Assessing Supply Chain Performance through Applying the SCOR Model

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***Abstract*— In recent years, supply chain performance measurement has received much attention from researchers and practitioners. Effective supply chain performance through supply chain antecedents such as business analytics has become a potentially valuable way of securing competitive advantage and improving supply chain performance. This study addressed the lack of the empirical studies by developing a comprehensive model to examine the effect of business analytics on supply chain performance. A quantitative methodology using a cross-sectional survey method was used to investigate the relationship between variables. Data were collected from automotive companies in Iran. The relationships between variables were examined using structural equation modelling (SEM) technique and partial least squares (PLS) software was used. The results revealed there is a significant positive relationship between business analytics and supply chain performance. The study combined resource-based theory, resource dependence theories to develop a new theoretical framework to demonstrate the importance of businesses analytics; in improving supply chain performance.**

***Keywords*—** *Supply Chain Performance (SCP), Business Analytics (BA), Supply Chain Operations Reference (SCOR) model*

1. Introduction

Traditional supply chain metrics have grown less relevant to today's business environments since they are too narrow inside scope to effectively tackle the broad ranges involving activities. More specifically, the original matrices don't capture exactly how well key business procedures have performed or provide understandings about how effectively the supply chain has met customer qualification. In addition, the majority of the original metrics are single –firm measures instead of the multi –firm measure which can be necessary to measure the performance with the entire supply chain. Finally, most commonly used metrics, like inventory turns, are inadequate for aiming performance across multiple companies in supply chain. Such misalignments bring about conflicting operational objective involving different functions, leading to inefficient inside supply chain. Thus, there exists a need for new metrics pertaining to efficiently managing the supply chain [1]. Clearly, the shift from functional to process oriented supply chain remains the development of new holistic measure that assimilates functional and non-practical metrics [2]. In the supply chain literature, attempts to define supply chain performance have been rare [3]. There are several performance measures that have been widely used in supply chain performance evaluation models for e.g., sales maximization [4], profit maximization [5], and buyer-supplier benefit maximization [1] etc. But academics have failed to address some reliable and comprehensive approach to measure supply chain performance by considering the role of different process throughout of supply chain from product realization process to transportation activities. There are metrics of supply chain performance enable firms to have a target to assess their partners performance throughout supply chain [3]. Business analytics (BA) is one of systematic and comprehensive of the metrics to determine the performance of the supply. There are several models that have been applied for business analytics. SCOR model is one of the most famous of them that has extensively are applied by researchers [1]. The SCOR model provides a systemic approach for identifying, evaluating and monitoring supply chain performance [6]. The model provides not only an opportunity to see how the firm is doing, but also a common frame of reference and language across the supply chain [7]. Based on the literature study on the measuring supply chain performance by using SCOR model is

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few and far between [8]. Most of these studies have without any sound and integrated approach focused on some aspects of supply chain performance. This study intends to examine the relationship between business analytics and supply chain performance. Specifically, this study addresses the research questions:

a) What is the effect of PA on the SCP?
b) What is the effect of SA on the SCP?
c) What is the effect of MA on the SCP?
d) What is the effect of DA on the SCP?

2. Literature review

This section reviews the related literature on the effect of BA on SCP. It starts with an introduction about the SCOR model. The section proceeds with a review of relevant studies on BA, influence of BA on SCP, the ways BA influence on the SCP. It follows with a discussion about the underlying theories of the study and the theoretical framework. Then, the sections end by formulating research propositions.

2.1. The SCOR model

SCOR is a process reference model developed by the management consulting firm PRTM and AMR Research. SCOR is endorsed by the Supply Chain Council as the cross-industry de facto standard diagnostic tool for supply chain management. SCOR enables users to address, improve, and communicate supply chain practices within and between all interested parties in an extended enterprise. SCOR provides standard business process definitions, terminology, and metrics. It enables companies to benchmark themselves against others and influence future application development to improve business processes in five distinct functional areas: plan, source, make, delivery, and return. SCOR is a management tool, spanning from customer to supplier. The model has been developed to describe the business activities associated with all phases of satisfying a customer demand. The SCOR-model comprises five components: plan analyse (PA), source analyse (SA), make analyse (MA), delivery analyse (DA) and return analyse (RA). Each of these components is considered both an important intra-organizational function and a critical inter-organization process. This framework can be viewed as a strategic tool for describing, communicating, implementing, controlling, and measuring complex supply chain processes to achieve good performance.

2.2. Business Analytic (BA)

In this study Business Analytics (BA) is defined as applying different analysis techniques on the data to give the answers of the questions or solve the problems related to SCM. BA is not the technology in real it is organizational procedures, tools and approaches to collect information, then analyzing the information and predicting the outcomes of different problems in four spots of SCOR (Plan, Source, Make, and Deliver) [9]. The well planned SCM system help organization to success, because financial performance get better the stock turnover improves along with reduced expenditures on sales. These are some basic advantages additional can also be recognized [10]. In past decades the large investment is made on supply chain systems yet these systems are struggling to get competitive advantage [11]. The worse thing is there is lack to evaluate the business value [12]. Most of the research papers have discussed the initial experience and not the improvement along with the time [13]. Therefore it is an essential to study the effect of BA, factors that help the impact along with areas of supply chain management.

2.3. Influence of BA on SCP

Supervising and developing the performance of the SC is a complex task now a day which includes numerous processes like identifying the measures, target defining, monitoring, reporting, planning, communication and feedback [14]. Therefore conventional approach like benchmarking for SC decision is useless. Consequently, data analysis is necessary for all the applications of business [15]. Same is in SC situation because a right decision is based on external and internal bundles of data this could only be done by BA, as it can only enable to analyze large data gathered on regular basis [11, 16]. The example is the framework of supplier evaluation [17] as the organizations have many suppliers it could not be done without BA.

BA use has been increased in SCM. Improvement in the supply chain performance is now a continuous process therefore there is a need for performance measurement system [14]. In addition to this BA helps in increasing the efficiency of the organization, using the different analytical methods by reducing the operating cost and correctly

forecasting trends of market [18]. The companies can cut their cost and can increase the profits by implementing the mature SC system [17]. The performance can be improved along with competitive advantage by high SCM practices and high quality of information sharing [19]. As it is a complex process SC management could be done by software to standardize the operations. Competitive advantage can be got by implementing a good decision support program. It should be managed carefully to get fruitful results [20]. Just implementation of the IT system is not enough the main issue is the best utilization of the software and the data provided by it. Many of the organizations have these software's but the problem is they cannot utilize the data and information to make a good strategic decision [21]. The organization should evaluate their models constantly to check the utility, and should update or change the models at the time of need it can provide knowledge about changes in conditions that can affect performance [22].

2.4. The Ways BA Influence the SCP

It have been discussed that BA have a positive impact on SC performance but there is still need to understand potential ways of this impact. In many research papers SCM have been used as umbrella to find the results of this impact. It is a fact that SCM is abroad term that connects different business units to fulfill the demand of customers [23]. Supply chain management is diverse still with consensus on some of its concepts [24] and include almost all business activities. SCOR have been used for SC on past years (e.g. [14, 25], in this study it is being used as a framework. It is a systematic approach to identify, evaluate and monitor the performance of supply chain [14, 26]. The model of SCOR is a system for performance measurement at various levels that covers the SC processes (Plan, Source, Make, Deliver, and Return) [14]. It is very useful model for strategic nature decision making for supply chain [27]. It also provides the framework, terminology that could be used for evaluation, positioning, and implementation of supply chain process [27]. Supply chain analysis includes plan, source, make and delivery [11].

Examples elaborate the use of analytics in different areas: In Planning: data is analyzed to forecast the market trends for the products and services this is mostly done in the shape of monthly or yearly reports made by marketing or finance departments [16].In Source: agent based system for procurement that include model, evaluation, search and negotiation agents for improving the selection of supplier, negotiating for price [28], and supplier selection and evaluation approach [29]. In Make: production of products should be correct, well on time, and each production batch should be correct also [21]. In Deliver: BA has many applications for logistics management to bring products at right time to the market [30]. The delivery decisions are taken at end and many organizations have outsourced the deliver process, BA impact on delivery decisions could be limited.

2.5. Underline Theory of the Study

Resource –based theory (RBT) was chosen to explain and interpret the relationship between business analytics and supply chain performance. The RBT states that a company develops a competitive advantage by not only acquiring but also developing, combining, and effectively deploying its physical, human, and organizational resources in ways that add unique value and are difficult for competitors to imitate [31]. The RBT proposes that companies should consider internally to their resources, both physical and intellectual, for sources of competitive advantage. The essential assumptions of RBT as proposed by academics [32-35] are that resources that are valuable, rare, inimitable, and non-substitutable will produce competitive advantage. Value in this perspective is outlined as resources either utilizing opportunities or neutralizing threats to the organization and rarity is defined as a resource that is not currently available to a large number of the organization's current or future competitors [31]. Inimitability refers to the difficulty other firms have in copying or reproducing the resources for their own use. Finally, non-substitutability means that other resources cannot be used by competitors to reproduce the benefit [31].When all of these are met, it is said that the firm or organization possesses resources which can potentially result in sustained competitive advantage over time [31, 36]. Before the advent of the RBT (Barney, 1991), the main strategic management thinking concentrated on external factors such as (industry position) that determined company profitability (Allen, and Wright, 2007). However, with the advent of the RBT [31, 37], strategic management research has moved to a more internal focus in accounting for

firm performance [31, 36] . Unlike the RDT, RBT focuses on the use of internal resources. The RBT can be applied to explain and justify how BA can lead to improved SCP. This theory also can justify how the relationship between business analytic and SCP.

According to Sachs and Rühli [38] over time the focus of the RBT has shifted more from physical resources to intangible assets. Intangible assets such as Business Analytic has greatly increased the ability of a firm to acquire and develop valuable resources [39]. This assets provide a source of sustainable competitive advantage for the firm because they appear to satisfy Barney's conditions of the competitive condition i.e., valuable, rare, imperfectly imitable and non-substitutable (VRIN) [38]. The VRIN model identifies how resource based theorists think. Based on the model, competitive advantage and improving organizational performance is derived if the VRIN conditions are satisfied [40]. It has provided the basis for many subsequent studies that, among others, have identified resources e.g., organizational culture, relationship with a partner, and business analytic as important resources that can provide conditions for improving supply chain performance and hence competitive advantage. The RBT seeks to identify those things that organizations have (e.g., business analytic) that cannot easily be the basis for copying, because it would be so costly for other firms to do so or because competitors are unable to access and emulate them. Thus, rather than scanning the market for opportunities, strategists should be looking inside the firm to discover the resources of competitive advantages. Consequently, if a firm has a greater capacity to acquire valuable resources due to its stakeholder network, then it should have a greater capacity to develop a competitive advantage, leading to higher performance [41].

2.6. Resource Dependence Theory

Resource dependence theory (RDT) is concerned with how organizational behavior is affected by external resources the organization utilizes, such as raw materials. The theory is important because an organization's ability to gather, alter and exploit required resources faster than competitors. RDT is based on social exchange theory as proposed by Emerson [42] and became popular as a result of its full exposition by [43]. According to Pfeffer and Salancik [43], organizations depend on others in their environment for resources to ensure their continuing capability. RDT predicts the types of responses that organizations would display depending on the level and nature of dependence they develop, and the relative power of all players. It also provides guidance on how the resource acquisition process can be facilitated and sustained. A primary issue that RDT addresses, therefore, is the interchange of resources between trading partners as a means by which environmental uncertainty is managed. RDT was chosen because it extensively covers organization environment boundary spanning activities. First, RDT suggests that firms that lack necessary resources to achieve their desired organizational results will pursue to inaugurate relationships with others to obtain the required resources [44].

2.7. The Theoretical Framework in the Study

The purpose of the study is to examine relationships between BA in SCM and the performance in the SCOR areas of plan, source, make, and delivery. The RBT and RDT are exercised as the main theoretical framework to predict and to interpret the relationships between constructs that have been proposed in the theoretical model of the study. RDT was exercised to interpret and explain how the effective use of external resources can lead to improve supply chain performance. With emphasizing on importance and effective utilization tangible and intangible resources within the organization, the RBT was utilized to explain the relationship between BA and SCP. Therefore, according to this explanation, the theoretical framework of research is represented in Figure 2. 1 as follows,

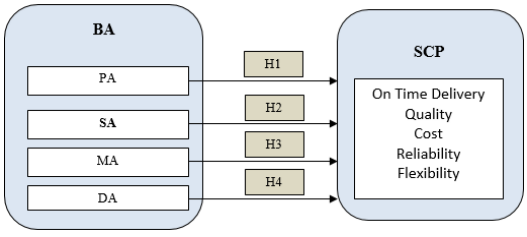

Figure 2.1. Theoretical Framework of the study

2.8. Hypothesis Development

According to the research model, totally 4 hypotheses which need to be tested as follows:

H1: PA positively influences SCP.

H2: SA positively influences SCP.

H3: MA positively influences SCP.

H4: DA positively influences SCP.

3. Methodology

A quantitative survey methodology using self-administered questionnaires has been adopted to collect data for the constructs proposed in the theoretical model. BA and SCP are the constructs of the study. These constructs were operationalized by multi-item measures using 5-point Likert scale, and the items used to measure them were adopted and adapted from previously tested scales. An English version questionnaire was developed in this study. Since the native language of respondents is not English, the survey tool was translated to Persian by one bilingual expert.

To ensure that the wording of this questionnaire is clear and understandable and the equivalence of the instrument is met, a pilot study will conduct prior to conducting the final survey. The pilot study is considered necessary to discover any problems in the instrument, and to determine face validity of the measures. Following the pilot study procedures, the final survey was conducted. In total, 226 questionnaires were distributed among companies active in the automotive industry across Iran. The respondents of the study were performance appraiser managers. To analyze the data, two statistical techniques were adopted. The Statistical Package for the Social Sciences (SPSS) version 21 was used to analyze the preliminary data and provide descriptive analyses about the study sample such as means, standard deviations, and frequencies. Structural Equation Modeling (SEM using smart PLS) using Confirmatory Factor Analysis (CFA) was used to test the measurement model. Structural Equation Modeling using CFA used to test the measurement model. SEM was conducted using the two steps. The first step includes the assessment of the measurement model, while the second step includes assessment of the structural model. The measurement model stage in this study conducted in two steps. This involves the assessment of the uni-dimensionality, followed by the assessment of reliability and validity of the underlying constructs. Reliability was investigate using both the internal consistency measures of Cronbach's alpha, construct reliability and AVE. Validity criterion construct, including convergent, discriminant and construct validity were assessed. Once the scale is developed in stage one, the hypotheses were tested in stage two (the structural model).

4. Data analysis

The methodology described in the previous section provided the baseline for data gathering. In this section, the presentation of data is systematically linked to format of the self-developed questionnaire of the study. This section focuses on the analysis and interpretation of data that was collected for the study. According to De Vos [45] data analysis entails that the analyst break down data in to constitute to obtain answer to research questions and to test hypothesis. This section is divided majorly in four subsections. After, introduction sub-section (4.1) offers the pilot study results to confirm the reliability and validity of the survey instrument. Consistent with the reliable survey instrument, sub-section (4.2) displays the reliability and validity for Pilot study. Sub-section (4.3) is an important subdivision of the section which is categorized into two segments. Sub-Section (4.3.1) presents measurement of convergent validity and sub- section (4.3.2) exhibits measurement of discriminant validity. Section (4.4) exhibits structural model through evaluation of the structural equation model with substantive relations in framework.

4.1. Pilot Study

It is well established in the literature that pilot study is an integral step towards developing a reliable instrument, to achieve the set objectives. The pilot study aimed to evaluate the important requirements during instrument purification e.g. testing questions wording, sequence, layout, familiarity with respondents, response rate, questionnaire completion time and analysis process [46]. Accordingly, after minor revisions of the instrument in pretest, a pilot-test was performed. For the piloting, selecting small sample size is in accordance to the guidelines in literature which suggested the pilot study sample size to be generally small i.e. up to 100 respondents [47] or between 10 to 30 [48]. The pilot test of the instrument was conducted by distributing 25 instruments to automakers company in Iran company, out of which 4 were excluded due to large number of missing data. Thus, response rate of the pilot study was 84%. The respondents included into pilot study were not invited to participate in the final study. This is because it may influence the later behavior of the respondents if they have already been involved in the pilot study [49].

4.2. Reliability and Validity for Pilot Study

In purifying process of the questionnaire, next stage after content validity is reliability of the questionnaire which confirms that 'measures are free from the error and therefore yields consistent results [50]. Moreover, exploratory factor analysis (EFA) was exercised to validate that scale

designated for the study is reinforced by the data. The overall reliability of the questionnaire within piloting was α=0.812 or 81.2% which is above than the suggested threshold 0.7 [51].The individual construct reliability ranges from 0.707 to 0.952 (see table 4.1). The results of EFA revealed that Kaiser-Mayer-Olkin (KMO) statistics which is measurement of sampling sufficiency was higher than minimum recommended value of 0.60 [52] for all of the constructs. In addition, significance of Bartlett's test of Sphericity in all the constructs designates that the correlation among the measurement items was higher than 0.3 and were suitable for EFA [53]. The total variance extracted by the questions within construct were higher than 0.60 [53].

Table 4.1. Cronbach's Alpha Value of the Instruments

Variables	Number of Items (n=30)	Cronbach's α	KMO	Bartlett's test Sphericity	Variance Explained
PA	11	0.952	0.831	0.000	60.084
MA	7	0.942	0.833	0.000	66.606
DA	6	0.952	0.784	0.000	63.612
SA	5	0.819	0.848	0.000	66.661
OTD	3	0.921	0.857	0.000	70.411
Cost	5	0.890	0.832	0.000	75.123
Quality	5	0.707	0.782	0.000	68.592
Reliability	3	0.902	0.856	0.000	68.231
Flexibility	4	0.726	0.801	0.000	69.561

4.3. Measurement Model

The structural equation modelling process centers around two steps: validating the measurement model and fitting the structural model. The former is accomplished primarily through confirmatory factor analysis, while the latter is accomplished primarily through path analysis with latent variables. The measurement model specifies the rules governing how the latent variables are measured in terms of the observed variables, and it describes the measurement properties of the observed variables. That is, measurement models are concerned with the relations between observed and latent variables. Such models specify hypotheses about the relations between a set of observed variables, such as ratings or questionnaire items, and the unobserved variables or constructs they were designed to measure. The measurement model is important as it provides a test for the reliability of the observed variables employed to measure the latent variables. A measurement model that offers a poor fit to the data suggests that at least some of the observed indicator variables are unreliable, and precludes the researcher from moving to the analysis of the structural model.

4.3.1 Measurement of Convergent Validity

The validity is the extent to which a set of measuring items correctly represents the underlying theoretical proposed concept [54]. Specially, convergent validity enlightens that the correlation between responses obtained through different methods denote same construct [55]. On the other hand, it indicates that set of items should denote one and same underlying construct that can be confirmed through their one-dimensionality [56]. In the study, convergent validity was surveyed by means of widely recognized method average variance extracted (AVE) [54, 56, 57]. An AVE was originally recommended by Fornell and Larcker, [58] that tries to examine the amount of variance that a construct captures from its measuring items compared with the amount because of measurement error. Table 4.2 shows that AVE extracted for the each construct was higher than the required value 0.5 (50%) [58] and designate that each construct has capability to enlighten more than half of the variance to its measuring items on average.

4.3.2 Measurement of Discriminant Validity

The discriminant validity is complementary concept of convergent validity which shows that two conceptually different constructs should exhibit differently i.e. the set of measuring items are expected not to be un-dimensional [56]. In this study, discriminant validity at construct-level was inspected by means of Fornell and Larcker [58] criterion, while at item level were inspected by means of Chin [59] criterions. Fornell and Larcker criterion propose that square-root of AVE for each constructs should be greater than the other construct's correlation with any other (i.e. inter-construct correlation). Table 4.3 shows that none of the inter-construct correlation value was above the square-root of

the AVE and fulfilled the criterion of the discriminant validity. At item-level discriminant validity, Chin [59] recommended to inspect the cross-loading within factor loading.

Table 4.2. The Result of Convergent Validity

Constructs	AVE	Composite Reliability	Cronbach's α
PA	0.777	0.975	0.971
SA	0.774	0.945	0.927
MA	0.820	0.970	0.963
DA	0.618	0.905	0.915
SCP	0.846	0.943	0.909

Table 4.3. The Results of Discriminant Validity

4.4 Structural Model Evaluation

Table 4.4 shows that four path relations representing four hypotheses were significant.

Dimension	Communality	R Square
PA	0.7766	
SA	0.7744	
MA	0.8201	
DA	0.6599	
SCP	0.4884	0.5396
GoF	0.611	

Graphical image of paths is presented in figure 4.1 and 4.2 .The results of boot strapping method (Table 4.4) show a p-value for each relation. All structural model relationships were significant considering a p-value = 0.05. In the model all IV's had a significant a positive coefficients which means, companies with higher level of BA will tend to achieve a better SC performance. Among BA dimensions the highest coefficient belonged to Make (β=0.29, p<0.05) followed by Plan (β=0.30, p<0.05) and Source (β=0.28, p<0.05). Compare to the other BA components delivery had a lower influence on SC performance (β=0.12, p<0.05). It is important to note that contrary to confirmative SEM models (e.g., LISREL), explorative PLS models still do not have such global indicators that would assess the overall goodness of the model, to evaluate the goodness of fit for models. The criterion of global fitness (GoF) was calculated. The GoF is a geometric average of all communalities and R^2 in the model. The GoF is an index that can be used to validate models with PLS. The R^2 coefficient is 0.539, which demonstrates that the indicator of analytical businesses was able to explain 53.9% of the variability in the performance results. A value higher than the GoF> 0.5 shows that the set of structural equations is well defined and offers a good representation of the dataset and is valid. GoF of current model was 0.611 which is ready to consider 61.1 % of the reachable fitness

$$\text{GoF} = \sqrt{\overline{Communality} \times R^2}$$

Table 4.4. Goodness of fit for the structural model without moderator

	PA	SA	MA	DA	SCP
PA	**0.881**				
SA	0.480	**0.880**			
MA	0.548	0.554	**0.905**		
DA	0.048	0.136	0.047	**0.785**	
SCP	0.627	0.583	0.559	0.168	**0.618**

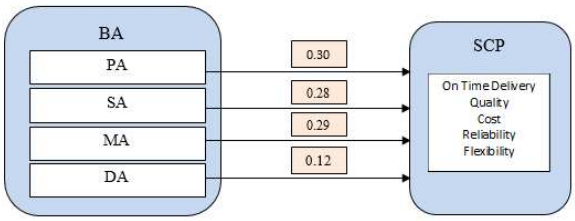

Fig 4.1. Paths Standardized Coefficient (B) Results of Hypothesis

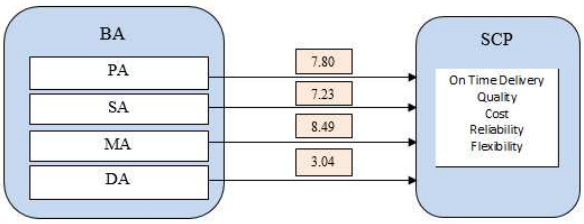

Fig 4.2: t- Value of Hypothesis Results

5. Discussion and Results

Business analytics is the practice of iterative, methodical exploration of an organization's data with emphasis on statistical analysis. BA is used by companies committed to data-driven decision making. For measuring the function of BA in SCP as a broad term a number of models are designed. Among these models SCOR is one of the most famous them that has been used extensively by scholars. SCOR has often been recognized as a systematic approach to identifying, evaluating and

monitoring supply chain performance. In the model, a balanced performance measurement system at multiple levels, covering four core SC processes (Plan, Source, Make, and Delivery) was developed. SCOR is supposed to be the most promising model for SC strategic decision-making. It provides a common SC framework, standard terminology and metrics that can be used for evaluating, positioning and implementing SC processes. This section explains the results of testing the hypotheses related to the relationship between BA (plan analyze, source analyze, make analyze and delivery analyze) and SCP. These linkages have aimed to answer the questions raised in the introduction as below:

a. Does PA have a positive effect on the SCP?
b. Does SA have a positive effect on the SCP?
c. Does MA have a positive effect on the SCP?
d. Does DA have a positive effect on the SCP?

For achieving the objective of the study and answering the research questions the following hypothesis was proposed:

H1: PA has a positive impact on SCP.
H2: SA has a positive impact on SCP.
H3: MA has a positive impact on SCP.
H4: DA has a positive impact on SCP.

The Plan processes describe the planning activities associated with operating a supply chain. Plan is gathering customer requirements, collecting information on available resources, and balancing requirements and resources to determine planned capabilities and resource gaps. In other words, the Plan process focuses on analyzing data to predict market trends of products and services and developing supply plans to match market demands. This is followed by identifying the actions required to correct any gaps. The goal of supply planning is to match customer demands with resources in a portable manner. A supply chain needs to consider a broad range of activities, including sourcing and production from a planning perspective.

Hypothesis H1 was presumed to examine the consequence of PA on the SCP. The results of Table (4.5) have provided new empirical evidence on the relationship between PA and SCP. Based on the results the relationship was positive and significant (β= 0.30, t=7.80) that suggested applying of PA with the approach of SCOR model might help the firms in automotive industry to enhance SCP.

Source is necessary for successful Plan through issuing purchase orders, scheduling deliveries, receiving shipment validation and storage, and accepting supplier invoices. The primary role of source analyzes lies in improving inbound supply chain consolidation and optimization. Broad applications include the use of an agent based procurement system with a procurement model, search, and negotiation and evaluation agents to improve supplier selection, price negotiation and supplier evaluation and the approach for supplier selection and evolution. Hypothesis H2 was postulated to measure the consequence of SA on the SCP. Table 4.5 demonstrated the results. Based on the table the relationship was positive and significant (β= 0.28, t=7.23) that revealed utilizing SA might have a crucial role in appraising and enhancing SCP in automotive industry by approach of (SCOR) model.

Make processes describe the activities associated with the conversion of materials or the creation of the content for services. It focuses on conversion of materials rather than production or manufacturing because make represents all types of material conversions: assembly, chemical processing, maintenance, repair, overhaul, recycling, improvement, remanufacturing, and other material conversion processes. As a general guideline: these processes are recognized by the fact that one or more item numbers go in, and one or more different item number come out of this process. Hypothesis H3 was assumed to evaluate the consequence of MA on the SCP. Table 4.5 validates the outcome of assessing the consequence of MA on SCP. Based on the results the relationship is positive and significant (β= 0.29, t= 8.49) that point to that the MA as a component of SCOR model might use as an indicator of SCP.

Deliveries processes describe receive, schedule, pick, pack and ship orders. The activities associated with the reverse flow of goods back from the customer. The delivery process includes the identification of the need for a delivery, the disposition decision making, the scheduling of the delivery, and the shipment and receipt of the returned goods. Hypothesis H4 was presumed to examine the relationship between DA and SCP. Results of the Table 4.5 demonstrated that the relationship between DA and SCP is positive and significant (β= 0.12, t= 3.04) that indicated that DA enables to predict SCP.

These results provides additional support to the findings [60] who indicate that planning and making analyze has a greater effect on supply chain performance compared to other elements of the SCOR model and confirmed the finding of the scholar who suggested that companies that using the good plan and make analyze are more capable to perform better. Moreover, the results reinforced by the finding of the aforementioned scholar who recommended that the DA has less effect on the performance of supply chain in relation to other model elements of SCOR model. Moreover, the results are in line with Cai, Liu [14] those who emphasized on a comprehensive and integrated approach to improving SCP. Moreover, the results is in consort with Irfan, Xu [61] those who suggest that the SCOR model enables companies to communicate, compare and learn from competitors and companies both within and outside of their industry.

The results of the hypotheses might be supported by RBT. The study by inspiration of the SCOR model applied a comprehensive, sound and integrated construct as antecedent of supply chain performance. The results from the hypothesis indicated that four components of BA derived from SCOR model have a positive and significant effect on supply chain performance. Based on the RBT having and implementing of a strategic resource will lead to competitive advantage. In the study the SCOR model is assumed as a strategic resource. SCC (2010) describes a comprehensive reportage of strategic resource, i.e. (i) redesign and optimization efficient supply chain network, (ii) alignment of supply chain team skills with strategic objectives, (iii) provide a detailed game plan for launching new businesses and products, (iv) deliver a systematic supply chain mergers that capture expected savings, (v) assisting universal fact-based decision-making, and (vi) enhanced operational control from standard core processes. Therefore , based on resource-based theory business strategy such as SCOR model could be considered as one valuable intangible asset [62].

5.1 Implication for Future Research

Future research should investigate the moderating effect of enterprise resource planning on the relationship between BA and SCP by considering different aspect of organizational performance e.g. business performance and operational performance. In the study a quantitative approach has been applied to examine the consequences of business analytics on supply chain performance. Given that there are several benefits to mixed methods research has several benefits, to achieve more reliable results, Future studies are needed to conduct the effects of BA by mixed mode approach.

6. Conclusions

In this research an attempt was made to find the relationships between business analytics and supply chain performance. Four research questions were formulated in this Particular research. In connection with answer to the first research question which illustrates the effects of four components of BA on SCP, the results highlight a positive and significant relationship between the four components of BA and SCP. The results were in line with RBT as well as Sachs and Rühli [38] those who suggested as time passes the focus of the RBT has shifted more from tangible to intangible resources.

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