

Sustainability Consciousness Dimensions for Achieving Sustainability Performance in Thailand: Role of Supply Chain Resilience

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Abstract— Organization can never achieve sustainability until its employees not develop such consciousness about sustainability. Such consciousness includes knowingness, attitude and behavior regarding sustainability which can affect sustainability performance. This research has seen the impact of supply chain resilience on sustainability performance in mediating role of sustainability consciousness in Thailand's manufacturing sector. Managerial employees have been taken as unit of analysis as data has been collected from them through questionnaire. Respective data was then analyzed by applying CFA and SEM through AMOS and data screening through SPSS. Results have confirmed that supply chain resilience has significant impact on sustainability performance through sustainability consciousness dimensions. This study is unique and novel due to adding sustainability performance as new outcome of resilience driven sustainability consciousness. Implications of this study will add empirical evidence about sustainability consciousness and performance linkage and will also facilitate Thailand's manufacturing industry to train their employees to develop sustainability consciousness in them. Future research indications and limitations have also been given in this study.

Key Words: Supply Chain Resilience, Sustainability Consciousness, Sustainability Behavior, Sustainability Knowingness, Sustainability Attitude and Sustainability Performance

1. Introduction

Performance of any company tells about the present condition of the firm; how well it is going or how bad it is. Performance depends upon the efficiency of an organization; how well it is managing its resources and at how much low cost [1]. Profits and productivity are some other factors to determine the performance of any organization. The company having higher productivity and higher profits will be having good performance and vice versa [28-29]. There are many operations of a firm that are taking place through collaboration of different people, so in this case to define the collaborative performance, the performance of each of them is considered [2].

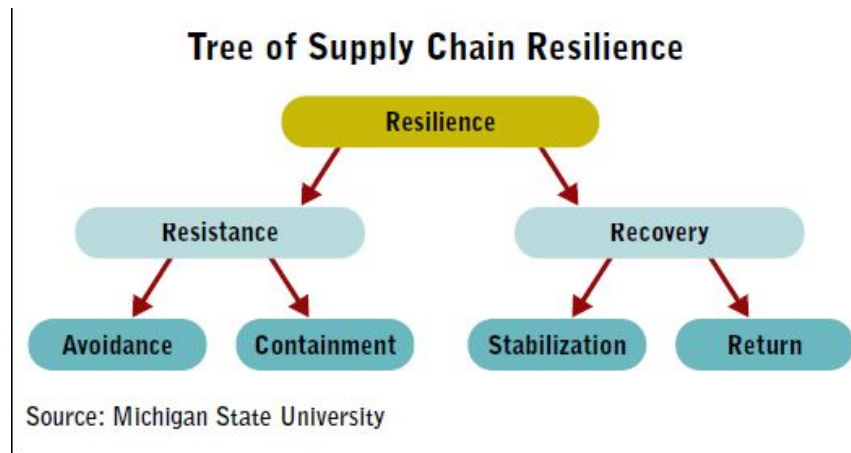


Figure 1: Supply Chain Resilience

Figure 1 shows that supply chain resilience has two dimensions i.e. resistance and recovery. Resistance refers to the efforts to minimize the impact of change and recovery refers to the coming back to initial state after disturbance. Supply chain resilience refers to the coming back of a particular process to its actual or initial state or going to a new state altogether, when it is disrupted [3]. In any organization, there are certain processes taking place every time, which may include manufacturing processes and organizational processes. Sometimes these processes may get disrupted because of one reason or the other. These disruptions put a break on the whole system [4]. So it is very important to bring those processes back to their normal condition or entirely adopt a new form. Disruptions can be divided into different kinds. Internal disruptions usually cause disturbance in the manufacturing processes. External to firm but internal to supply chain disruptions have their impact on demand and supply functions [5]. Similarly, totally out of the network disruptions affect the overall environment. These disruptions must be dealt carefully with précised policies and approaches otherwise the disruptions usually have adverse effects on the organization [6].

Consciousness has no single definition in psychology; it may be the sense of being aware that he is distinct from others, it may be the sense of being awake and attentive, it may be the sense of having knowledge about something. Sustainability consciousness can be defined as the knowledge and experience about the sustainability process [7]. Sustainability consciousness can be subdivided into further categories i.e. sustainability knowingness,

sustainability attitude and sustainability behavior. Sustainability consciousness refers to the state of mind in which a person has some beliefs, thoughts, values and ideas in his mind [8]. Belief is actually something that a person thinks is true. Sustainability attitudes include emotions, feelings and mood of an individual. This depicts the negative or positive thinking of an individual about something, person or problem. Sustainability attitude is somehow also related with knowingness. The last category, sustainability behavior means the response of an individual in favor or against something, person or idea. All these types of consciousness sustainability are affected by supply chain resilience and they may make the performance of an organization better or worse [9].

Supply chain resilience improves the sustainability consciousness which in return improves the performance of any organization [10; 29]. This is necessary because the profit and productivity growth depends upon the performance of the firm. Better the performance, higher the profits and productivity and vice versa. However, in Thailand, the supply chain resilience is facing issues which ultimately affect the company's performance. This condition, in addition to Thailand, prevails in other developing and under developed countries as well [11]. This has dramatically reduced the overall productivity and net revenues in Thailand and other countries. If this problem remains as it is, it will create more difficulties for the organizations due to lack of performance. So, this is very much necessary to overcome this problem as soon as possible in order to avoid its adverse effects. Many studies have shown

the performance of organizations in Thailand and fewer studies also have shown that how the supply chain resilience affects the organizational performance in Thailand [12]. But no studies have shown the mediating effect of sustainability consciousness between supply chain resilience and overall company's performance. A research paper has recommended doing studies to check the mediating role of knowingness, attitudes and behavior sustainability between the above mentioned two variables [13]. The basic objectives of this research are as follows:

- Analyze the significant impact of supply chain resilience on sustainability performance in organizations in Thailand
- Analyze the significant mediating role of sustainability consciousness between supply chain resilience and sustainability performance in organizations in Thailand
- Analyze the significant mediating role of sustainability knowingness, attitudes and behaviors between supply chain resilience and sustainability performance in organizations in Thailand

Thailand is making progress by leaps and bounds in all of its sectors including manufacturing, services, tourism, agriculture etc. At this progressing stage it is very important that each and every aspect in the betterment of these sectors must be entertained [14]. As we know that there are various processes going on in any firm or organization which require careful monitoring. Any negligence may result in unfavorable circumstances. These researches provide theoretical significance to all the actors involved in the progress of organizations and firms in Thailand. These researches assist them to use the business practices which are helpful in the increase in productivity and profits [15]. These practices include supply chain resilience as a very important factor that improves the sustainability consciousness of employees which in return boost their performance which is ultimately beneficial for the whole organization. It is also noticeable that the govt. of Thailand is not unaware of these aspects. Govt. officials are equally interested in the better productivity and profits of the country. So they are devising favorable policies for the improvement of supply chain resilience to improve performance [16]

2. Literature review

2.1. Complex Adaptive Systems Theory

Supply chain resilience (SCR) is a chain that is used in different events, in different practices and in different situations. Studies [17] believe that SCR sometimes has a positive impact on the event management while sometimes it can have a negative impact on the chain management system. However, with the help of supply chain resilience model on which basis an inductive theory can be built to solve and evaluate certain factors related to SCR management. Many companies across the globe identify various patterns of management to build a theoretical and testable supply chain content analysis and through which they can develop conceptual approaches that is working behind the whole concept of SCR. Theory frame that develops an understanding regarding this topic of research, depends on the function and practices of SCR, for which research have proposed a Complex Adaptive Systems (CAS) theory [18], which can be considered as an appropriate and adjustable lens that can easily identify the liability, flexibility, accessibility, and creation pattern of redundancy related to the formation and collaboration of supply chain, relating it with moderate improvements in the supply chain agility. This theory draws some future implications that include: adaptation and co evolution, non-linearity, self-organization and emergence, these give directions for SCR about its future objectives along with its future implications. There are two emerging disciplines on whose basis SCR seems to be highlighted as a source of integrator. These two disciplines are risk management and supply chain management; they also define the perspective of SCR more appropriately than number of other disciplines. The practical implications of supply chain resilience along with its integration perspective includes its capability of providing an efficient response towards the disrupt situation, with the help of SCR, management can negate the negative or adverse effects which can be faced by the developing revenues or costs rate of business of an organization. SCR has yet to be researched from the logistic point of view, because it provides a vast platform for the researchers to investigate about supply chain integration as well as supply chain resilience.

1) Supply Chain Resilience Relationship with Sustainability performance

Studies by ref [6] believes that SCR is a huge topic and it provides a wide scope for the researchers to research about it, however there is still little work done on the implications and limitations of SCR performance over the years, to completely understand the basic fundamental concept of SCR along with supply chain management. Sustainability consciousness is related to the development of SCR because, it elaborates the ides of individual's experience and having awareness regarding the function of sustainable development. CAS theory provides a theoretical ground and empirical scale on which study can measure the sustainability consciousness and its effect on the relationship of SCR and sustainability performance (SP). SCR is held responsible for evaluating citizen's responses to stakeholder's engagement and development of sustainable policies. SP [4] act as a theoretical foundation for the concept of defining the perspective of sustainable consciousness moreover with environmental consciousness. Though, sustainable development is defined as the basic concept for the policy makers and decisions makers. Management team also work on the basis and policies designed by SP to increase the rate of productivity and to gain competitive advantage at large scale with the help of SCR. Theory also explain about the positive impact of SCR on SP due to management efficiency, quality control, receiving funding from different companies and organizations and generating revenues. Sustainable development is responsible for meeting the needs and requirement of people by involving the role of SCR which helps in improving the quality of human life, coping with the societal and environmental pressures. SCR is considered as a popular benchmark of the society which drives the most worldwide efforts to accomplish social, economic and environmental goals that will further enhance the impact of SCR on SP. SP deals with economic or environmental dimensions, which also focuses on social dimensions that includes cultural norms and behavior. These dimensions reflect it impact on the function of SCR in the environment. Thus, the following hypothesis is proposed:

H1: Supply chain resilience has a significant impact on sustainability performance

2) Mediating Role of Sustainability Knowingness between Supply Chain resilience and Sustainability performance

As per past literature [19] analysis, sustainability knowingness is also knows as sustainability consciousness, which works and function according to the available environment, ecological system and management perspective. Consciousness and knowingness both develops from a same set of thoughts or school of thought that accomplishes the effect of a mediator between two important variables like SCR and SP. Theory of CAS configures the significant impact of Sustainability knowingness (SK) over SCR [14] and Sustainability performance. SK or SC involves those concepts, perceptions, feeling and thinking that enhance experiences, abilities and capabilities. Sustainable knowingness is also associated with sustainable development which includes cultural and societal norms, beliefs and viewpoints. Three major dimensions related to environment, societal and ecological are categorized within the study of SK that further enhances the relationship between SCR and SP. SK generate growth and set up a welfare system for people which might leads to poverty reduction and establishment of employment for the unemployed, while maintaining commercial responsibilities and performance. SK is always organized for long term basis through which each and every person can be facilitated. SK prevent the degradation of the environment due to the in availability of resources, however SK give rise to the efforts made by SCR and SP within the society and its related environment. Thus, the following hypothesis is proposed:

H2: Sustainable knowingness has a significant mediating role between the relationship of Supply chain resilience and Sustainability performance.

3) Mediating Role of Sustainability Attitude between Supply Chain Resilience and Sustainability Performance

According to researches [20], attitude change also leads to sustainable development of the organization, environment, ecological system or social behavior. Change in attitude also refers to the change in feelings and perspectives towards the issues of the environment, real life, society and the economy. Attitude is the second name for developing concerns while through attitude or concerns one can relate itself with someone else feelings and attitude within

the environment or situation. Attitude can be of both type good and bad, therefore its effect can also be both types positive or negative. So when attitude is good towards something than that means its effect will be positive, however if attitude is bad than its effect will also be negative. Theory of CAS believes that use of positive sustainable attitude can produce significant impact on the development of SCR and SP. Supply chain is quite beneficial to the sustainable attitude which is further beneficial to sustainable development. SA develops pro-sustainable actions at both individual and societal level that will for instance understand the relation between the three particular dimensions which can have [21] a significant impact on SCR performance and SP capabilities. Theory of CAS produces holistic approach to develop a new agenda that integrates the capabilities of sustainable attitude to ensure the promotion of three-dimensional values at global level. Thus, the following hypothesis is proposed:

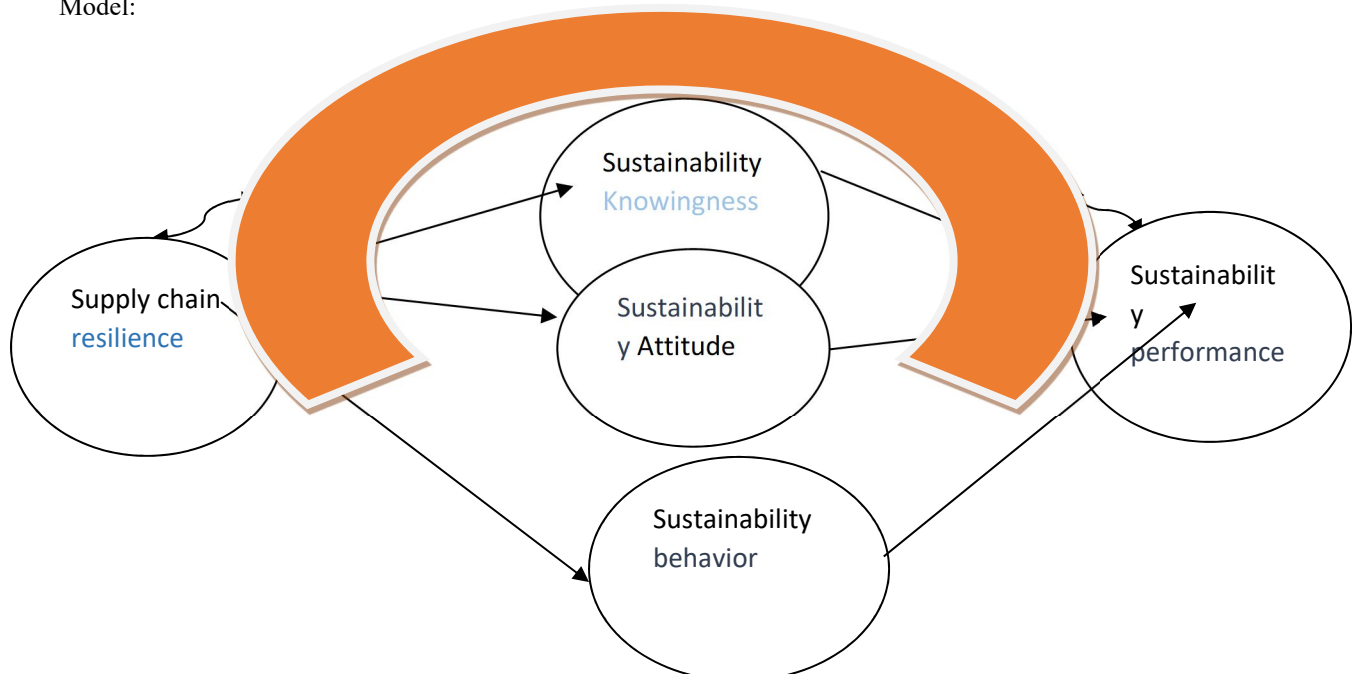
H3: Sustainable attitude has a significant mediating role between the relationship of SCR and SP.

4) Mediating Role of Sustainability behavior between Supply Chain resilience and Sustainability performance

Sustainable behavior is considered as a building block for sustainable development of the society, environment, ecological system and cultural values. Sustainability behavior is basically required to encompass people values, beliefs, norms, sense of Model:

responsibility which will provide a sense of wellbeing to all living beings living in a society. As because of sustainability of behavior everyone can be benefitted from the wellbeing which includes both present and future generations. Theory of CAS links sustainable behavior with the field of psychology, in which human minds are being studied along with human perceptions and human feelings. Though studies by [22] believes that to understand the environment change and to adapt the environment fluctuations, it's necessary for humans to change behavior more often. This change behavior can enable humans to protect the changing environment along with the changing culture. To make behavior sustainable different behavioral strategies and dimensions are followed which gradually play a role of a mediator between the affectivity of SCR and efficiency of sustainable performance related to the changing environment. Community engagement [23] tools give a huge hype to the development of sustainable behavior, which are perhaps designed in such a way that we can attain best results from the changes behavior culture. Sustainable behavior builds up a gap between the relationship of SCR and SP, which will definitely generate sustainable outcomes for the development project regarding sustainable behavior change. Thus, the following hypothesis is proposed:

H4: Sustainable behavior has a significant mediating role between the relationship of SCR and SP.



3. Research Methodology

3.1. Population and Sample Selection Criteria

This research has been conducted in order to check the role of supply chain resilience in achieving the sustainability performance. Relationship between supply chain resilience and sustainability performance has been facilitated with intervention of sustainability consciousness dimension such as sustainability knowingness, sustainability attitude and sustainability behavior. Researcher has been selected the Manufacturing sector of the Thailand for observing the impact of the study. Sample has been selected from automotive industry, textile industry and agriculture industry of Thailand because these are top rated manufacturing industries in Thailand and have fully developed supply chain systems. Researcher selects managerial employees, official officers as the respondents of the study as they clearly illustrate the about the role of sustainability consciousness in achieving sustainability in supply chain performance. Sample size has to be selected carefully as it is most issuing point of sampling because Hazen et al. (2015) reports that sample size has to be large if covariance-based SEM approach has been used for the evaluation. Klein (2015) idea has been used by researcher in sample size selection which entails that number of questions* 10 generate exact figure of sample size. Almost 300 questionnaires have been distributed among the

respondent, out of which 289 responds have been collected. After deletion of invalid responses, 289 respondents accurately responded about the impact of study.

3.2. Data Collection Technique

Validity has been assessed by AMOS by examining different type of criteria. Convergent validity has been assessed by examining three criteria which entailed that (1) items loading (λ) which has to be greater than 0.70 because its values were strong above 0.70, (2) composite construct reliability and its threshold range is greater than specific limit 0.80 and (3) average variance extracted which has to be higher than 0.50, because its values were strong at 0.58 or at above. Different criterion has been examined for the assessment of discriminant validity, which states that as per [21] square root of AVE has to be greater than all other correlated constructs. As far as reliability

concerned, it has been assessed by SPSS and criterion examined for it states that, Cronbach's α and its threshold range is higher than 0.70. Common bias has been reduced by performing Harman's single factor test, which has been conducted by two type of analysis approach (1) exploratory factor analysis and (2) confirmatory factor analysis. The reason for origination of common bias method is that respondents used similar measures for the evaluation variables which have been recommended by common rater. Every study has some novelty on the bases of addition of explanatory variables that's why some modification has been required in measures but due to neglecting risk of common bias has been originated. Set of variables for this study includes supply chain resilience, sustainability consciousness dimensions and sustainability performance. In Harman's one factor analysis, EFA approach has been used in order to check whether most of constructs interpreted by one factor. According to results, different factors has been used for the interpretation of most of constructs such as 86% of variance accounted for by factor solution and 14% of variance accounted for by one factor. Further, CFA approach has been used in order to confirm the inexistence of risk of common bias.

3.3. Hypothesis Testing

Standardization and significance of hypotheses has been tested in order to report which relationship has been accepted or which relationship has been rejected. Structure equation model has been used for hypothesis testing and it runs on AMOS. As the AMOS used covariance-based approach in SEM that's why correlated hypotheses have been tested. In this research study, researcher tried to observe the impact of supply chain resilience on sustainability performance, in mediating role of sustainability consciousness dimensions through SEM. After that, researcher reports the acceptance or rejection status of hypotheses by analyzing the significance of relationship and through direct, indirect and total effect.

3.5. Measures

SCR was measured with the scale developed by [22], with the help of five items that were taken on a five-point Likert scale. Then SK was assessed by the scale developed by the researcher [21] and here four items

were taken on a five-point Likert scale and were assessed. SA and SB measured by a scale developed by [23], four items were taken and measured on a five-point Likert scale. Finally, SP was measured by the scale developed by [24] and five items were taken which were measured on a five-point Likert scale.

4. Empirical Findings:

For research purpose, data was collected from 289 employees from the manufacturing sector of Thailand and was included in the analysis. It is important to check the reliability, validity and normality of the present data before doing further analysis, for which

pre requisite analysis is done. According to the demographics of data, 124 of the total employees from which the data was collected were males and other 174 were females. The educational qualification of 23 employees was graduation, 143 had post-graduation, 122 had master's degree and remaining 10 were having other qualifications. Coming towards the age, maximum employees were young having age between 21 and 30. 42 employees were 31-40 years old, 9 employees had age between 41 and 50 and remaining 2 employees were above 50 years.

4.1. Descriptive Statistics:

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Std. Error
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	
SCR	298	1.00	5.00	3.5517	1.12508	-.746	.141
SKW	298	1.00	5.00	3.5973	1.06644	-.887	.141
SAT	298	1.00	5.00	3.4526	1.11243	-.587	.141
SBE	298	1.11	5.00	3.5354	1.06641	-.792	.141
SPR	298	1.00	5.00	3.4052	1.05211	-.276	.141
Valid N (listwise)	298						

From Table 1, descriptive statistics of the collected data shows that there is no outlier in the data because the minimum and maximum values are in 5 points likert scale. Moreover, the values of skewness depict the normality of data for further processing, as the

values are between -1 and +1, which is the threshold range for normality assumption. From this description, we can conclude that the collected data is completely normal and qualifies for moving into further analysis.

4.2. Rotated Component Matrix:

This is used to check the factor loading of all the indicators included in the data. Following are the values for factor loading of indicators of our data:

Rotated Component Matrix^a

	Component				
	1	2	3	4	5
SCR1				.766	
SCR2				.800	
SCR3				.803	
SCR4				.824	
SCR5				.821	
SKW1		.670			
SKW2		.753			
SKW3		.831			
SKW4		.831			
SKW5		.827			
SKW6		.810			
SKW7		.820			
SKW8		.826			
SKW9		.818			
SAT1	.827				
SAT2	.859				

SAT3	.865				
SAT4	.866				
SAT5	.870				
SAT6	.880				
SAT7	.848				
SAT8	.813				
SAT9	.798				
SBE1			.797		
SBE2			.833		
SBE3			.858		
SBE4			.799		
SBE5			.750		
SBE6			.817		
SBE7			.847		
SBE8			.799		
SBE9			.766		
SPR1					.690
SPR2					.721
SPR3					.779
SPR4					.695

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

From Table 2 of rotation component of matrix, it is very clear that all the indicators have factor loading of more than 0.7, which shows that all of them are completely eligible for further hypothesis testing as the loading is in threshold range and a suitable order. In addition, it is clear that there is no cross-loading issue in the rotation component matrix table, which makes it further qualified for hypothesis testing.

The following table is used to measure the convergent and discriminant validity of the research variables. The result of both validities is as follows:

4.3. Convergent and Discriminant Validity:

Table 3. Convergent and Discriminant Validity

	CR	AVE	MSV	MaxR(H)	CBE	SCR	SPR	SKW	SAT
CBE	0.955	0.701	0.349	0.958	0.837				
SCR	0.951	0.794	0.349	0.977	0.591	0.891			
SPR	0.896	0.683	0.516	0.981	0.418	0.390	0.827		
SKW	0.963	0.745	0.346	0.987	0.507	0.588	0.570	0.863	
SAT	0.949	0.779	0.516	0.991	0.413	0.402	0.718	0.518	0.883

Table 3 of convergent and discriminant validity shows that the composite reliability of all variables is more than 70% and average variance extracted is more than 50%. Moreover, discriminant validity shows that loading of each variable is different from one another. So these validities show that the data is authentic as well as reliable.

4.4. Confirmatory Factor Analysis:

Confirmatory factor analysis is a test used to check the fitness level of hypothetical model of the research. Following are the values for each indicator for this study:

Table 4. Confirmatory factor analysis

Indicators	Threshold range	Current values
CMIN/DF	Less or equal 3	2.026
GFI	Equal or greater .80	.817
CFI	Equal or greater .90	.952
IFI	Equal or greater .90	.952
RMSEA	Less or equal .08	.059

Table 4 shows that all the current values of each indicator are within the threshold range. For example, the value of CMIN/DF is 2.026, which is less than 3, value of GFI is .817, which is greater than .80, CFI and IFI values are .952 each, which are greater than

.90 and finally the value of RMSEA is .059, which is less than .08. These values show that the hypothetical model is completely fit for use. The following figure is screenshot of CFA:

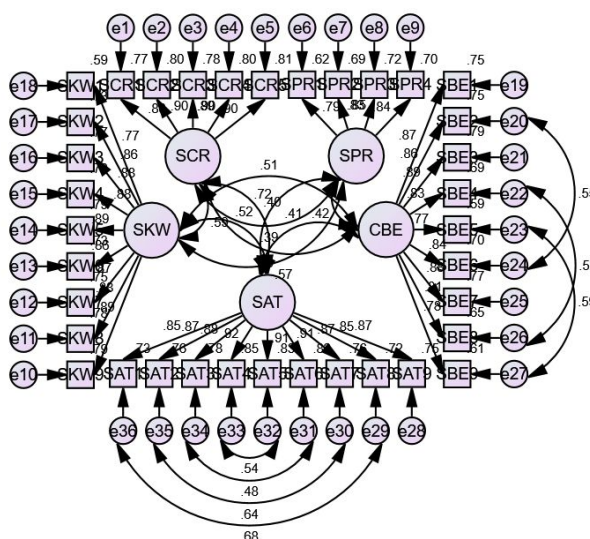


Figure 1: CFA

4.5. Structural Equation Modeling:

Structural equation modeling is a multivariate regression analysis which is used to confirm the

hypothesis made for research. This analysis gives direct and indirect regression tests simultaneously. Following table shows the results of SEM:

Table 5. Structural Equation Modeling

Total effect	SCR	SBE	SAT	SKW
SBE	.582***	.000	.000	.000
SAT	.384***	.000	.000	.000
SKW	.575***	.000	.000	.000
SPR	.382***	.081	.546***	.266***
Direct effect	SCR	SBE	SAT	SKW
SBE	.582***	.000	.000	.000
SAT	.384***	.000	.000	.000
SKW	.575***	.000	.000	.000

Total effect	SCR	SBE	SAT	SKW
SPR	-.028	.081	.546***	.266***
Indirect effect	SCR	SBE	SAT	SKW
SBE	.000	.000	.000	.000
SAT	.000	.000	.000	.000
SKW	.000	.000	.000	.000
SPR	.410**	.000	.000	.000

The first portion of the table, total effect, shows that the impact of supply chain resilience on sustainability behavior, sustainability attitude, sustainability knowingness and sustainability performance is significant. Table shows that with an increase in one unit of SCR, CBE increases by 58.2%, SAT increases by 38.4%, SKW increases by 57.5% and SPR increases by 38.2%. in the same way, impact of SAT and SKW on SPR is significant. However, the impact of SBE on SPR is insignificant. In direct effect, the

impact of SCR on SPR is insignificant so the first hypothesis will be rejected. In the last portion, indirect effect, there is indirect impact of SCR on SPR which means that with 1% increase in mediators (SKW, SBE and SAT), SPR will increase by 41%. We can conclude with this result that the three hypotheses showing the significant mediating role of SKW, SBE and SAT between SCR and SPR will be accepted. Following is the screenshot of SEM:

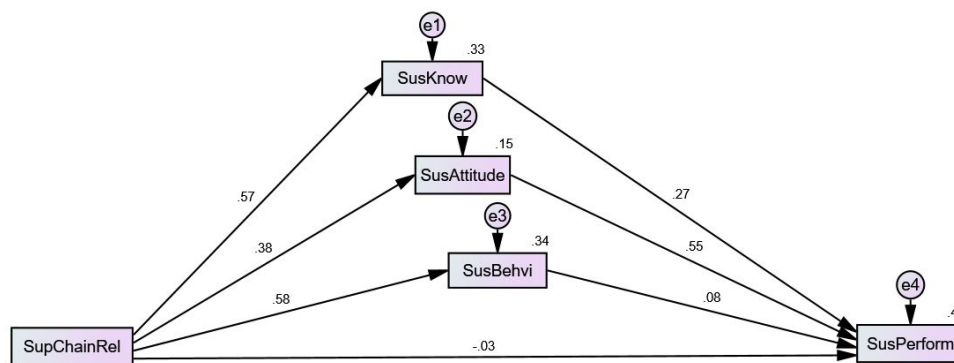


Figure 2: SEM

5. Discussion and conclusion

5.1. Discussion

The objective of this study was to know about the affiliation between Supply Chain Resilience (SCR) and sustainability performance (SP). The objective was also to know about the mediating role of sustainability drivers between SCR and SP. SCR drivers comprise of Sustainability Knowingness (SK), Sustainability Attitude SA, and Sustainability Behavior (SB) [24]. The proportional study suggested the following hypothesis, the very first hypothesis suggested that the relation between SCR and SP is positive and significant. This hypothesis is accepted. A researcher “George Malindretos” suggested that the resilience in the supply chain is circular and

crucial. And resilience is the reason for the increased capabilities of SP. The next hypothesis suggested that SK has a significant mediating role between SCR and SP [25]. This hypothesis was also accepted. According to the study of “Zach G Zacharia” examined that hoe OP and RO affected by the collaboration and performance between suppliers and buyers in the supply chain. This provides an organization competitive situation. The hypothesis number third recommended that the mediating role of SA between SCR. This hypothesis was also accepted. “Rodrigo Lozano” a famous French researcher suggested that the corporate sustainability drivers provide positive opportunities in adopting the changing environment which can prove beneficial for

the manufacturing industry [26]. Hypothesis number four suggested that the mediating role of SB has a positive impact on SCR and SP. This hypothesis is accepted due to its significant impact. "Robert F Lusch" stated in his research that positive SB can be proved significant if the organization is using its modern supply chain resilience methods with the goal of enhancing the SP [27]. This can be done if there is significant and positive integration between steps of the supply chain.

5.2. Conclusion

This study was conducted in Thailand. The main purpose of doing this research was to know about the impact of SCR on SP. The sustainability drivers played a crucial mediating role between SCR and SP. These drivers are SK, SA, and SB. The study was done by gathering information about the problem under study from the sample of three hundred people from the manufacturing sector of Thailand, 289 were valid responses. The method opted was the use of questionnaires for the collection of data. After collecting and analyzing the data research concluded that the role of sustainability drivers between SCR and SP is significant and the main impact of SCR on SP is positive.

5.3. Implications of the Study

This study increased the data and literature material of the variables under study. This research enlarged the importance of the SCR and SP. The people can have knowledge about the crucial mediating role of SK, SA, and SB between SCR and SP. The solution can be found in this research. Manufacturing sectors of Thailand can make the decision and they can make policies by reviewing this research. They can have significant knowledge and they can implement the knowledge in their own situations and solve them. The study can be in any other country in the world.

5.4. Limitations and Future Research Indications

The study was conducted in Thailand. This research targeted the manufacturing sector of Thailand. The size of the sample was very small, our study has only considered three hindered manufacturing sectors of Thailand. Future researchers can complete this study outside Thailand in other countries as well because companies of underdeveloped countries are facing the same situations. The sample could be large,

future reviewers can take more than 300 industrial sectors as a sample this may be better for them in terms of suitable and more correct data. The future researcher can use interviews, cold calling, feedback from the internet as a data collection tool because the only questionnaire is used in this research.

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