Knowledge Transfer: A Mediation Analysis of Knowledge, Technology and Sustainable Innovation

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Abstract

The study has tested the relationship between information technology based systems, knowledge transfer, and innovation performance in international joint ventures operating in India. The study has its roots in the theory of dynamic capabilities. Questionnaire was developed by adapting the standardised scales of the three constructs. It was subjected to a survey from middle and top-level executives of Indian IJVs. Data were analysed using Smart-PLS-3. A significant direct impact of IT-based systems on innovation performance was confirmed. Bootstrapping process has shown the presence of partial mediation between knowledge transfer, IT-based systems and innovation performance in IJVs. Various secondary reports have suggested that innovation is a crucial factor for the growth of Indian economy and Indian economy is now focusing more on improving the innovation ecosystem to become globally competitive. The study has theoretical as well as managerial implications. Managers can identify the areas of IT-based systems to be focused in order to attain sustainable competitive advantage through innovation. Researchers may extend this model to include more relevant variables to make the model more robust, thus opening new avenues for research. Despite the researchers' best efforts, the study suffers from a few limitations. It is limited in scope, size, place, and time. It is only validated in Indian IJVs context and needs to be checked in other organizational forms and countries to check its generalizability. The study is original in nature. It is among the few studies to establish an empirical link among IT-based systems, knowledge transfer, and innovation in Indian IJVs context.

Keywords: *Dynamic capabilities, Innovation, International Joint Ventures, IT-based Systems, knowledge transfer.*

Introduction

According to Global Economic Prospects of the World Bank, India is the fastest growing economy of the present day world as no other economy in the world is growing at 7% per annum (Global Economic Prospects, 2019). Thus, it has been the destination of world investments because of being the engine of growth. One of the major form of foreign investments is FDI, i.e. foreign direct investment (Mittal, 2012). Accordingly the number of strategic alliances has been increasing substantially over the past several decades for the accelerating growth of relationships based on partnerships rather than ownerships as suggested by Drucker (Inkpen, 2000; Atalay and Sarvan, 2014). Strategic alliances are formed between two or more organizations through a co-operative legal agreement for mutual benefits (Tsang, 1999). One of the basic assumptions for a business organization to succeed globally is having some competitive advantage over competitor which requires some unique assets (Inkpen, 2008). Partnership based business relations are becoming a new way of accelerating growth as suggested by Drucker. One such business agreement is called as joint venture, which is a type of strategic alliance. An international joint venture is a legally independent firm which is formed by two or more organizations operating in two or more different countries to

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combine their resources and skills in order to attain success (Ray, 2013). International joint ventures combine resources of two or more organizations with different national origin (Killing, 1982). One of the most crucial resource is knowledge which plays a key role in attaining competitive advantage in today's world where factors of production like land, labour fails to provide the required competitive advantage (Lin, 2007).

If an organization does not create, mobilize, share, refine, or store organizational knowledge, then it cannot use such knowledge to foster organizational wisdom. Thus knowledge management is essential for a business firm especially an international joint venture which requires co-ordination and integration of two or more firm with different national origin (Lyles and Salk, 2007). This is based on the resource based view of the organization, given by Barney (1991), which demands the effective utilisation of resources, skills and competences of a firm/organization for better performance (Conner and Prahalad, 1996). Knowledge management which provides deep insights and understanding of an organization's own procedures and experiences, is defined as the management processes and practices adopted by an organization to leverage their intellectual capital to acquire and sustain competitive advantage (Syed-Ikhsan and Rowland, 2004; Ashtiani, 2014). Numerous researches have been done confirming the importance of technology based systems as a tool for effective knowledge management (especially explicit knowledge transfer) for building distinct competences (Dave, Dave and Shishodia, 2012; Badawy, Marwan and Magdy, 2015; Serenko and Dumay, 2015). Building on the theory of Nonaka and Takeuchi (1995) of knowledge creation and management argued that knowledge retained in individuals working in an organization forms the knowledge base for that organization which is necessary to be effectively managed for performance improvement and thus sustained competitive advantage (Nonaka and Takeuchi, 1995; Rambe and Mbeo, 2017).

Knowledge which resides in the minds of people and has not yet put into structured, document based form is known as tacit knowledge. In converting tacit knowledge into explicit knowledge, IT plays an important role by providing platform and tools for conversion (Davenport, Long and Beers, 1998). Information technology is not only important for high tech firms but is a crucial factor for all firms operating internationally due to its role of connecting people across the globe (Sher and Lee, 2003). The nature of economic growth has been evolving continuously in this fast changing world where innovation has become the mainstay of every organization (Plessis, 2007). Continuous innovation is possible with the help of rapidly evolving technology for improving business processes, products and services offered by the firm to their customers (Davenport and Prusak, 1998). Thus this paper highlights the importance of information technology in improving the innovation performance of international joint ventures and empirically tests three major hypotheses in this regard.

The next section elucidates the detailed literature review, followed by the proposed research framework and methodology in third and fourth section, Fifth section deals with the data analysis and results. The seventh and the final section explains the conclusion and future scope along with the limitations.

Literature Review

Information technology based resources

Researchers have identified information management as an important way of gaining competitive advantage today (Tippins et al., 2003). Reviewing the literature of strategy, information technology IT competency has been defined as "the

extent to which a firm is knowledgeable about and effectively utilizes IT to manage information within the firm" (Tippins et al., 2003). Thus almost all firms in different industries and sectors have started focussing on information technology as an effective way of collecting and utilizing information which is scattered in the systems or is in tacit form (Bharadwaj, 2000; Claver-Cortés et al., 2018; Borges, Bernardi and Petrin, 2019). Tippins, et al. proposes that IT competency is comprised of three components which are IT knowledge, IT operations, and IT objects and studied its link with performance via organizational learning:

a. IT knowledge

It can be defined as the 'information combined with experience, context, interpretation, and reflection,' it possesses a tacit component that is difficult to quantify (Davenport, Long and Beers, 1998). It has been conceptualized as the level of technical knowledge possessed by a firm regarding IT objects like computer based systems, etc. (Tippins et al., 2003).

b. IT operations

IT operations refers to the techniques, methods, skills and processes which are considered essential for completing a given task aiming to attain some competitive advantage by a firm (Richard, 1999). These are considered essential in order to implement the IT knowledge efficiently (Tippins et al., 2003).

c. IT objects

These are the enablers which are required for information production, processing, storage, sharing, etc. (Glazer, 1991). It comprises mainly of computer based hardware and software and supporting personnel (Tippins et al., 2003).

These components are said to be co-specialised as all of them are required to achieve IT competence. This study incorporates all the above mentioned elements of IT for developing the questionnaire. Information technology has helped the companies across the globe to take advantage of leveraged knowledge which involves use of both humans and information technology (Richard, 1999). Drucker in 1988 gave the concept of Information based organizations (IBO) which are a need of modern day business requiring more specialists or knowledge workers for survival and growth in global business environment (Lee and Hong, 2002).

Knowledge transfer & IT

Theory of organizational knowledge explained two dimensions of knowledge creation which are the epistemological and ontological. At the level of epistemology, researchers identified two types of knowledge- tacit (personalized) and explicit (codified). Tacit knowledge is difficult to transfer and requires formal and informal interactions between the donor and receiver of knowledge, whereas explicit knowledge can be written down in codifiable languages in the forms of manuals, blueprints, databases, etc. (Dhanaraj et al., 2004; Park, Vertinsky and Becerra, 2015; Rambe and Mbeo, 2017). Thus it can be seen IT plays a major role in storing, and disseminating explicit knowledge across the individuals of an organization (Sher and Lee, 2003; Syed-Ikhsan and Rowland, 2004).

Nonaka and Takeuchi (1995) highlighted the need of information technology for creation of new knowledge, its dissemination across the organization, utilizing that knowledge for developing new products, or improving products, services, processes and other organizational systems (Nonaka and Takeuchi, 1995). Various conceptual and empirical studies have been done for establishing and validating the relationship between information technology and knowledge management (Young-Ybarra and Wiersema, 1999; Bharadwaj, 2000; Sher and Lee, 2003; Rhodes et al., 2008; Atalay and Sarvan, 2014). IT plays a

crucial role in knowledge management by providing technologies like groupware, multimedia systems, electronic databases, communication platforms and other various soft wares which speeds up the conversion process from tacit to explicit knowledge and vice-a-versa (Wong et al., 2003). The above mentioned infrastructure of information technology builds a pipeline for the easy flow of explicit as well as tacit knowledge thus it has been acknowledged as an important instrument facilitating knowledge transfer which is an essential part of knowledge management (Ashtiani, 2014; Zou, Ertug and George, 2018; Anzola-Román et al., 2019).

Theory of Dynamic capabilities says that a business firm needs to continuously evolve according to the environmental opportunities and threats, and for being dynamic a firm needs latest technology for managing its information and knowledge based resources (Teece, Pisano and Shuen, 1997; Teece, 2017). IT is considered as a crucial instrument in knowledge management as it helps in storage, categorization, retrieval, sharing, transfer of knowledge (Maryam and Leidner, 2001). IT has been identified as an important enabler for knowledge management by various studies (Lin, 2007; Rhodes et al., 2008). Davenport empirically tested and found a positive relationship between IT and knowledge transfer in an intra firm set up. It showed both a direct relationship between IT and innovation performance and its indirect relationship via knowledge transfer (Davenport, Long and Beers, 1998). Thus, following hypothesis is proposed for empirical testing:

H1: There is a significant positive relationship between Information technology based systems and knowledge transfer.

IT, Knowledge Transfer and Innovation Performance

Performance measurement of corporate houses is one of the most significant topics in business management (Zahra, Ireland and Hitt, 2000). Strategic management researchers have emphasized the importance of continuous innovation for improved performance of business firms for sustaining competitive advantage. Literature has witnessed various conceptual as well as empirical studies linking IT with firm's innovation but still results have remained equivocal (Chatterjee et al., 2015). The strategic relationship between the knowledge and IJV performance has also been empirically studied by Salk, et al. and significant positive relationship was found between them (Lane, Salk and Lyles, 2001). Chen, et al. used structural equation model to analyse the positive effects of relationship learning on Taiwan firm's innovation performance which again used product and process innovation as performance constructs (Chen, Lin and Chang, 2009). Researchers like Davenport have also found empirical evidence of the direct relationship between Information technology and innovation performance (Davenport, Long and Beers, 1998). Integration of various IT based systems like web portals, databases for data storage and data mining, retrieval and transfer of information/knowledge, workforce search, customer relationship management could help in increasing the knowledge transfer across the organization leading to improved innovation performance (Rhodes et al., 2008). But it is also highlighted that IT systems are not the ultimate solution; its presence doesn't guarantee the success of the firm, rather it requires the willingness of individuals to share knowledge and a conducive work environment (Wong et al., 2003).

Many researches have been done on the direct relationship between IT systems and innovation performance of the firm (Davenport, Long and Beers, 1998; Rhodes et al., 2008). But they have also emphasized that it impacts innovation in a

mediated fashion with mediating constructs such as knowledge transfer, innovation-supportive cultures, dynamic capabilities (Chatterjee et al., 2015; Aggarwal and Kapoor, 2018; Matricano et al., 2019; Mohammed, Elrehail and Ahmad, 2019). This study proposes knowledge transfer as a mediating variable between IT based systems and innovation performance for empirical testing, the proposed research framework is shown in the figure-1. Thus following hypotheses are proposed:

H2: There is a significant positive relationship IT-based systems and innovation performance.

H3: Knowledge transfer mediates the relationship between IT-based systems and innovation performance.

Methodology

After reviewing research articles, books, reports, etc., a survey questionnaire was developed to operationalise the constructs of the proposed research model. The questionnaire was made using the 7-point Likert scale as it provides more normality to the responses and data as compared to 5-point scale (Dawes, 2008). The questionnaire underwent validation process through various academic and industry experts, who suggested some changes. The final items of the questionnaire are presented in the following Table 1 along with the references. A primary survey, through personal interviews and online professional sites like LinkedIn, has been conducted. The explanatory research of survey

Figure-1: Proposed Research Framework

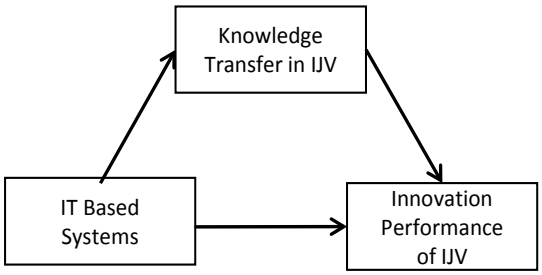


Table 1: Questionnaire Items with their references

Variable	Construct	Items	References
IT-aided Resources & Systems	IT Support	1. Use of knowledge- management systems.	(Rhodes, et. al., 2008); (Tippins, 2003)
		2. Use of e-databases and repositories.	
		3. Use of internet and intranets.	
		4. Degree and patterns of open communication systems.	
		5. Facilities like single-sign in.	
		6. Extent of sharing of IT- resources with stakeholders.	
Knowledge Transfer	Flow of organizational Knowledge	1. Storage & organization of knowledge in organizational databases.	(Dhanaraj et al., 2004); (Inkpen, 1998); (Mowery, Silverman, 1996); (Simonin, 1999b, 2004); (Nonaka & Takeuchi, 1995); (Rhodes, et. al., 2008)
		2. Categorization of knowledge in databases.	
		3. Use of network facilities for knowledge transfer.	
		4. Storage and sharing of tacit elements of knowledge like processes, etc.	
		5. Experience sharing among employees through formal & informal channels.	
		6. Incremental learning programs.	
Innovation Performance	Products Innovation, Process Innovation, Technical Innovation, and Services Innovation	1. Launching of new products in comparison to competitors.	(Hertog, 2000); (Rhodes, et. al. 2008); (Teece, 2010); (Costa & Monteiro, 2016)
		2. Product quality improvements.	
		3. Innovation in logistics networks.	
		4. Innovation of services in comparison to its competitors.	
		5. Availability of customization of production.	
		6. Innovative technologies.	
		7. Pace of adoption of technology in comparison to its competitors.	
		8. Frequency of innovation in operations, HR, etc. processes	
		9. Innovation Increasing customer satisfaction	
		10. Degree of patenting the innovations	

method has been chosen for this study combined with semi-structured interviews to collect data and cross-sectional design for the research.

Purposive sampling is used to collect data for the study. Top and middle level managers of the international joint ventures operating across India formed the population for this study. The list of Indian IJVs.

Smart-PLS-3 was used for data analysis due to non-normality and small sample size of data. To determine the adequate sample size the most used criterion is the 10 times rule (Barclay, Higgins and Thompson, 1995). The largest number of arrows pointing to any one of the constructs (innovation performance) is 10 in the present study. Thus the sample of 108 respondents used in the study for pilot testing which is higher than the minimum requirement. (10*10=100 -minimum sample size for meaningful analysis). The pilot testing results showed satisfactory reliability and validity results, thus the final data set comprised of 176 responses for the data analysis as discussed in the next section.

Data analysis

Preliminary Data Analysis

Preliminary data analysis is done for detecting any missing value and then data are coded accordingly. Distribution diagnosis was done and descriptive statistics was determined, skewness and kurtosis was checked which is presented below in the Table 2 and it did not show any problem. Further test for common-method bias was also conducted. The present study uses Harmon's one-factor test to check the presence of this bias (Jarvis et al., 2003). As the value of one factor was less than 50%, no major problem of common method bias is determined in the collected data set.

Table 2: Skewness and Kurtosis

Construct	Items	Skewness	Kurtosis
IT-based Systems	IT1	-0.701	0.068
	IT2	-0.527	-0.497
	IT3	-0.956	0.615
	IT4	-1.615	2.808
	IT5	-0.74	-0.198
	IT6	-0.853	0.006
Knowledge Transfer	KT1	-0.939	0.697
	KT2	-0.841	0.359
	KT3	-1.193	0.922
	KT4	-0.979	0.261
	KT5	-0.984	0.753
	KT6	-0.823	0.176
Innovation Performance	IV1	-0.895	0.479
	IV2	-0.844	-0.024
	IV3	-0.865	0.37
	IV4	-0.899	0.115
	IV5	-0.998	0.646
	IV6	-0.858	0.101
	IV7	-0.726	-0.095
	IV8	-0.725	-0.294
	IV9	-0.826	-0.082
	IV10	-0.782	-0.185

Results

Measurement Model

Reliability and validity of all the variables are assessed in measurement model. Accuracy and precision of the measurement procedure is assessed through reliability and validity assesses the extent of accuracy of data collection method adhere with what was intended to measure (Hair et al., 2010; Hair et al., 2012; Field, 2013). Cronbach's alphas, composite reliability and AVE values are calculated in Smart PLS 3 and shown below in Table 3.

Table 3: Factor Loadings, Cronbach's alpha, Composite
Reliability and AVE values

Constructs	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	AVE
IT-Based Systems	IT1	0.744	0.806	0.861	0.512
	IT2	0.74			
	IT3	0.789			
	IT4	0.671			
	IT5	0.798			
	IT6	0.511			
Innovation Performance	IV1	0.823	0.955	0.961	0.712
	IV10	0.747			
	IV2	0.902			
	IV3	0.879			
	IV4	0.843			
	IV5	0.837			
	IV6	0.859			
	IV7	0.818			
	IV8	0.87			
	IV9	0.85			
Knowledge-Transfer	KT1	0.786	0.871	0.903	0.609
	KT2	0.793			
	KT3	0.662			
	KT4	0.825			
	KT5	0.771			
	KT6	0.834			

Internal consistency reliability is measured by Cronbach's alpha values which is more than the acceptable value of 0.7 for all the three variables, thus establishing reliability of the research model. The co-relation among the various measurement items of the same construct is measured by convergent validity, which can be evaluated by assessing the values of average variance explained (AVE). The AVE is calculated as the mean of sum of squared loadings of the items of a construct divided by number of indicators of that construct and thus, indicated mean average variance extracted for the items loadings on a construct (Hair, Ringle and Sarstedt, 2011). AVE was calculated for all the constructs of the measurement model of the study by taking minimum indicator loading as 0.4 into consideration as shown in Table 3.

Convergent validity is assessed through the factor loadings and the AVE values, as shown in Table 3, all the factor loadings are above 0.7, thus satisfactory and all the AVE values are above 0.6, thus satisfactory and establishing the convergent validity. Another important measure of the measurement model is the discriminant validity measured with the help of well-known Fornell-Larcker criterion is stated below in Table 4. The diagonal values are the square roots of AVE and other cells contain squared correlation of the construct with other latent variables in the model. This criterion is important to ensure two different constructs are theoretically and empirically uncorrelated (Hair et al., 2016). According to this criterion, the value of square roots of AVE of the constructs lying at the diagonal should be more than the square roots of AVE of the constructs lying in other cells (Hair et al., 2014). Another criterion of discriminant validity is HTMT values, which should be less than 0.9 for establishing discriminant validity (Hair, Hult, Ringle and Sarstedt, 2016). As shown in the table 5, discriminant validity is confirmed for the measurement model of the study.

Table 4: Fornell-Larcker Criterion of Discriminant Validity

	IT Based Systems	Innovation Performance	Knowledge Transfer
IT Based Systems	0.716		
Innovation Performance	0.71	0.844	
Knowledge Transfer	0.741	0.713	0.78

Table 5: HTMT Criterion of Discriminant Validity

	IT Based Systems	Innovation Performance	Knowledge Transfer
IT Based Systems			
Innovation Performance	0.783		
Knowledge Transfer	0.859	0.772	

The above analysis clarifies the issue of composite

reliability, convergent validity, and discriminant validity for all the constructs in the measurement model. Thus it can be concluded that there is no issue of reliability or validity in the given data set of the present study.

Structural Model

After checking the various parameters of the measurement model, now various parameters of structural model need to be tested which includes the assessment of collinearity issues, significance of the relationships between constructs, checking the level of R^2, f^2, and Q^2.

Collinearity Statistics of Structural Model (Inner VIFs)

Collinearity can be a major issue in data analysis and can distort the analysis. Thus measuring collinearity is important. VIF values as shown in the following Table 6, VIF values for all the constructs are less than the acceptable limit of 5, thus it can be concluded that the present study has no issue of collinearity between any of the constructs.

Table 6: Collinearity Statistics of Structural Model (Inner VIFs)

	KT	IV	IT
KT		2.105	
IV			
IT		2.105	1

Coefficient of Determination (R^2 Value)

Structural model assessment is the final step in the data analysis of this study. R^2 is considered one of the most reliable measure of structural model irrespective of the choice of data analysis technique (Hair et al., 2010; Field, 2017).

Table 7: Coefficient of Determination (R^2)

	R Square
Innovation Performance	0.582
Knowledge-Transfer	0.549

As there are two dependent variables in the research model, there are two R^2 values as shown in table 7 above. The value for innovation performance is 0.582, which means 58.2% variables in innovation performance is explained via knowledge transfer and IT-based systems. The value 0.549 signifies that 54.9% variations in knowledge transfer is explained via changes in IT-based systems. As per the thumb rule, these values of R^2 indicate the moderate predictive accuracy.

Standardized Root Mean Square Residual (SRMR)

SRMR is defined as the 'root mean square discrepancy between observed correlations and the model-implied correlations' (Hair, Black, & Babin, 2010). It is also considered as an important measure of model fit. The acceptable value of SRMR is less than 0.08 indicating a good fit (Hair et al., 2014). The study has an SRMR value of 0.075 which is less than 0.08, thus indicating a good fit.

Table 8: Standardized Root Mean Square Residual (SRMR)

	Saturated Model	Estimated Model
SRMR	0.066	0.066

Mediation Analysis

The purpose of this study was to check the relationships between IT-based systems, knowledge transfer and innovation performance in context of Indian IJVs. In SMARTPLS 3, the distribution free bootstrapping process, as suggested by Preacher and Hayes, is run in order to obtain the path coefficients and p values associated with these coefficients (Preacher and Hayes, 2004). First the direct relationships are assessed as shown in Table 9 and figure 2 also depicts this significant relationship. A significant direct relationship was found between IT-based systems and innovation performance with a t value of 18.290 and p value of 0.

Figure 2: Direct Relationship between IT-based systems and Innovation performance

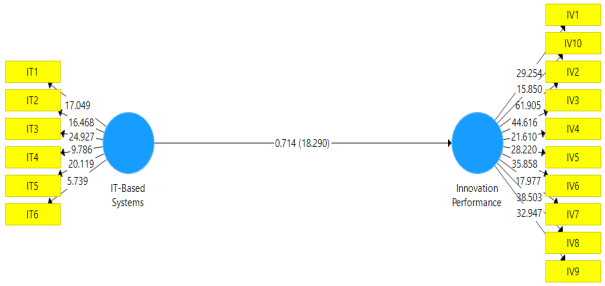


Table 9: Direct relationship in the absence of mediator

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
IT-Based Systems -> Innovation Performance	0.714	18.29	0

Thus the above results show that mediation can be possible among the three variables. Bootstrapping was run to assess the mediation analysis as shown below in figure 3 and Table 9 and 10.

Table 10: Total Indirect Effect

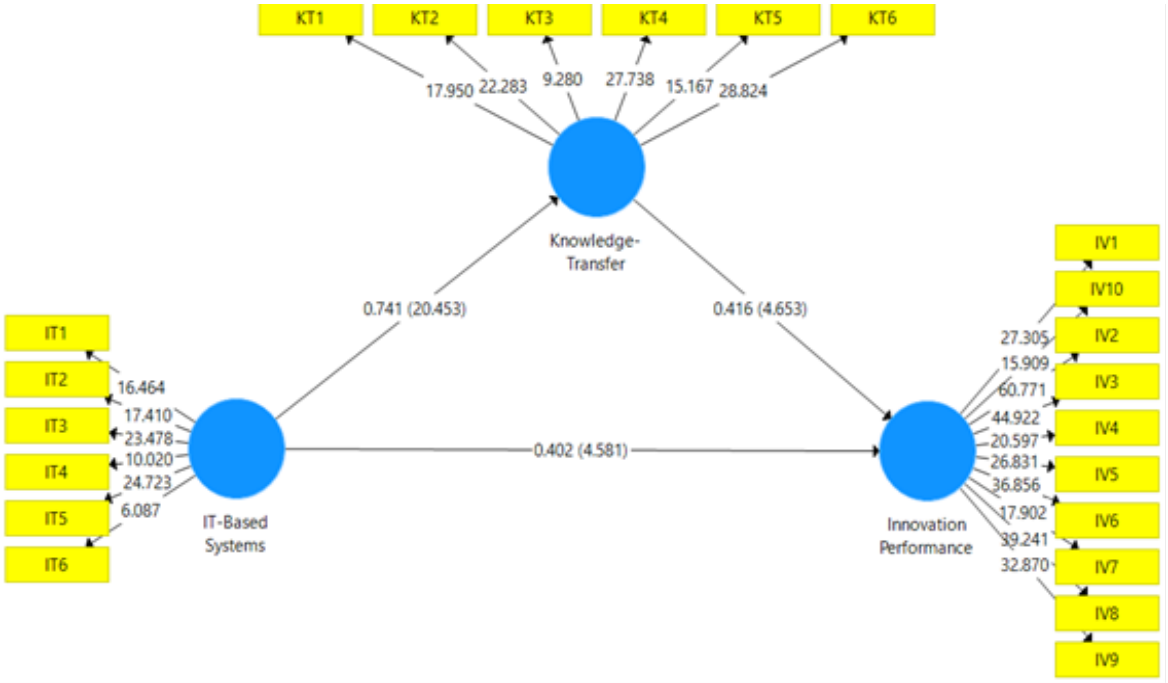
	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
IT-Based Systems -> Knowledge-Transfer -> Innovation Performance	0.308	4.355	0

Table 11: Path Co-efficient after bootstrapping

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
IT-Based Systems -> Innovation Performance	0.402	4.581	0

Table 10 shows the significant indirect effect of IT-based systems on innovation performance through knowledge transfer with p value of 0, thus confirming the mediation effect in the research model. Table 11 shows the path coefficient of IT-based systems after performing mediation analysis, i.e. to identify which type of mediation is present: partial or full mediation. As the path co-efficient 0.402 is significant with a t value of 4.581 (p value-0). It can be confirmed that the direct

Figure 3: Mediation Analysis



relationship between IT-based systems and innovation performance is still significant in the presence of knowledge transfer indicating a partial mediation case in the present study.

Assessment of the Significance of Relationships and Hypothesis Testing

SMARTPLS 3 is used to analyse the data collected from various international joint ventures operating in India. By running the PLS algorithm, the path coefficients representing the relationships among the constructs in the structural model are obtained. These coefficients are the indicator of the strength or degree of the relationships among them. The value of these coefficients lie between the range of -1 and +1 where +1 shows the positive strength of the relationship and -1 shows a negative relationship while values near to zero indicates weak or no relationship between constructs.

Table 12: Relevance and Significance of path coefficients

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
IT-Based Systems -> Innovation Performance	0.402	4.581	0

5% significance level

Table 12 shows the t-statistic and p-values along with the path coefficients for the constructs after the process of bootstrapping. All the obtained p values are compared to the 5% significance level and critical t value is thus 1.96 for comparison. As can be seen from the table above, the relationships between Information Technology based system, knowledge transfer and innovation performance are significant.

Table 13: Hypotheses Testing Results for H1-H3

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
IT-Based Systems -> Innovation Performance	0.402	4.581	0
IT-Based Systems -> Knowledge-Transfer	0.741	20.453	0
Knowledge-Transfer -> Innovation Performance	0.416	4.653	0

Table 13 placed above shows the results for hypothesis testing. As can be seen in the table, the study tested three hypotheses. First hypothesis which is regarding the relationship between IT-based systems and knowledge transfer is significant as the t value is greater than 1.96 at 5% significance level with p value 0, thus accepting the first hypothesis. Similarly, second and third hypotheses are also accepted due to the significant relationship between knowledge transfer and innovation performance (p value = 0), and presence of partial mediation in the research model.

Discussions and Conclusion

Discussions

The study has incorporated three important elements of contemporary world in order to attain sustainable competitive advantage in an economy. Information technology is seen as a crucial source of competitive advantage in the present world. Thus this study tries to establish an important relationship in context of Indian IJVs which can help Indian economy to become more robust in the world economy. The management of information and knowledge has become an enormous task and globalization has led to the management of big data which requires proper systems for managing information and knowledge, essential for innovation (Dossani and Kenney, 2007; Chatterjee et al., 2015).

The study has found the evidence from the collected data supporting the relationship between innovation

and IT-based systems. The path coefficient of IT-based systems with IJV success is 0.714 (p Value-0), thus the data supports the hypothesis that IT-based systems have a direct significant impact on IJV innovation. Further there is a significant relationship between IT-based systems and knowledge transfer with path co-efficient 0.402 (p value-0), and between knowledge transfer and innovation performance with path co-efficient 0.416 (p value-0). Furthermore, partial mediation is also found in the study, thus it can be concluded that in Indian IJVs, knowledge transfer mediates the relationship between IT-based systems and innovation performance, i.e. knowledge transfer facilitates the relationship between them.

This positive relationship has enhanced India's innovation status in the world. India has seen the highest growth of 27% in the number of patent applications filled with World Intellectual Property Organization (WIPO) in 2018. Thus India has joined the innovation race and has strengthened its participation in international patent system, making India third country only after China and US in volume of patent filling. According to Bloomberg's most innovative index 2019, India is now at 54th position among the world's most innovative 200 countries, showing improvement in the recent past.

Another evidence of this relationship can be traced in the highest gain for any country in 2019 in the International Intellectual Property (IP) Index issued by the US Chamber of Commerce's Global Innovation Policy Center (GIPC) as India has climbed eight places to 36th position on the index. It reflects that India is incessantly implementing reforms for building and improving innovation culture and ecosystem for domestic entrepreneurs in order to bring more FDI (international joint ventures also) which can benefit the economy in attaining sustainable global competitive advantage. This index has shown an improvement of India's overall score from 30.07% (12.03 out of 40) in the previous edition to 36.04% (16.22 out of 45) in the present edition. Thus it can be concluded that Indian economy is progressing towards a more innovative ecosystem which is due to the growing importance of innovation in order to attain sustainable global competitive advantage.

Limitations and future directions

Although the study has explored a new link in Indian IJVs, it can be made more robust in future. The study only applies to the Indian IJVs, thus limiting its applicability in terms of organizational structure. Future studies can apply this research model in context of other organizational structures and in different countries, and at different times to check its applicability. More elements can be added to the present research model to make it more robust. The research framework can be further extended to incorporate various other items of IT based systems, knowledge transfer, and innovation performance. More such organizational factors influencing the IJV success can also be added to the model. Furthermore, the study can be applied to specific industries even in Indian context as some industries are more knowledge-intensive than others and use more IT resources as compared to some labour-intensive industries. Sample size, although apt from methodological point of view, can be enlarged for enhancing its generalisability.

Implications

The present empirical study tries to develop a research framework on the basis of dynamic capabilities theory by integrating three important elements of the theory, i.e. IT-based systems, knowledge transfer and innovation performance. It also tries to overcome the criticism of the theory by providing empirical evidence in Indian context. Thus it has some important theoretical as well as managerial implications.

The study is helpful for future researchers as it opens up avenues in strategic management of international business firms, especially international joint ventures. More such studies in context of Indian IJVs are required as it is an important form of organization in this globalized world and an important source of attaining sustainable competitive advantage for firms as well as for the economy.

Managers of international joint ventures will also benefit from this study as they can now look at localised studies rather than referring to the studies done by foreign researchers which may not be able to present the true picture due to national and cultural differences. This study, by establishing positive relationships between IT based systems, knowledge transfer, and innovation performance of IJVs, conveys that IJV managers must invest their resources in IT-based systems and in effective knowledge transfer processes as these two variables are of crucial importance in attaining sustainable competitive advantage by enhancing the innovation performance. The managers should incorporate the use of knowledge management systems, e-databases, online repositories, internets and intranets, sharing of IT resources with their partner firms in order to boost the knowledge transfer in international joint ventures. Moreover, this study also suggests that both the tacit and explicit knowledge transfer are important for better innovation performance in IJVs. Managers must focus on proper storage and categorisation of knowledge into organizational databases, and should use both formal and informal platforms for efficient knowledge transfer of tacit and explicit components. These types of knowledge transfer are proved to be necessary for development of innovative products, processes, techniques, and services.

Conclusion

Innovation is seen as inadvertent to make an economy more robust, which is why Indian government is also coming up with new government schemes like stand up India, start up India to promote entrepreneurship and innovation in India economy. This study aimed at confirming the positive relationships between IT-based systems, knowledge transfer, and innovation performance in Indian IJVs. This pan India study involved online and offline primary survey with middle and top level managers forming the population of the study. Purposive sample was used and data analysis was done in Smart PLS 3 due to its various advantages over co-variance based analysis tools. The data collected from Indian IJVs confirmed the positive relationships among the three variables established in literature. Moreover this study also established the mediation relationship between IT-based systems and innovation performance through knowledge transfer, implying knowledge transfer is an important variable in their relationship. India has registered highest growth in the number of patent applications filled with WIPO in 2018 and according to Bloomberg's innovative index India's rank has improved in the current period, thus the evidence of growing innovation in the Indian economy is visible. Thus it can also be concluded that IT-based systems, and knowledge transfer mechanisms are important for better innovation performance of IJVs and Indian economy.

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