your production strategies (e.g. production at multiple sites), new product development (e.g. reduce the number of parts, modulation etc.) and purchasing strategy (e.g. multiple sourcing)?

Sets of recovery time indicators from the questionnaire are; Q19: Do you investigate/ assess the impact of the damage in case of a natural disaster, estimate the time when the production stops, and periodically evaluate the information?, Q21: Is the time until recovery you answered in Q20–21 satisfactory?, Q23: Is the time until recovery you answered in Q21–22 satisfactory?, and Q25: Do you think further target reduction (reduced timeline) against the required to return to current 100% production?

2.2. Challenges

A major challenge we faced had to do with the risk ranking construct. As mentioned earlier, this factor is an original idea, meaning that it has never been discussed before in this regard, and as such, there was no literature to get insight from. Therefore, during model formulation and testing, we realized that risk ranking construct has to further be divided as we realized that including all the indicators in one construct significantly reduced internal consistency reliability and validity. In this regard, risk ranking was divided into manmade risk ranking and natural risk ranking. In this study manmade risk ranking questions (Q18-2 and 18-3) investigated degree of implementing earthquake resistant strengthening and enforcement measures while natural risk ranking questions (Q18-6, 18-9, 18-10, and 18-11) investigated degree of flooding, snow damage and cold wave, thunderbolt and heatwave respectively. The study also encountered limitations of data collection, as it covered regions thousands of miles from each other. The coordination of the exercise was particularly cumbersome, however through constant follow up by emails and phones were able to get some responses.

2.3. Literature Informing "Size of Company" Hypotheses Formulation

Previous studies by [1, 14] provided an insight into these set of hypotheses. In their study [14] concludes that most of the Small and Medium Enterprises (SMEs) are family owned and as such limited in growth as the family has total control in regards to strategic decisions, control and operation management. Therefore, by the nature of their operations, the business tends to have limited supply chain capabilities, exposing it to major damage in the event of supply chain disruption [16]. We adopted one factor – net turnover (annual sales) – to categorize company size. This is based on a Center for Strategy and Evaluation Services report, to EU member states, the European Investment Bank (EIB), and the European Investment Fund (EIF) to provide a framework for statistical definitions in EU policies that supports small and medium enterprises (structural funds, framework programs for research and development, competitiveness and innovation programs etc.) and govern state aid [5].

Hypothesis 1: *Big company size has positive effects on manmade risk ranking*

Hypothesis 2: *Big company size has positive effects on natural risk ranking*

Hypothesis 3: *Big company size has positive effects on BIA*

Hypothesis 4: *Big company size has positive effects on Supply Chain Cooperation*

2.4. Literature Informing "Supply Chain Cooperation" Hypotheses Formulation

If companies trust each other and develop bonds and communication channels between the different actors in the network, the resources and activities in the network can be organized in a more efficient way [2]. From this literature, we were able to note that previous studies did not make mention of Supply Chain Cooperation (SCC) at all in their BCM framework and models even though its benefit to the supply chain network is known In this study, SCC is defined as identifying all supply chain network players and developing a coordinated communication platform to promote easy flow of goods, services and information. Supply Chain Cooperation questions (Q3, 14, 15 and 16) investigated sufficient planning in the supply chain network, sufficient disaster and damage risks surveys, sufficient implementation of countermeasure at suppliers and measures in place to guarantee supplies to customers respectively.

Hypothesis 5: *Supply Chain Cooperation has positive effects on manmade risk ranking*

Hypothesis 6: *Supply Chain Cooperation has positive effects on natural risk ranking*

Hypothesis 7: *Supply Chain Cooperation has positive effects on recovery time*

Hypothesis 8: *A company that achieves higher Supply Chain Cooperation also achieves higher BCM*

Hypothesis 9: *A company that achieves higher Supply Chain Cooperation also achieves higher competitive advantages*

2.5. Literature Informing 'BIA' Hypotheses Formulation

BIA is very important because the restoration and resumption of the organization's disrupted functions are carried out based on the BIA results/ report [19]. Indicators which constituted the BIA constructs were Q1: Have you formulated sufficient measures to prevent disasters to suppress the damage to the internal infrastructure such as important buildings, equipment and machines?, Q2: Have you sufficiently formulated plans of securing electricity, gas, water, communication etc. in case of a disaster?, Q4: Have you sufficiently planned priority for operation restoration and securing essential management resources?, Q5: Do you think crisis management system in case of disaster occurrences is sufficiently established?, Q6: Have you sufficiently formulated the plans of alternative equipment's, alternative manufacturing location, etc.?, Q21: Is the time till recovery at satisfactory level?, Q28: What degree of loss will shortening the production time be?, Q29: What is the current level of BCP/ BCM of the company if you evaluate? and Q31: Do you think it is necessary to set up a target with shorter number of days till operations resume?

Hypothesis 10: *BIA has positive effects on recovery time*

Hypothesis 11: *A company that achieves higher BIA also achieves higher competitive advantages*

Hypothesis 12: *BIA has positive effects on manmade risk ranking*

Hypothesis 13: *BIA has positive effects on natural risk ranking*

Hypothesis 14: *BIA has positive effects on BCM*

Hypothesis 15: *BIA has positive effects on Supply Chain Cooperation*

2.6. Literature Informing "Risk Ranking" Hypotheses Formulation

This set of hypotheses were informed by [18] who stated that identifying scenarios leading to severe impacts on the company's reputation, assets or financial position is very important. As a way of responding to this need, this study introduces RR as a practical solution in identifying scenarios leading to severe impacts while at the same time providing a common ground to optimize both inventory and profit making ambitions. For the specific indicators of these two constructs, refer to Section 2.2 (challenges above).

Hypothesis 16: *Manmade risk ranking has positive effects on BCM*

Hypothesis 17: *Natural risk ranking has positive effects on BCM*

Hypothesis 18: *Manmade risk ranking has positive effects recovery time*

Hypothesis 19: *Natural risk ranking has positive effects recovery time*

3. Research Method

3.1. Smart PLS

In this study, SmartPLS was used to analyze the data. Considering the data and model characteristics, the algorithmic properties and model evaluation issues the Partial least Squares Structural Equation Modeling (PLS-SEM) approach (Smart PLS 2.0 statistical software package) was used over Covariance-Based Structural Equation Modeling (CB-SEM) approach. This is so because of several benefits PLS-SEM offers, benefits in terms of data size, distribution and algorithm properties. For instance, small number of minimum observations are applicable for analysis [4] was ideal for a study that had 75 number of observations valid for analysis. Smart PLS 2.0 does not account for any distribution, thus bootstrapping resampling technique was used to get t values [6, 20]. Missing data in a questionnaire exceeding 15% was removed, while observations containing less than 15% of missing data was treated using a group average method. The questionnaire adopted a 5 point Likert-type scales ranging from 1 = strongly disagree to 5 = strongly agree.

3.2. Data Collection Policy and Procedure

Since the questionnaire was in Japanese, questionnaires, which were sent to Europe, the US and other Asian countries were translated to English language and a batch sent to Chinese companies, were translated into Chinese language and the translations were verified. The pilot study was done by sending questionnaires to some Japanese companies. Some modifications were introduced to the initial questionnaire before large-scale data collection.

3.3. Results and Discussion

3.3.1. Model Testing and Results

Common criteria to evaluate reflective measures of PLS path models are the average variance extracted, the composite reliability and the communality (Stone-Geissers Q2) [4]. The results of these measures are presented in **Table 2**. Measurement models assessment was done by evaluating internal reliability and validity. The two traditional criteria for evaluating the two are Cronbach's alpha and composite reliability. All latent variables have values above suggested thresholds [17] of 0.7 of Cronbach's alpha and above 0.7 of composite reliability. Average variance extracted (AVE) value of 0.5 or higher is considered acceptable as it indicates that the latent variable explain more than half of its indicator variance [12]. Considering the values in **Table 2**, we can conclude that all the measures are well above the required minimum thresholds and acceptable.

Fornell-Larcker criterion was used for evaluation of discriminant validity of the latent variables (uniqueness of the latent variable), following recommendations by [12], we performed Fornell-Lacker analysis **Table 3**. This criterion compares the square root of the AVE with the latent variable correlations. The logic of this method is based on the idea that a construct shares more variance with its associated indicators than with any other construct.

4. Discussion

The results analysis showing both the direct and total effects are presented in **Table 4**.

Table 2. Measurement assessment.

	AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality
Business Continuity Management	0.667	0.9231	0.7671	0.8998	0.667
Business Impact Analysis	0.6044	0.9131		0.8874	0.6044
Comparative Advantage	0.8688	0.9298	0.2934	0.8489	0.8688
Company Size	0.8046	0.925		0.8788	0.8046
Manmade risk ranking	0.7884	0.8817	0.3405	0.7319	0.7884
Natural risk ranking	0.5525	0.8595	0.2074	0.8022	0.5525
Recovery time	0.6725	0.8911	0.3858	0.8383	0.6725
Supply Chain cooperation	0.7617	0.9274	0.5345	0.8952	0.7617

Table 3. Latent variable correlations (calculation with Smart PLS 2.0).

	Business Continuity Management	Business Impact Analysis	Competitive Advantages	Company size	Manmade Risk Ranking	Natural Risk Ranking	Recovery time	Supply Chain Cooperation
Business Continuity Management	1							
Business Impact Analysis	0.8409	1						
Competitive Advantages	0.4019	0.2292	1					
Company size	0.0943	0.0043	0.3264	1				
Manmade Risk Ranking	0.4902	0.3833	0.3097	0.2053	1			
Natural Risk Ranking	0.374	0.3705	0.2027	0.1163	0.2377	1		
Recovery time	0.6014	0.4997	0.245	0.1058	0.2734	0.258	1	
Supply Chain Cooperation	0.7606	0.7209	0.1997	0.1202	0.5661	0.4449	0.5371	1

4.1. Hypothesis 1& 2 *[Not Significant]*

As expected, big company size has positive effects on both man-made and natural risk ranking. However, these positive effects are not significant.

4.2. Hypothesis 3 *[Not Significant]*

Indeed, this hypothesis proved to be positive but was not significant. This could be because a well-assembled management team can develop a very good and BIA policy regardless of the size of the company. Some small companies are known to be more efficient because of little bureaucratic administration involved, while some big companies are known to be inefficient and usually takes long to change due to the bureaucracy involved.

4.3. Hypothesis 4 *[Not Significant]*

As expected, big company size has positive effects on Supply Chain Cooperation, however, this hypothesis is not significant. A possible explanation could be that large companies face more challenges due to their extensive and complicated supply chain network. Once a company has many companies in its supply chain network, its risk of disruption significantly increases making it highly vulnerable. On the other hand [14] explains that small companies have resource limitation to develop a resilient supply chain network. In the end, the relationship between big company size and Supply Chain Cooperation is not significant, though positive.

4.4. Hypothesis 5 and 6 *[Significant]*

As expected, Supply Chain Cooperation has significant positive effects on risk ranking (both manmade *** and natural **: Asterisk indicates significant levels denoted under **Table 4**. Note $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$). These results are pivotal in understanding the most effective and efficient way to handle risks, be they man-made or of nature.

In this regard, we refer to the works of [2] who concluded that a cooperative network will not only eliminate risks but promotes companies' development.

4.5. Hypothesis 8 *[Significant]*

We also realize that a company that achieves higher Supply Chain Cooperation also achieves higher BCM. The direct effects indicate a weak (*) significant level while total effects showed a strong significant level of (***). A possible explanation to this relationship could be because, normally a cooperative supply chain network takes care of the risk as in hypotheses 5 and 6, which is a crucial aspect to be handled in order to develop a BCM that can withstand a serious or intense disruption.

4.6. Hypotheses 7 and 9 *[Not Significant]*

Supply Chain Cooperation's relationship with recovery time and competitive advantages was positive relationship, though not significant. A possible explanation could be that the effect of supply Chain Cooperation on recovery time and competitive advantages is only fraction of other

Table 4. Parameter estimation (calculation with Smart PLS 2.0).

	Direct effects					Total effects				
Hypotheses	Original Sample	Sig Level	Standard Deviation	Standard Error	T Statistics	Original Sample	Sig Level	Standard Deviation	Standard Error	T Statistics
1	0.1385		0.0972	0.0972	1.4246	0.2081		0.1066	0.1066	1.9523
2	0.0615		0.1239	0.1239	0.4963	0.1048		0.1383	0.1383	0.7573
3	0.005		0.1397	0.1397	0.0358	0.005		0.1397	0.1397	0.0358
4	0.1186		0.0829	0.0829	1.4307	0.1222		0.1436	0.1436	0.8511
5	0.5706	**	0.1669	0.1669	3.4195	0.5706	***	0.1669	0.1669	3.4195
6	0.349	**	0.1363	0.1363	2.5602	0.349	**	0.1363	0.1363	2.5602
7	0.2597		0.2417	0.2417	1.0745	0.3463		0.1979	0.1979	1.7503
8	0.2428	*	0.0989	0.0989	2.4549	0.3069	***	0.0904	0.0904	3.3968
9	-0.2388		0.144	0.144	1.659	0.0073		0.1504	0.1504	0.0484
10	-0.0713		0.2741	0.2741	0.2601	0.5016	***	0.1066	0.1066	4.7035
11	-0.2347		0.1525	0.1525	1.5395	0.2272	*	0.1065	0.1065	2.1323
12	-0.0295		0.1785	0.1785	0.1653	0.3818	**	0.1091	0.1091	3.499
13	0.1169		0.1419	0.1419	0.824	0.3685	***	0.1023	0.1023	3.6027
14	0.6205	***	0.0796	0.0796	7.7997	0.8405	***	0.0391	0.0391	21.5247
15	0.7208	***	0.0649	0.0649	11.1042	0.7208	***	0.0649	0.0649	11.1042
16	0.103		0.0687	0.0687	1.4996	0.103		0.0687	0.0687	1.4996
17	0.0154		0.0763	0.0763	0.2015	0.0154		0.0763	0.0763	0.2015
18	-0.1098		0.1286	0.1286	0.8541	-0.0552		0.131	0.131	0.4212
19	-0.0212		0.1172	0.1172	0.1807	-0.013		0.1209	0.1209	0.1077

Note; *$p<0.05$, **$p<0.01$, ***$p<0.001$

important aspects of BCP like BIA and RR. Therefore, SCC factor's impact on these two success factors limited.

4.7. Hypotheses 10 and 11 *[Significant]*

Contrary to the above scenario, BIA has a significant positive total effects on recovery time (***) and positive predictive impacts on competitive advantages (*), suggesting that companies that achieve higher BIA also achieve higher competitive advantages. This suggests that BIA has more effects than Supply Chain Cooperation in as far as recovery time is concerned. Whereas companies that achieves higher BIA also achieves higher competitive advantage. We also note that BIA has stronger effects on recovery time than competitive advantages. This could be because competitive advantages has more factors constituting it whereas recovery time is a single factor concerned with the aspect of time, thus easy to establish recovery time association with other factors than it is with competitive advantages.

4.8. Hypotheses 12 and 13 *[Significant]*

The total effects of BIA on both manmade and natural risk ranking is positive and significant (**) for manmade and (***) for natural risk ranking. A possible explanation could be that BIA report informs and organization about potential risks and the organization responds accordingly. We think that risk ranking is an excellent way to accomplish this mission. We also note that BIA significance is relatively weak in manmade risk ranking than in natural risk ranking. A possible explanation could be that most of the companies avert any potential risks facing their organization, hence BIA having a moderate impact on manmade risk. However, BIA strongly affects natural risk ranking because such risks are usually outside the companies control in the process been affected more by BIA.

4.9. Hypothesis 14 *[Significant]*

One of the strongest positive relationship in this study is that BIA has a positive impact on BCM at (***) in both the direct and total effects. BIA report is very crucial in the BCM formulation as it the foundation of a relevant BCM and this relationship confirms what we have expected in this study.

4.10. Hypothesis 15 *[Significant]*

BIA has (***) positive impact on Supply Chain Cooperation in both the direct and indirect effects as expected. We are of the view that BIA report identifies any impacts within and outside the company. Therefore, SCC is analyzed by this report as an 'outside' the company factor, making this relationship very significant.

When employing the bootstrapping techniques, Original Sample (O) denotes the original estimate of outer loadings. The original sample is then divided by the bootstrap standard deviation of that outer loadings and the results provides its empirical t value displayed in **Table 4**.

Direct effects measures direct impacts between 2 variables, while total effects calculate the effects that different interaction among different variable/ constructs have on a construct, i.e. Outer loading is a coefficient between indicators and latent variables (constructs). Whereas Coefficients between constructs/latent Variables are called path coefficients.

4.11. Hypotheses 16 and 17 *[Not Significant]*

Both risks (manmade and natural) have very important contribution to BCM as indicated by the results in **Table 4**. However, the relationship is insignificant. This might be because even though some companies with high risk ranking usually develops a good BCM program suited to their conditions, such a good BCM program is not only limited to high risk ranking companies as some companies with lower risk ranking can develop a good BCM well suited to their conditions.

4.12. Hypothesis 18 and 19 *[Not Significant]*

Contrary to our expectations, both natural and manmade risk ranking has negative effects on recovery time. This might be because when risks are high, frequency of disruption will be high resulting in constant challenges to recovery time and possible delays. We also note that management input plays a pivotal role in combating impact that high risk can bring.

5. Conclusions

- Big company size has positive but insignificant impacts in lowering manmade risks and natural risks a company faces (**Table 3**).
- Big company size does not significantly influence a good BIA status and Supply Chain Cooperation (**Table 3**).
- Our original term (Supply Chain Cooperation) plays a pivotal role in the study as it has strong positive effects on both natural and manmade risk ranking and BCM. Therefore, SCC can be utilized to lower company risks and enhance the overall BCM efficiency (**Table 3**).
  Even if a company may rank very high in terms of risks, the effect of such a risk is significantly associated with BCM. Perhaps, this underscore the importance of management in averting some risk effects. A robust BCM can be a very powerful risk averting management engagement
- BIA's contribution to the development of BCP, BCM and the outcome is the most significant among all BCP factors. BIA has significant impacts on recovery time and predictive impacts on competitive advantages, BCP factors (natural and manmade risk ranking & Supply Chain Cooperation) and BCM (**Table 4**).

Acknowledgements

This paper has been produced by the Grants-in-Aid for the Scientific Research program (KAKENHI), which is supported by the Japan Society for the Promotion of Science (JSPS). We express our gratitude to JSPS.

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- A. L. Montshiwa and A. Nagahira, "Impacts of Business Continuity Management (BCM) on Automobile Parts Makers against Natural Disaster Events," J. of disaster research, Vol.10, No.6, pp. 1091-1098.

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1979- Investment Bank of Japan
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2002- Professor, Graduate School of Engineering, Tohoku University

Selected Publications:

- B. Verworn, C. Herstatt, and A. Nagahira, "The Fuzzy front end of Japanese new product development projects – impact on success and differences between incremental and radical projects," R&D Management, Vol.38, No.1, pp. 1-19, 2008.

Academic Societies & Scientific Organizations:

- Institute of Electrical and Electronics Engineers (IEEE)
- Academy of Management (AOM)
- Academic Association for Organizational Science (AAOS)

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2009- Chairman of the Society for Diffusion of Low-Emission Vehicles in Osaka supported by Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and a member of the board of directors at several academic societies
2012-2013 Visiting Researcher at Institute for Manufacturing and a Visiting Fellow of the St Edmund's College at University of Cambridge

Selected Publications:

- S. Ishida and S. Furusaka, "Drop shipment-type Wooden Housing Projects Utilizing Locally-produced Lumbers: Determination of Project Leaders," Int. J. of Business and Systems Research, Vol.1, No.1, pp.29-46, 2007.

Academic Societies & Scientific Organizations:

- Architectural Institute of Japan (AIJ)
- IEEE Engineering Management Society
- International Joseph A. Schumpeter Society
- International Society for Professional Innovation Management (ISPIM)
- Japan Association for Management Systems (JAMS)
- Japan MOT Society
- Japan Society for Information and Management (JSIM)
- Japan Academic Society for Ventures and Entrepreneurs (JASVE)
- Japan Society for Science Policy and Research Management (JSSPRM)
- Japan Society of Strategic Studies (JSSS)