Coping Strategy to Counter the Challenges towards Implementation of Industry 4.0 in Thailand: Role of Supply Chain Agility and Resilience

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Abstract--- Industry 4.0 is emerging as one of the most modern supply chain and manufacturing practices. Unfortunately, there are many challenges at organizational, legal, strategic and technological fronts which are barring implementation of industry 4.0 in manufacturing sector of Thailand. Such challenges can potentially be coped through supply chain agility and subsequently supply chain resilience as both provide enough sustainability to overall organization that can take care of implementation of Industry 4.0. This study has been conducted to determine the impact of supply chain agility on organizational, legal, strategic and technological challenges in the way of implementation of industry 4.0. Furthermore, mediating role of supply chain resilience has also been checked in relationship between agility and challenges. A questionnaire survey has been used to collect the data from Thailand's manufacturing sector employees and the same data was then analyzed through structural equation modeling for hypotheses testing. Results have interpreted significant impact of agility on challenges in implementation of Industry 4.0 while mediating role of resilience have also been flagged significant in respective relationship. Novelty in this research was testing agility and resilience as predictors to resolve challenges for Industry 4.0. This study will help different sectors of economy in a successful transition towards Industry 4.0.

Key Words: *Challenges in Implementation of Industry 4.0, Supply Chain Resilience, Supply Chain Agility and Thailand*

1. Introduction

Organizational challenges are the most important challenges for industry 4.0 in Thailand. For sustainability of industry 4.0, companies need to improve the organization of their management, labor force, employees and organizational policies etc. Top management has very crucial role in the overcoming of these challenges so it must be focused to develop approaches to solve these challenges [1]. There are different dimensions of organizational challenges. Financial constraints refer to the requirement of lot of financial resources for the development of technology in industry 4.0. Management support is another problem to sustain industry 4.0 where managers fail to make the vision and mission of their companies for the employees. Lower levels of company processes understanding, reluctance and lack of spirit in adoption of new technology for the sustainability of industry 4.0 are some other dimensions of organizational challenges [2]. To cope with these challenges, management and leadership involvement is very important. Next important challenge faced by industry 4.0 is technological challenge. There is lack of smart production systems for data sharing protocol. In addition, the infrastructure and internet connectivity is very poor to make all the devices remain connected. Technology integration and data quality must be improved for betterment of industry 4.0 [3]. Then we have strategic challenges, which include lack of govt. support and policies. For the betterment of industry 4.0 it is very crucial that govt. must take serious interest for making better policies that may help in the sustainability of this industry. In addition, the benefits obtained from this industry are very unclear in Thailand, due to which lack of interest creates

problems. In this sector the department of research and development also needs improvement [4]. At last there are legal challenges, which are important because in industry 4.0 there is lot of very sensitive and confidential information which must be carried very carefully. So security must be improved and all the legal aspects related to information and data must be secured [5].

The key concept of agility of supply chain is how an organization responds to change in business environment. These changes may be of any nature, they may be changes in the processes of manufacturing [6], changes in management, changes to survive threats in business world and many more. These changes are mostly unexpected so we can say that agility is the ability of supply chain to react quickly to the unexpected changes in business word for customer satisfaction. We know that changes are part of business community and they come very often and sometimes they have serious impact on business activities. So, any organization must be ready every time with appropriate approaches and policies to overcome these changes. This is very crucial for the betterment of their organization [7].

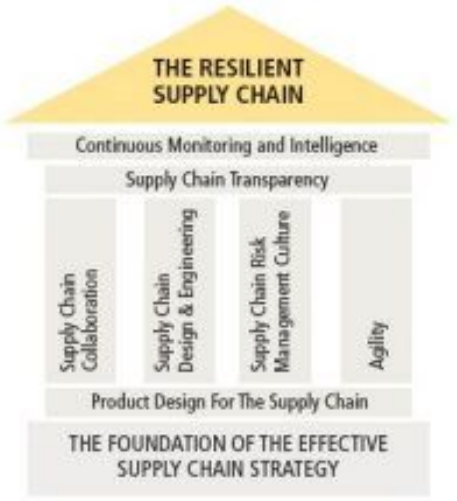


Figure 1: Supply Chain Resilience

Figure 1 shows different components of supply chain resilience. Supply chain resilience can be defined as the returning back of any process to its initial state or shift to a new one, when that process is seriously disturbed. We can say that the basic and key element of resilience is disruption [8]. Disruption can be of any type, internal to the firm disruption affects the manufacturing processes and risks. External to firm but internal to supply chain disruption affects supply and demand processes. Completely out of the network disruption affects the environment as a whole. Whatever the type of disruption is, the organization must have the required processes and techniques to overcome those disruptions for the betterment of the organization [9].

Supply chain agility has very crucial role in overcoming the challenges faced by industry 4.0. An organization knows how to overcome organizational, technological, strategic and legal challenges by making appropriate policies and adopting better approaches [10]. In Thailand, however, organizations are not taking interest in making these policies and as a result their industry 4.0 is facing different challenges [30]. They are stick to old and traditional business techniques and facing adverse consequences. These problems are not only confined in Thailand, many surrounding developing and under developed countries are facing these problems [11]. Thailand is facing severe losses because of not making their supply chain agility any better. If this issue remains unsolved, the industry 4.0 will be in very serious danger. So it is very important to solve this issue. This can be solved by developing better strategies and new improved policies to overcome these challenges. In past, although, some studies have been done to understand the challenges faced by

industry 4.0 in Thailand, very few studies show the impact of supply chain agility on these challenges [12]. Moreover, no study has been conducted to study the mediating role of supply chain resilience in this regard. A research paper on the same topic has recommended studying the mediating role of supply chain resilience between supply chain agility and challenges of industry 4.0 [13]. The study done in this research paper has following objectives:

- Analyze the significant impact of supply chain agility on challenges faced by industry 4.0 of Thailand
- Analyze the significant mediating role of supply chain resilience between supply chain agility and challenges faced by industry 4.0 of Thailand
- Analyze the significant mediating role of supply chain resilience between supply chain agility and organizational, technological, strategic and legal challenges faced by industry 4.0 of Thailand

Industry 4.0 has huge importance in Thailand as the country is under transformation of it economy and is moving towards modern and innovative ideas. All this transformation is being supported by govt. of Thailand under Thailand 4.0 policy [14]. Its govt. is supporting this shift by making new policies and strategies and Thailand is expecting to be an important investment point in Asia. Theoretic significance includes researches and studies on agility and resilience of supply chain. These researches have helped in making effective changes in industry 4.0 in Thailand [15]. Govt. also seems interested in making effective policies for the betterment of industry 4.0.

2. Literature Review

2.1 RBV and Agility Theory

Supply chain agility (SCA) and supply chain resilience (SCR) both are used as the antecedent for firm production and firm sustainability [29; 31]. There has been a theory that shows the development of firm production area with the help of the performance of SCA. Ref [16] believe that Agility has been identified as the source of one of the salient features of contemporary chain management. However, due to its developing importance there are still less developed theories available in this area of research. Theories and models regarding Agility depend on its related capabilities, practices and performance outcomes. Moreover, researchers use life science theory so that they can rigorously expand agility theory. Through these theories study focuses on the working and practices of agility performance that depend on the role of different managerial orientations. Literature suggest [17] that origins of agility as a business phenomenon can be traced back to the manufacturing competitiveness. Due to the construct of SCA that is considered as the multi-dimensional agility, market orientation and learning orientation are theorized to be antecedents to internal integration, external integration, and external flexibility which in turn lead to the SCA. To answer certain dependable questions through which the researcher can easily figure out the difference between dependent variable, independent variable and mediating variable along with its significant influence on each other including organizational challenges (OC), legal challenges (LC), strategic challenges (SC) and technological challenges (TC), the study focuses on certain relevant theoretical base of the Resource Based View (RBV) [18] of the firm, and the Relational View RV Theory [19] in order to address these questions along with finding the relationship among the variables. These theoretical evidences will drive the following hypothesis and will generally assist the theoretical model development.

1) Supply Chain Agility relationship with Organizational Challenges for Industry 4.0

According to study by [20] that construct a relationship between (SCA) and OC for the setting up of an industry 4.0 by forming a suitable theory of RBV that acts as a base which deals with certain challenges faced by firm performance or business productivity, that needs to be solved to improve the growth rate. According to RBV firm will develop the identification and assessment of internal strategic resources that contributes in finding the solution to Organizational challenges within a form to create and maintain a competitive advantage. Organizational challenges might include low growth rate, less productivity due to weak employee performance and decreasing level of supply chain resources that directly affect the performance of the firm. However, due to development in technology, firm associations

and firm competitiveness many alternatives are designed in order to meet the requirements of the industry 4.0. SCA works efficiently to draw multiple solutions so that challenges can be met beyond firm's boundaries and capabilities. Thus, the following hypothesis is proposed that:

H1: Supply chain agility has a significant impact on Organizational challenges for Industry 4.0.

2) Supply Chain Agility relationship with Legal Challenges for Industry 4.0

As per ref [21] that examines the firm determinants of SCA with the performance of LC for industry 4.0 depends on the firm sources of competitive advantage, though (CA) is only achieved when a firm restrict itself to fulfill the legal challenges (LC) faced by the strategic planning. Firm performance is highly dependent upon LC along with its efficiency and effectiveness. RVB promotes different laws and reforms to deal with cultural and legal challenges, addressed by firm's incapacities. LC includes the role of policies, law and past or new reforms on whose basis industry functions. SCA plays a significant role in addressing these LC while, SCA also maintains its cost efficiency apart from facing different type of challenges. Although, LC might harm the firm's financial performance but due to the sustainability of SCA, LC does not influence the development of financial performance neither does it affect it. Thus, the following hypothesis is proposed that:

H2: Supply chain agility has a significant impact on Legal challenges for industry 4.0

3) Supply Chain Agility relationship with Strategic Challenges for Industry 4.0

[13] explains the strategic challenges (SC) faced by business or firm strategic capabilities but yet, it can be secured by the effectiveness and performance of SCA. SC might consist of dimensions of strategic applications, performance and strategic level-antecedents that might be dealt with strategic structure performance SSP and its related paradigm. However, theoretical lenses of RBV theory drive the performance of SCA along with the significant influence on LC. SCA identifies alertness, flexibility, assertiveness, decisiveness, swiftness, and accessibility performance which performs as the sources of firm agility dimensions. Strategic challenges faced by business performance and firm competitiveness can be dealt with firm SCA capabilities, accessibility and performance. Thus, the following hypothesis is proposed that;

H3: SCA has a significant impact on Strategic challenges for Industry 4.0

4) Supply Chain Agility relationship with Technological Challenges for Industry 4.0

Study depicts that every industry or firm deals with technological and information challenges which can perhaps be solved through the effectiveness of SCA. Technological challenges are faced due to the advancement of methods, techniques and procedures related to latest technology that is necessary for the employees to learn and update themselves with the developing technology. RVB theory provides a significant platform for the instructors, managers and employees that belong to the technical department of firms, who can easily cater with the challenges as a source of opportunity to enhance their technical and learning skills through learning more and more. SCA constructs certain dimensions to deal with TC for the purpose of achieving desired goals and desired supply chain agility level. Thus, the following hypothesis is proposed that:

H4: SCA has a significant impact on Technological challenges for Industry 4.0

5) Mediating Role of Supply Chain Resilience between SCA and Organizational Challenges

Empirical studies often develop a base for the mediating role of SCR between the performance of SCA and OC. Mediating role shows its impact on the capability of SCA along with effectiveness of OC related to any firm or industry 4.0. RVB theory, theoretically contributes to the effective role of the mediator between the two variables. SCR positively influence the supply chain management which further produces a positive impact on SCA and OC. Industry 4.0 based sustainability-oriented concept which helps industrial managers who are competitive enough to deal with OC to incorporate environmental protection by diminishing the environmental and organizational challenges. Thus, the following hypothesis is proposed that:

H5: SCR has a significant mediating role between the relationship of SCA and OC for Industry 4.0

6) Mediating Role of Supply Chain Resilience between SCA and Legal Challenges

Theoretical base contributes to the performance of mediating role by SCR between SCA and LC faced by firm or Industry 4.0. SCR control initiatives but though it also has to tackle with the safety process of firm such as resources efficiency, employee and community welfare, taking care of the legal rights of the employees and workers, SCA has a significant influence over LC due to the effective and competitive performance of SCR between the two variables. LC if dealt with full concern and dedication might provide tremendous industrialization growth but however, without SCA, it might disturb the sustainability of SCR and current industrial systems. Thus, the following hypothesis is proposed that:

H6: SCR has a significant mediating role between the relationship of SCA and LC for Industry 4.0

7) Mediating Role of SCR between SCA and Strategic Challenges

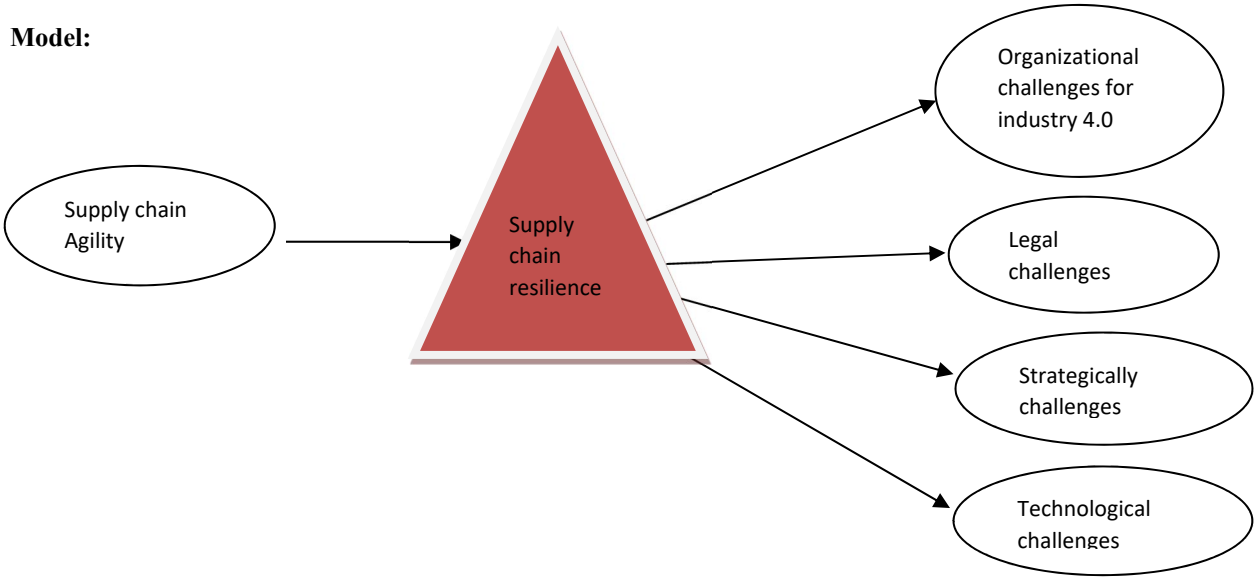
Study [23] believe that for proper understanding and practice in business, it requires the effective role of SCR that caters the efficiency and performance of SCA along with SC. A country or a state can only become a leading emerging economy due to the growth rate of SCR and SCA because of which SC will be faced with full enthusiasm and zeal. If strategic challenges are dealt with care and full support from SCA than, firm or economy might be shaped and structured by the manufacturing sector, as per studies [24] manufacturing industry contributes to the developing GDP of the state. Thus, the following hypothesis is proposed that:

H7: SCR has a significant mediating role between the relationship SCA and SC for Industry 4.0. **8) Mediating Role of SCR between SCA and Technological Challenges**

As per study [25] development in the field of modern technologies in manufacturing environment, leads the way towards the high level of productivity with the significant impact on SCA and TC by SCR. Latest use of technology drives a country or a state in the race of an emerging economy, which will be beneficial to the development of GDP and business performance of firm. TC has to be dealt while focusing on the capabilities of SCR that will further enhance the effectiveness and sustainability of SCA according to the theoretical RVB approaches and latest's strategies. Thus, the following hypothesis is proposed that:

H8: SCR has a significant mediating role between the relationship of SCA and TC for Industry 4.0.

Model:



3. Research Methodology

3.1 Population and Sampling

In this research study, researcher examined the role of supply chain agility and resilience in coping the challenges towards implication of industry 4.0. The target population for this research study is manufacturing sector of Thailand and out of this sector different industries have been selected in order to observe their supply chain for surviving the challenges of industry 4.0. Researcher has been selected agriculture, automotive and electronic industries because they have fully developed supply chain and with the agility and resilience of their supply chain the challenges of the implementation of industry 4.0 can be subsist. Further, researcher has been selected the managerial employees as the respondents because they have authority in the organization and have knowledge about all the operations of organization. In sampling, the main vexing point is the sample size because previously the small sample size has been selected but now according to the researcher has to selected large sample size while using covariance-based SEM approach for analysis. For calculating accurate sample size, researcher used idea represented by [25] which elaborate that number of questions*10 provide more accurate sample size. Researcher has been selected 300 sample size among which questionnaire has been distributed and good 296 responses were selected.

3.2. Data Collection and Procedures

Questionnaire has been used by research as data collection procedure because data collected by this method is numeric in nature which can easily analyzed statistically. Researcher used structured questionnaire which composed of closed ended questions. Two types of questions have been used by researcher such as demographics questions and variable assessment questions. Content validity of scale which has been used by researcher must has been checked and language of questionnaire has to Thai in order to collect data from employees of Thailand companies. Moreover, researcher administered the questionnaire by using both techniques such as online and self- administered questionnaire.

3.3. Validity, Reliability and Common Bias

Validity has been assessed through AMOS but criteria to assess the convergent and discriminant validity are different. To assess the convergent validity, three criteria have been used which are (1) items loading (λ) which has to be greater than 0.70, (2) composite constructs reliability and its threshold range is greater than 0.80 and (3) average variance extracted must be greater than 0.50. on the other hand, discriminant validity between construct has been assessed by criteria which states that square root of AVE has to be greater when corelated with other constructs [26]. As far as the reliability is concerned, it has been assessed by SPSS and criteria to examined

it is that Cronbach's α has to greater than 0.70 (Chin, 1998).

Researcher has to ensure that research study not observed the risk of common bias method, which has been generated when the respondent measure the variables of study such as supply chain agility, supply chain reliability and challenges of implication of industry 4.0 on the bases of recommendation provided by common rater [27] for measuring explanatory and dependent variables. All the variables are different in nature and approach to evaluate them has to be different. In order to test the risk of common bias method, researcher has been used Harman single test, which has been administered in order to check whether all the constructs interpreted by single factor. According to results, different factors have been used for accounting of constructs such as 96% of variance accounted for by factor solution and 13% of variance accounted for by single factor.

3.4. Hypothesis testing

Hypothesis testing is an essential part of research which has been done through structure equation modeling which runs on AMOS. Hypotheses which has been tested in this research are impact of supply chain agility and resilience on encountering the challenges which have been occurred due to the implication of industry 4.0. The direct, indirect and total effect and significance of relationship has been analyzed under path analysis in order assessed the acceptance or rejection status of hypotheses.

3.5. Measures

SCA was measured with the scale developed by [27], with the help of five items that were taken on a five-point Likert scale. Then SCR was assessed by the scale developed by the researcher [28] and here four items were taken on a five-point Likert scale and were assessed. OCI and LCI were measured by a scale developed by [19], four items were taken and measured on a five-point Likert scale. Finally, SCI and TCI were measured by the scale developed by [28] and five items were taken which were measured on a five-point Likert scale.

4. Empirical Results

The aim of the current research was to analyze the role of supply chain agility (SCA) and supply chain resilience (SCR) in coping the organizational, legal, strategic and technological challenges for manufacturing industry in Thailand. The 296 responses were received from participants of the current study that were in the position to be used for analysis. Out of 296 responses, 158 were filled by female respondents while only 138 were filled by males thus revealing the higher participation of female participants in the current study. Out of 296 considerable responses, most of the respondents (i.e. 43.6 percent) were having Master degree and 42.9 percent respondents were post-graduated. Among all respondents, only 9.8 percent respondents were holding degree of graduation while remaining respondents (i.e. 3.7 percent) were having other education. With respect to the age, most of the respondents were of age between 21 to 30 years while 17.2 percent respondents revealed their age between 31 to 40 years. 6.4 percent respondents in the sample were of age between 41 to 50 years and the least number of respondents reported their age more than 50 years. It means that most of the respondents were of middle age in the overall sample.

4.1. Descriptive Statistics

The current data was analyzed in terms of its descriptive statistics that have been presented in the following table.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
SCA	296	1.00	5.00	3.5893	1.07724	-.877	.142
SCR	296	1.00	5.00	3.4980	1.08998	-.695	.142
LCI	296	1.00	5.00	3.5194	1.08429	-.713	.142
SCI	296	1.00	5.00	3.4983	1.04759	-.713	.142
TCI	296	1.00	5.00	3.3226	1.01566	-.237	.142
OCI	296	1.00	5.00	3.3474	1.09746	-.489	.142
Valid N (listwise)	296						

The results of descriptive statistics are showing that the data of SCA, SCR, LCI, SCI, TCI, and OCI is normal and acceptable because the means and standard deviation of all these variables are showing that there is not any abnormal variation in the data. Furthermore, the value of skewness against all of them is ranging between -1 to +1 so, the normality of the data is confirmed. Furthermore, the suitability of the current data has also been proved through following test.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.938
Bartlett's Test of Sphericity	Approx. Chi-Square	6596.923
	Df	435
	Sig.	.000

The value of KMO for the current data is more than 0.6 (i.e. 0.938) and significance against it is also less than 0.01 so, the current data is proved to be suitable.

4.2. Convergent and discriminant validity

To check the multicollinearity and internal consistency in the data, the convergent and discriminant validity was analyzed for which the following results were found:

Table 3. Convergent and discriminant validity

	CR	AVE	MSV	MaxR(H)	SCI	SCA	OCI	SCR	LCI	TCI
SCI	0.858	0.602	0.314	0.861	**0.776**					
SCA	0.949	0.727	0.370	0.963	0.543	**0.852**				
OCI	0.919	0.654	0.441	0.975	0.496	0.530	**0.808**			
SCR	0.913	0.677	0.370	0.980	0.560	0.608	0.467	**0.823**		
LCI	0.885	0.658	0.338	0.983	0.497	0.519	0.458	0.581	**0.811**	
TCI	0.846	0.578	0.441	0.984	0.486	0.558	0.664	0.360	0.423	**0.760**

It can be seen in table 3 that CR for SCI, SCA, OCI, SCR, LCI, and TCI is more than 0.7 which means that the data is reliable. The value of AVE for all of them is more than 0.5 while the MSV is less than AVE that are confirming the discriminant validity of the data. The highest correlation of each variable with itself as compared to the other variables is indicating the convergent validity of the data. Hence, the convergent as well as discriminant validity of the current data has been proved through results.

4.3. Confirmatory Factor Analysis

The CFA for the current data was performed to ensure that the current model is good fit or not. For this purpose, the key indicators of model fitness were computed to analyze if the current model comprising of SCI, SCA, OCI, SCR, LCI, and TCI has good fit or not. Table 4 provides the summary of model fitness.

Table 4. CFA

Indicators	Threshold range	Current values
CMIN/DF	Less than or equal 3	1.711
GFI	Equal or greater than .80	.870
CFI	Equal or greater than .90	.957
IFI	Equal or greater than .90	.957
RMSEA	Less than or equal .08	.049

The values of all indicators are falling within acceptable ranges of respecitve idnciators thus proving that the current model containing SCI, OCI, LCI, and TCI as dependent variables, SCA as independent variable and SCR as a mediator is good fit because the values of CMIN/DF, GFI, IFI, CFI and RMSEA for this model are all suitable. Figure 1 shows the CFA of the current data.

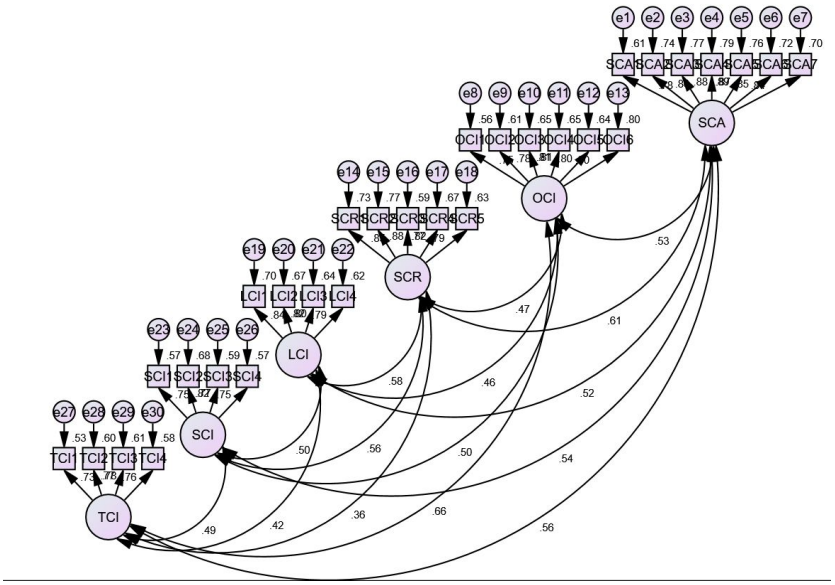


Figure 1. CFA

4.4. Structure Equation Modelling

The SEM was run to analyze the hypotheses of the current study in which the total effects, direct effect and indirect effect were computed on dependent variable. SEM gave following results.

Table 5. SEM

Total effect	SCA	SCR
SCR	.572***	.000
TCI	.502***	.023
SCI	.491***	.317***
LCI	.474***	.361***
OCI	.506***	.226***
Direct effect	SCA	SCR
SCR	.572***	.000
TCI	.489***	.023
SCI	.310***	.317***
LCI	.268**	.361***
OCI	.376***	.226**
Indirect effect	SCA	SCR
SCR	.000	.000
TCI	.013	.000
SCI	.181**	.000
LCI	.206**	.000
OCI	.129*	.000

Note: * indicates p-value<0.1, ** indicates p-value<0.05 and *** indicated the p-value< 0.01.

SEM shows that the supply chain agility has significant and positive total effect on all dependent variables i.e. SCI, OCI, LCI, and TCI (p-value <0.05) however, the total impact is not equal to the direct impact of SCA on SCI, OCI, LCI, and TCI. It means that the impact of SCA on SCI, OCI, LCI, and TCI was mediated by some mediator i.e. SCR. The indirect effects and their significance are showing that SCR significantly and positively mediates the relationship between SCA and SCI, between SCA and LCI, and SCA and OCI (p-value <0.05, P-value<0.01, p-value<0.1). However, SCR has not shown any significant mediation between SCA and TCI. Hence, the results of SEM have revealed that SCA has significant impacts on LCI, TCI, OCI and SCI. Furthermore, the SCR is proved to be a significant mediator for the impacts of SCA on SCI, LCI, and OCI but it is not a significant mediator between SCA and TCI. Figure 2 further clarified the SEM for the current data.

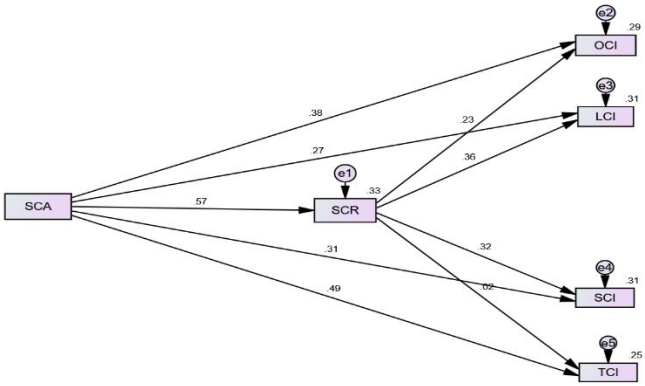


Figure 2. SEM

5. Discussion and Conclusion

5.1. Discussion

This study was intended to know about the impacts of supply chain agility (SCA) on organizational challenges of industry 4.0. (OCI-4.0) and the study was also to know about the association between (SCA) and legal challenges for industry 4.0 (LCI-4.0) and the relationship between (SCA) and strategic challenges for industry 4.0 (SCI-4.0) and the relationship between (SCA) and Technological challenges for industry 4.0 (TCI-4.0) [26]. This study also has aimed to know about the mediating role of supply chain resilience (SCR) between (SCA) and (OCI-4.0, LCI-4.0, SCI-4.0, TCI-4.0). This study recommended the following hypothesis, the first hypothesis suggested that SCA has a significant impact on OCI-4.0 this hypothesis was accepted because SCA has a positive impact on (OCI-4.0) [27]. The next hypothesis proposed was that SCA has a positive impact on LCI-4.0. This hypothesis was accepted. Edmund Prater stated that with the help of SCA the companies remove many legal fences which were hurdles for industry 4.0. The third hypothesis advised that SCA has an optimistic and significant impact on SCI-4.0. This hypothesis was also accepted. According to Markus Biehl, there is a significant affiliation between SCA and SCI-4.0. The fourth hypothesis suggested that the impact of SCA on TCI-4.0 is positive and this hypothesis was accepted. [30] in his research proposed that due to SCA there is a significant positive change in the organization with respect to technological changes. The companies now adopt the technology and compete with each other in effective way with the help of SCA. The fifth hypothesis suggested that SCR has an encouraging mediating role between SCA and OCI-4.0. This hypothesis was accepted, and the researchers stated that there is a significant mediating role of SCR between SCA and OCI-4.0 [28]. The next hypothesis has a beneficial mediating role of SCR between SCA and LCI-4.0. This hypothesis got accepted. According to Thomas j. Roads SCR helps in creating a good relationship between SCA and LCI-4.0. The next hypothesis suggested a constructive role of SCR on SCA and SCI-4.0. This hypothesis was also acknowledged. A

researcher Christopher explained in his article that due to the SCR the companies adopt the changed environment accordingly, that caused a positive relationship between SCA and SCI-4.0. The last hypothesis suggested that there is the important and positive mediating role of SCR between SCA and TCI-4.0. This hypothesis was accepted as well. The researchers stated that the companies adopted the technological changes in their industries which proved valuable.

5.2. Conclusion

This study designed to know about the impacts of SCA on OCI-4.0, LCI-4.0, SCI-4.0, TCI-4.0. This study has also the aim to know about the mediating role of SCR between SCA and OCI-4.0, LCI-4.0, SCI-4.0, TCI-4.0). This study was conducted in Thailand. The data was collected from a sample of 300 people from the manufacturing sector of Thailand and 296 responded. Through questionnaires data was gathered and analyzed. It is resolved that SCA has a significant impact on OCI-4.0, LCI-4.0, SCI-4.0, TCI-4.0, with the mediating role of SCR.

5.3. Implications of the Study

This study has enlarged the literature material about the SCR and its impact on different challenges. This study will help people to have a deep insight into the related problem which is discussed in the paper. The people related to the manufacturing sector can apply this study in order to improve their sector.

5.4. Limitations and Future Research Indications

The sample size which is used in this study was small. The future researcher can use a large sample in order to get a number of opinions. Future research students can use multiple tools for data collection rather than the questionnaire. This study was only conducted in Thailand the researchers can get data from outside Thailand and can debate the problems of the multiple countries.

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