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Determining critical success factors related to the effect of supply chain integration and competition capabilities on business performance

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Abstract This study analyzes those critical success factors related to supply chain integration (SCI) and competition capabilities (CC) and which have more effect on business performance (BP) by using a structural equation model. For this purpose, the relationship between integration, CC and BP has been analyzed. Data was obtained from the survey that applied to Turkish Small and Medium Sized Enterprises (SMEs) and we examined the critical factors by using a Structural Equation Model to analyze which factors have more effect on BP. As a result of the study it was found that there are positive associations between SCI and CC, and both SCI-CC and BP and it was also found that most critical factor that affects BP is reliability and the least important one is lower price.

Keywords Supply chain integration · Competition capability · Business performance · Structural equation model · SMEs

1 Introduction

In todays world, it is not enough for a company to optimize the functions inside itself in order to be successful. It is assumed that If companies can integrate their internal processes with the suppliers and customers in the supply chain, they will have an important competitive advantage (Frohlich and Westbrook 2001). Supply chain management (SCM) enhances competitive capabilities and performance by integrating the internal functions of the company and associating these with the suppliers and customers operations effectively. Strategic

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advantage is gained by adopting supply chain integration (SCI). The linkage between the company and its suppliers and customers has a crucial effect on competition and business performance. To be successful in SCM applications which aim to achieve high supply chain performance, external integration with suppliers and customers in addition to integration between the inside functions in the company is needed (Kim 2006). Recently, It has been accepted that competition is among supply chains, not between companies anymore. Supply chain issues gain more and more importance in business problems. Achieving business excellence via improving performance, integration of supply chain members and improving competition capabilities (CC) through the entire supply chain system is much more important (Özdemir and Aslan 2011). There are many studies on the impact of SCI on performance (Zailani and Rajagopal 2005; Lee et al. 2007; Torino Green et al. 2008; Huo 2012). However, the definitions, the measurements, the sample sizes, and scope of both SCI and the performance vary significantly from research to research. Conclusions are not consistent either (Sun and Ni 2012). Researchers still believe that little is known about the impact of SCI on performance and call for more empirical research. Fabbe-Costes and Jahre (2007, 2008) also argued that contrary to what could be assumed, there are very few papers on the association between performance and integration and we need more research on the effect of SCI on performance. At the same time it is assumed that CC such as quality, delivery, flexibility and cost contribute to the business performance (Vickery et al. 1993, 1994; Ward et al. 1994). Additionally, competitive capabilities ensure that the company satisfies its customers and obtains a good market performance (Tracey et al. 1999). The purpose of this paper is to investigate the effect of SCI on Capabilities and effect of both on firm performance by the study of relationship between manifest variables and latent variables through a precise model known as the Structural Equation Model (SEM). The paper is organized as follows. First, we develop the theoretical basis of the study, investigate the main concepts and present our research framework. Then, we present the research methodology and the results. In the following section, we discuss the results of the study. Finally, the conclusions of the study are presented along with their potential implications for managers and further research.

2 Theoretical background

In this section, the literature review is done on supply chain integration, CC and their impact on performance. Then our main propositions are presented.

2.1 The scope of supply chain integration

There are many different types of SCI definitions (Rosenzweig et al. 2003; Kim 2006; Gimenez et al. 2012, etc.). Some of them define integration as upstream (with suppliers) and downstream (with customers) (Frohlich and Westbrook 2001; Sun and Ni 2012, internal or external Richey et al. 2009), integration with supplier and customer and internal (Lee et al. 2007; Boon-itt and Wong 2011; Huo 2012) so on. Kannan and Tan (2010) extended the discussion of integration to explicitly incorporated firms beyond first tier suppliers and customers. Also there are different types of integration classification like Supply chain practice, supply chain patterns and supply chain attitudes (Gimenez et al. 2012) or, SCI Practices (planning information and joint improvement) and SCI enablers (communication infrastructure, and cooperative behaviour) (van der Vaart et al. 2012). In another distinciton, Liu et al. (2013) defined SCI, by information-sharing and operational coordination. As pointed out in prior studies, the scope of integration can vary and followings were included (Fabbe-Costes

and Jahre 2007):—Limited dyadic downstream: integration between the focal company and its customers;—Limited dyadic upstream: integration between the focal company and its suppliers;—Limited dyadic: integration between the focal company and its customers on the one hand and with its suppliers on the other (i.e. both ways, but separately);—Limited triadic: integration of suppliers focal company customers (without differentiating upstream and downstream relationships);—Extended: integration between more than three parties along the supply chain, e.g. includes customers customers, suppliers suppliers or other stakeholders.

2.2 Supply chain integration and performance

In the recent competitive business environment, the companies which are highly integrated with its partners in the supply chain achieve better performance. Whether it is integration with customers or with suppliers, the majority of the existing studies have found a positive relationship between SCI and performance (Gimenez et al. 2012). Frohlich and Westbrook (2001); Rosenzweig et al. (2003) and Vickery et al. (2013) found support for the positive impact of integrating with suppliers and customers (upstream and downstream integration). Sun and Ni (2012) studied the effect of SCI on quality performance. They used integration -as upstream and downstream- and quality initiatives as performance measurement. Richey et al. (2009) found that businesses desiring to improve internal and external integration in a challenging competitive environment typically experience high levels of performance. Huo (2012) examined the impact of three types of SCI (internal, supplier and customer integration) on three types of company performance; supplier-oriented, customer-oriented and financial performance. Boon-itt and Wong (2011) also handled SCI in terms of internal, supplier and customer and examined supply chain integration and customer delivery performance. Liu et al. (2013) studied the effect of SCI on firm performance by different aspects. They defined SCI, by information-sharing and operational coordination, and firm performance in terms of operational and BP. In a different approach to SCI and performance, Gimenez et al. (2012) used three levels of integration, supply chain practices, patterns and attitudes and their impact on performance. According to Gimenez and Ventura (2005) prior studies on performance can be classified in three groups in terms of their relationship with each integration type: Internal SCI and performance, between external SCI and performance or both types of SCI and performance. In this paper, we focus on studies including internal or external or both types of integration. On the other hand, Fabbe-Costes and Jahre (2007, 2008) searched many journals and found articles related with supply chain integration (in terms of integration level, scope and degree) and performance. They argued that contrary to what could be assumed, there are very few papers on the relationship between performance and integration And they emphasize that we need a clear definition and consensus about SCI and performance measurement. And they claimed that a higher SCI does not always improve performance (Fabbe-Costes and Jahre 2008). Although there are many studies on the impact of SCI on performance, the definitions, the measurements, the sample sizes, and scope of both SCI and the performance vary significantly from research to research. Conclusions are not consistent either. Researchers still believe that little is known about the impact of SCI on performance and call for more empirical research (Sun and Ni 2012).

2.3 The supply chain and value creation in the public sector

In both the private and the public sector the SCM has generated value through the integration and the coordination of the supply, demand and relationships among entities to satisfy customers (private entities and citizens) in an efficient and profitable way (Ambe and Badenhorst-

Weiss 2011). In the Public Sector, the SCM deals with the co-ordination of all parties involved in delivering the combination of inputs, outputs or outcomes, that will meet a specific public sector requirement. In this context, the supply chain can impact different areas and can do so in many different ways. For example, it may affect both the healthcare and education areas. For the first one, the logistics, management and organization of goods and services in and out of hospitals is more important than for the education area, in which the SCM focuses on the quality of teaching materials offered to students. The interest in the supply chain performance measures and reporting, is seen as part of a wide process oriented towards the improvement of performancesand the increase of accountability in the public sector (Boyne 2003). The Public Administration sector, in fact, in order to enhance the satisfaction level perceived by citizens for Public Services is undertaking several measures to reach a higher level of modernization, administrative simplification, transparency and accountability of the Public Services it offers (DAlessio 1992; Reichard 1997; Ricci 2005; Migliaccio 2011; Grandis and Paoloni 2007). This status quo requires tailored reforms, for which an organizational restructuring is needed primarily, to improve the perception of the image of the public sector, through the improvement of the public administrations performance in terms of efficiency and effectiveness. This methodology is commonly known, in international literature, as government reinventing. Nevertheless, the reforms must not only apply to the organizational structure of the administrations, but must apply to all of the Public Administrations processes, including the cultural ones too (Amatucci and Mele 2012). The orientation towards the use of organizational processes leads to the advantage of being able to punctually monitor the operational processes tailoring them to suit the citizens needs. Citizens measure Public Service value created on the basis of time, costs and the quality of the service received (Guatri 1991). A process, can be shortly defined as an agglomerate of structured and measured activities, that aim at producing a specific output. Therefore, the process articulates following a logical order which then results in an induced work approach (Jannelli 2006). The success of this innovation hinges on a cultural and operating adhesion of all of the actors involved in the process (Zanda 1984) The shift towards a process based vision, which is centred around the citizens, implies a vision that places the Public Administration in a horizontal organizational structure. Therefore it would stretch across the entire organization, so that at the beginning and at the end of the chain there would be the productive inputs and the citizens respectively. The organizational process orientation is strictly linked to the approach adopted for both corporate governance and value management, therefore for the value chain itself. The value chain tool enhances a better understanding from the largest flaw of a business operation, to the flaw of operations among the activities of the chain itself, for single services, as for instance, with the aim of construing the most important information as the most critical activities, and of the related measure and measuring. The process approach stresses the interdependencies between the various activities and, therefore, easily allows for the elimination of duplication or those activities with no added value. Therefore, the timing and those costs that directly affect the efficiency and effectiveness of the organization, would be reduced. It should be emphasized that the effort made, at this stage, should aim at innovating the cultural environment of the governance and of the administrative bodies to meet citizens expectations. An improvement of the Public Administration operators skills will therefore be necessary, as, at the time being, they only encompass a legal and administrative level, whether economic competencies, such as the ability of making economic and adequate purchases to reach cost cutting practices, should be applied (Borgonovi 2012). In conclusion, there are a lot of differences among supply chains implemented in the private and in the public sector. For example, in the private sector the SCM is the exclusive extension of downsizing (right-sizing) and reengineering performed by the organization(s), which transforms the enterprises into lean and

mean competitive units, by implementing cost cutting and process simplifications. While in the public sector it can be defined as an instrument aimed at enhancing the quality of citizens services delivery. The two typologies of SCM, anyway, share the following common goals:

- the realization of the highest value for the organization;
- the necessity of possessing better quality, faster service rendering, and lower costs, for both customers and citizen;
- the condition of continually downsizing resources. Currently, the trend of the staff downsizing is being forced on the public sector. Therefore it is necessary, such as for the private sector, to find new ways of providing materials and services or even eliminating some services entirely (Smith 2011).

2.4 Competitive capabilities and performance

Capabilities such as quality, delivery, flexibility and cost contribute to the business performance (Vickery et al. 1993, 1994; Ward et al. 1994). The company has to offer a lower price in comparison with its competitors or in order to keep high prices the value of the products offered should be higher in comparison with the competitors (Kim 2006). Product quality and mix should meet or exceed customers expectations. They should have a high order execution rate, a low order cycle time and accurate order and delivery information. These competitive capabilities ensure that the company satisfies its customers and reaches good market performance (Tracey et al. 1999). In general, performance measures can be grouped into three categories: overall performance measures (e.g. profit), service-related measures (e.g. delivery speed) and cost-related measures (e.g. transportation costs). Based on the review by van der Vaart and van Donk (2008), it can be concluded that if the unit of analysis is the single buyer-supplier relationship, then cost and service measures are the most frequently used (Gimenez et al. 2012). The purpose of this paper is to investigate the effects of SCI on CC and BP and the effect of CC on performance.

3 Method

It is supposed that the SCI affects competitive capability and business performance, and competitive capability also affects business performance. The model below shows the relationship between integration, competitive capability and BP.

Hypothesis
H1: Supply chain integration has a positive effect on competitive capability.
H2: Competitive capability has a positive effect on business performance.
H3: Supply chain integration has positive effect on the business performance.

3.1 Data collection

Survey techniques are used for collecting data. The survey is carried out with the application of a web-based database on internet. The completion of the questionnaires has been ensured by directing the companies to the questionnaire form via the web link given in the e-mail and saving the answers immediately in the database. The questionnaire consists of four parts. In the first part, there are four statements to measure the companies supply chain integration level; in the second part, there are twelve statements to measure the companies competitive

Table 1 The sectorial distribution of the companies

$n = 174$	(f)	(%)
Food	11	6.3
Metal industry	20	11.5
Machine and equipment	19	10.9
Textile	17	9.8
Electric and electronic	11	6.3
Construction	8	4.6
Paper, Plastic & Package	15	8.6
Automotive	11	6.3
Furniture	21	12.1
Service	19	10.9
Others	22	12.6

capabilities; in the third part, there are nine statements to measure the BP. In the fourth and final part, five demographic questions about companies are asked.

Population and sample

The population of the research is the SMEs in Turkey. The businesses which are registered in the Small and Medium Sized Business Information Network (KOBINET) database in Small and Medium Size Industry Development and Support Management Presidency (KOSGEB), that is attached to Industry and Commerce Ministry, have been determined as population frame. It is possible to search according to the city where the company is located, sales turnover, number of workers and status in this database. For the companies registered in this database, it is possible to see each companys address, telephone number and most of the companies fax number and it is possible to send e-mails to most of them though KOBINET web site. Because of the difficulty of obtaining information from SMEs and applying the web based survey and considering the possible low rate of return, 1,000 companies are selected randomly and then the survey is planned to send to these companies. Since the database is not up-to-date and there is missing information for the some of the selected companies, communication information could not be gathered for some of the companies. In total, e-mails were sent to 892 companies and this was repeated there times with a one week interval. 236 companies could not be reached because of problems with their e-mail addresses. From the remaining 656 companies, despite repeated e-mails, only 187 of them filled in the survey. From these completed forms, six of them were not taken to evaluation since they were not filled fully, data from the remaining 181 companies has been analyzed as employable data. The sectorial distribution of these companies is listed in Table 1. In the option of others; there are companies from different sectors such as consultancy, health, advertisement, architecture, insurance and information technology. The companies from different sectors in the option others are the first with a 12.6 % share. This is followed by furniture (12.1 %), metal (11.5 %) and machine-equipment and service sectors (10.9 %).

In Table 2, the distribution of the companies according to the number of employees is shown. Micro scaled companies are the first with 42.5 %. Table 3 they are followed by small companies with 32.4 % and medium sized companies with 25.1 %.

Table 2 The distribution of companies according to the number of employees

$n = 179$	(f)	(%)
1–9 employees	76	42.5
10–49 employees	58	32.4
50–250 employees	45	25.1

4 The analysis of data

4.1 Structural equation modeling

In our study, the main aim of the SEM is to synthesize the effect of the SCI and Competitive Abilities factors on Business Performance indicators. The formalization of the relationship can be formalized through a precise model known as the SEM. This methodology consists of three steps: (a) construction of the model (b) factorial analysis and checking the validity and reliability of the model (Cronbachs alpha) (c) parameter estimation, measurement of latent variables and analysis of results. The questionnaires submitted to a sample of 181 companies consisted of a 25 items battery, organized in three sections. The evaluation was recorded on a seven point scale. This ordinal data needed to be transformed throughout the range of real numbers (Wright and Linacre 1989). The literature describes several methods for transforming the ordinal scores and expressing them in a quantitative and linear measure scale of intervals. We chose the Thurstone psychometric model (Zanella and Cerri 1999).

Model variables:

1. **Supply chain integration** is examined in four ways, integration closely within the organization (I1); with suppliers (I2); with distributors (I3) and; with customers (I4)
2. **Competion capabilities** are combined by four main factors:
   Cost leadership, Customer service, Flexibility and Quality indicators.
   Cost leadership: Lower price (C1) and lower internal costs than competitors (C2)
   Customer service: On-time delivery (C3), Promptly handled customer complaints (C4) and, After-sale service (C5).
   Flexibility: Developing new products (C6), Ability to change product mix (C7), Ability to change product volume (C8), and design flexibility (C9).
   Quality indicators: Product quality (C10), reliability (C11) and durability (C12).
3. **Business performance** is evaluated by three main factors:
   Market Performance: Sales growth (P1), Market share growth (P2)
   Financial Performance: Total cost reduction (P3), Return on investments (P4), Return on assets (P5), Net profit (P6)
   Customer Satisfaction Performance: The reduction degree of product return ratio (P7), Customer satisfaction level (P8), Customer complaints (P9). Measurements are obtained by 7 interval scale points, 1 represents strongly disagree, 7 represents strongly agree and others between them.

Supply chain integration level can be assumed as high because the mean of each indicator is more than 5 and close to 6. The mean of CC is around 5 it is above the average, but performance indicators show a mix distribution some of them less then 3, it means they do not envisage an improvement occurrence in their performance, some of them are more than 5 so they agree on improvement in their performance metric. In order to find the relationship

Table 3 Descriptive statistics of the items

Dim.	Item	Mean	Standard deviation	Asymmetry	Kurtosis
Supply chain integration	I1	5,16	1,59	−0,98	0,26
	I2	5.14	1.50	−1.17	0.87
	I3	5.01	1.53	−0.94	0.34
	I4	5.56	1.36	−1.43	1.89
Competitive abilities	C1	4.57	1.62	−0.47	−0.54
	C2	4.34	1.68	−0.25	−0.81
	C3	5.71	1.35	−1.47	2.48
	C4	5.73	1.26	−1.55	3.36
	C5	5.66	1.26	−1.35	2.61
	C6	5.14	1.66	−0.74	−0.16
	C7	5.05	1.57	−0.62	−0.11
	C8	4.93	1.61	−0.62	−0.26
	C9	5.35	1.64	−1.13	0.67
	C10	5.81	1.22	−1.46	2.81
	C11	6.03	1.16	−1.96	4.96
	C12	5.99	1.18	−1.81	4.23
Business performances	P1	4.65	1.32	−0.76	0.55
	P2	4.51	1.31	−0.48	−0.14
	P3	4.47	1.37	−0.40	0.41
	P4	4.24	1.35	−0.22	−0.10
	P5	4.11	1.35	−0.33	0.10
	P6	3.94	1.38	−0.31	−0.32
	P7	2.90	1.96	0.75	−0.76
	P8	5.68	1.16	−1.78	4.80
	P9	2.82	1.74	0.85	−0.28

Table 4 Grouping the measured variables on the latent construct

Latent variables	Symbol	Type	Related items
Supply chain integration	SCI	Exogenous	(I1–I4)
Competitive capability factors	CCF	Exogenous	(C1–C12)
Business performance	BP	Endogenous	(P1–P9)

among BP, Competitive integration and the SCI, we assume as endogenous end exogenous the variables as indicated in the Table 4.

4.2 Factorial analysis and model reliability

A factorial analysis before estimating the variable parameters of the structural model was carried out. Reliability analysis was performed to refine the factors further. For both latent variables (SCI, CCF)-Cronbach scores of 0.80 and 0.95 respectively were obtained. Val-

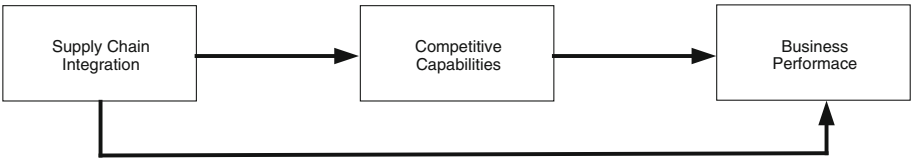

Fig. 1 The effect of SCI on competitive capability and business performance

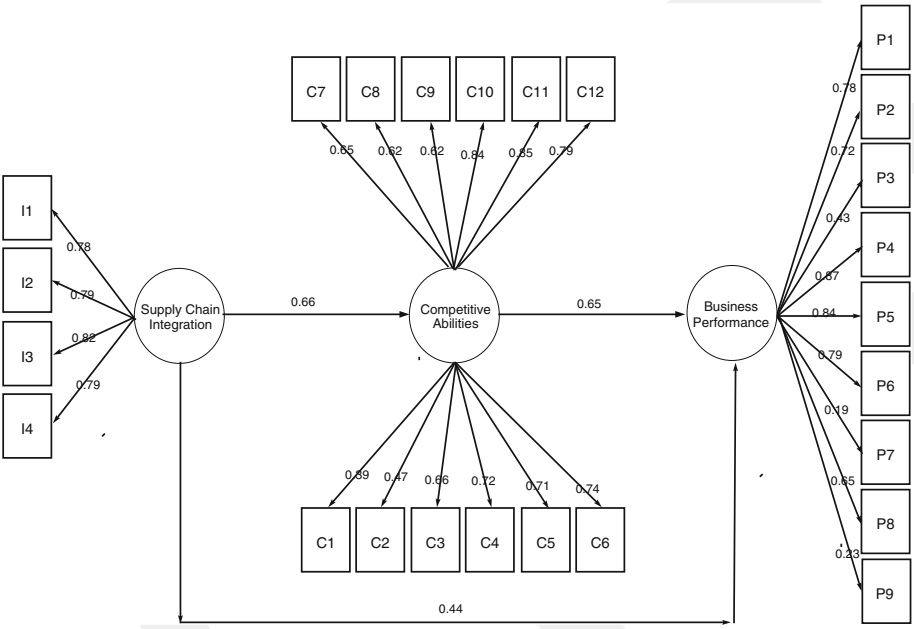

Fig. 2 Parameters estimated

ues greater than 0.7 (Nunnally 1979) are considered to demonstrate internal consistency. Individual-item analysis indicated that all the statements in each factor should remain. The underlying dimensions for the set of items were identified by evaluating the screen plot and the eigenvalue scores. The procedure used was principal axis factoring followed by a varimax rotation with a factor loading of 0.5 or greater. All indicators loaded significantly on the latent variables (factors) they were intended to represent, providing evidence of convergent validity.

4.3 A structural equations model

The third step consists of estimating the structural parameters of the LV and then analyzing the results. In literature, there are different approaches to estimation methods: Partial Least Square (Wold 1982) and Lisrel (Joreskog 1970). We chose this last methodology, and the model parameters were calculated with the software Lisrel v8.30.

To summarize Fig. 1, the parameters of the structural model are:

$$BP = 0.65 \cdot CA + 0.44 \cdot SCI$$

This data show how each factor contributes to determining BP in Fig. 2. The most significant are C11, C10 and C9 reaching the highest scores among the competitive capabilities.

Table 5 Hypothesis test results

Hypothesis	Statement	Conclusion
H1	SCI has positive effect on CC	Approved
H2	CC has positive effect on BP	Approved
H3	SCI has positive effect on BP	Approved

All three are related with quality. C1 and C2 represent cost leadership and are two weak contributors among competitive capability factors on business performance. On the other hand all SCI Indicators (I1, I2, I3 and I4) have remarkably high scores as main contributors on Business Performance. When we examine the factors representing business performance, we may conclude that while financial performance (P4, P5 and P6) and market performance (P1 and P2) indicators have the highest effect on business performance, customer satisfaction (P7 and P9) indicators have the lowest effect on business performance. An Assessment of model fit requires several diagnoses if the fit of the measurement and the structural model to the empirical data is to be judged. The goodness of fit index (GFI) for the overall model is sufficiently high (0.78) and the AGFI (0.78) reveals, instead, about the goodness of fit of the model to empirical data. So we obtained an adequate level of model fit. In particular the RMR index (Root Mean Square Residual), the value of which (0.08) is nearly zero, shows that the calculated values are close to the empirical values. The usual statistical t-tests that were used to analyze the significance of the regression coefficients revealed that both the exogenous latent variables are strongly significant (5 % of significance) in the characterization of the latent endogenous variable (BP) in Table 5.

5 Conclusion

In this study deals with the analysis of critical success factors related with SCI and CC to discover which have more effect on BP by using a structural equation model. For this purpose, the relationship between integration, CC and business performance is analyzed. As a result of the study it is found that there is a positive association between SCI and Competitive Capability and SCI has a positive effect on Business Performance. Meanwhile it must be seen that Competitive capabilities also have a positive effect on business performance. It means hypothesis related with positive association between SCI, CC and BP are approved. These results are compatible by literature. On the other hand the most critical factor that affects BP is Reliability and the least important one is Lower Price. In general all SCI indicators have a high impact on BP, but some CC indicators have a high impact particularly quality indicators, some of them have a low impact like cost leadership indicators. When we consider BP indicators financial and market performance indicators have a high impact on BP but customer satisfaction indicators particularly customer satisfaction level (P7) has the lowest score among BP representatives. This study has also some limitations. It is done in a single country and it might be necessary to broaden the study to make comparisons with other countries results SCI integration should also be measured in more detail. On the other hand, since this study is an empirical study and Turkey is developing and becoming one of the most important countries in all sectors throughout the World thus making this study worthwhile and original.

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