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Editorial Board

A BI-ANNUAL JOURNAL OF DELHI INSTITUTE OF ADVANCED STUDIES

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From The Editor's Desk

It is our profound delight to present to our readers, the thirty fifth issue of DIAS Technology Review.

The enigmatic pandemic Covid-19 appeared like a whirlwind, posing a big challenge to socio-economic scenario, and shaking business dynamics worldwide. The uncertainty and ambiguity caused by it has forced organizations to strategize again, in almost all the areas of business. Series of Lockdown and swift flow of information to investors has exerted significant impact on stock market sectoral indices as well as returns in the financial markets. The research article Contagious COVID 19: Leading to Hysteria in Indian Stock Markets and Sectoral Indices Performance studies the negative sentiment contributing to a phenomenal volatility in the sectors perceived to be most affected by the corona virus outbreak in India. Even the volatility in the oil prices made a great impact & disturbed all the sectors of economy. The author in her study Efficiency Testing of Indian Crude Oil Futures, has tried to scrutinize empirically whether Indian crude oil futures market is efficient and is overseeing the way of information flow between the spot and futures of crude oil. It was discovered that, both crude oil spot and future markets are cointegrated and error correction is taking place in both the markets. Similarly, recent developments in the Real Estate Investment Trusts(REIT) stocks have also seen a critical divergence. In the article Why are Storage REITS Outperforming other REITS, authors have examined different forces impacting storage REITs, by using structural breakpoint methodology and analyzing some structural trends.

Modern organizations are using enormous data to gain insights for various operations related decision made by the policymakers & Business Intelligence facilitates monitoring, reporting and management of data to accomplish their goals. In the research article **Business Intelligence Success in Selected Organizations in the Energy Sector in India: An Analysis**, the authors have tried to investigate the factors causing low success rate of BI project adoption in energy sector and allied industries and explored that interaction of systems, quality of data, user access to BI and risk level of the organization play significant role in business intelligence success in the organizations.

The COVID-19 pandemic has impacted not only the operational processes of the organizations, but efficiency of supply-chain systems making timely & low-cost delivery in broader markets. The unpredictability & uncertainty in supply chain has increased complexity, making day to day tasks even more difficult. The article **Managing Supply Chain: Issues and Challenges of Complexity, Risk and Flexibility** discusses the role of modularity and flexibility. Authors have suggested to make a balance between the needs for stability and flexibility and between the needs for variety and control, while managing supply chain complexity in the organizations.

The focus on Vocational Education and Training (VET) for skill development has increased in the recent years, due to decreasing employment and increasing uncertainty in business environment. The research study **Vocational Education: Determinants of Skill and its Relationship with Employability** investigates the constructs of skill development that affect employability skills of workforce after completing their Vocational Education and Training Programme and determines the association of skill development and employability.

In the fast-changing environment and information-based times, the service-driven hospitality sector has become more vulnerable. The operational bottlenecks and increasing competition have forced the hotel industry to radically modify its strategic orientation. The doctoral abstract, **Impact of Competency Development and Talent Management Practices on Employee Engagement in Indian Hotel Industry** signifies how senior management can cultivate a service excellence culture and shape the service delivery system from a diverse workforce by aligning and supporting employee goals through competency development and talent management practices.

In our quest of acquiring & disseminating knowledge in different areas of business and IT, we expect that the present edition of this journal, with all its illuminating features will come up to the expectations of our revered readers.

Regards,

Dr. Anju Batra

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Managing Supply Chain: of Complexity, Risk and

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Issues and Challenges
Flexibility

ABSTRACT

Supply chain is a network of organizations. It is a complex system. According to Simon (1962), complexity makes any system, including supply chain, unpredictable, thus resulting in its task of day-to-day management that much difficult. In a complex system, a minor incident in one area has a potential to bring disaster in another. This article elaborates on several types of unpredictability in supply chain systems and also discusses their relationships with various levels of complexities involved in it. Minimizing the negative effects of complexity is very important. This article also discusses the role of modularity and flexibility, and the risk in managing supply chain complexity.

In addition, Bozarth et al. (2009) measured organizations' performances using factors like low-cost delivery, schedule attainment, customer satisfaction, and competitive performance. The authors concluded that an increase in complexity negatively affects organizations' ability to achieve their goals. Also, according to Quinn and Rohrbaugh (1983), an organization must balance between many of its contradictory values to function effectively. For example, an organization must find a balance between the needs for stability and flexibility and between the needs for variety and control. An organization's management of supply chain adds to the complexity it faces. Hence, organizations find balancing between such competing values (e.g., stability and flexibility) very challenging, especially in the face of the COVID-19 pandemic.

Key Terms: Supply Chain, Complexity, Risk, Modularity, Flexibility, System Balancing

INTRODUCTION

Supply chain is a complex system. Complexity, according to Simon (1962), is the outcome of multiple nodes and arcs of a supply chain interacting in nonlinear ways (Simon, 1962; Bozarth et al., 2009; Choi and Wu 2009; Touboulic et al., 2018, 2020) with other components and functions of an organization. Add to this, today's global economy has entered the fourth industrial revolution, widely known as Industry 4.0 (Schwab 2016). According to Koh et al. (2019), Industry 4.0 includes technological advancement in emerging technologies in such fields as robotics, artificial intelligence, nanotechnology, quantum computing, biotechnology, the Internet, fifth-generation wireless technologies (5G), 3D printing, big data, and fully autonomous vehicles, to name a few. This revolution has made a supply chain system as the integral part of an organization whether business and non-business-with multiple suppliers, intermediaries, governmental agencies, and customers, increasing its complexity exponentially. In addition, intense competition and changing demands of customers have led to additional challenges and the shortening of organizational life cycle, thus ultimately expanding complexity in organizations (Bala 2014; Bozarth et al., 2009; Gunasekaran et al. 2015; Rajah et al. 2018; Sheffi 2005; Sheffi and Rice, 2005; Touboulic et al. 2018, 2020; Yang and Yang, 2010).

A simple system means the distance between cause and effect, both in physical and temporal sense, is narrow. A complex system puts an extensive demand on information gathering, processing, and on managers' assessment and handling of complex decision processes and systems in their organizations (Cheng et al. 2014; Garud et al., 2003; Galbraith 1974; Manuj and Sahin 2011; Sheel 2016; Simon, 1962; Snowden and Boone, 2007; Pich et al. 2002; Trentin et al., 2012). Bozarth et al. (2009) empirically verified the negative impact of system-based complexities on the performances of manufacturers. According to these authors, higher complexity leads to higher cost in production and more incidents of breakdowns and delays in production processes. They also found that the system complexity negatively affected the customer satisfaction and their competitive positions.

Several studies have proven that a complexity in a system breeds risk (Sheffi, 2005; Simchi-Levi et al., 2008; Chopra and Sodhi, 2004; Gunasekaran et al., 2015; and Yang and Yang 2010). Complex organizations are disproportionately affected by small failures in some remote corners of their supply chain. For example, American electronics and computer manufactures were unduly affected by Taiwan's earthquake of 1999 (Yang and Yang, 2010; Sheffi 2005; Simchi-Levi, 2008). Similarly, electronic giant Ericsson's eventual decision to get out of cell phone manufacturing has been attributed to an insignificant fire in a supplier's plant in New Mexico (Sheffi, 2005; Simchi-Levi et al., 2008; Chopra and Sodhi, 2004; Gunasekaran et al., 2015; Yang and Yang 2010; and Sheffi and Rice, 2005).

A related issue here is that of Modularity. Simon (1962), while discussing Complexity, used a thought experiment to show that a modular product design not only reduces the product complexity but also adds to the flexibility and reduces the associated risks of delay. He gave an example of two (fictitious) watchmakers, each making similar watches with ten thousand parts. One watchmaker used modularity and made ten different modules of one thousand parts each, and the other watchmaker did not use modularity to organize ten thousand parts. The experiment showed that the modularity minimized the effect of breakdowns from any interruption for the first watchmaker, but the similar breakdowns proved to be disastrous for the second watchmaker who did not use modularity. Many studies have shown that a modular product structure, and a disintegrated organizational structure go hand in hand (Baldwin and Clark, 1997; Langlois and Robertson, 1992; Fujimoto, 1999; Fine and Whitney, 1996). Modularization and standardization helps to reduce transaction costs (Williamson, 1996; Garud and Kumaraswamy, 1995; Sanchez and Mahoney, 1995). There are many examples in Auto-Industry in the United States (Langlois and Robertson, 1992; Raff, 1999) and Japan (Fujimoto, 1999), and in the Computer Industry (Baldwin and Clark, 1997; Fine and Whitney, 1996) to support this assertion.

Understanding and balancing the contradicting propositions like complexity, flexibility, and variety in a system are required for effective management of organizations; and it is more relevant when it is a part of a complex system like supply chain (Quinn and Rohrbaugh, 1983; Bozarth et al.,2009). What is complex in one context may not be the same in another situation. Still, flexibility, which can mitigate the effect of complexity and improve the customer satisfaction in one situation, can also exacerbate it without increasing customer satisfaction in many other cases (Bozarth et al., 2009; Fujimoto, 1999 and 1999b; Holweg and Pil, 2004; Ward et al., 2010).

Regarding complexity, one should also recognize that many of today's supply chains have replaced the vertically integrated corporate structures. The vertical structures have been proved complex, costly and inflexible facing increasingly demanding customers and intense market competition (Fine and Whitney, 1996; Langlois and Robertson, 1992). Also, for many products, increasing choices and varieties for customers entails adding complexities (Frohlich, 1998; Fujimoto, 1999; Fujimoto, 1999b; Bozarth et al.,2009).

UNPREDICTABILITY AND COMPLEXITY

Although commonly referred to as risk or uncertainty, there are various kinds of unpredictability. We can describe unpredictability in an ordered system as 'risk', whereas the same in an unordered structure can be regarded as 'uncertainty' or 'ambiguity' (Bazerman and Moore, 2012; Pich et al. 2002; Snowden and Boone, 2007).

Classifying Unpredictability

Knight is world-renowned author of the book, Risk, Uncertainty and Profit (1921), based on his doctoral dissertation at Cornell University. In this monumental book, he carefully distinguished between economic risk and uncertainty. Langlois and Cosgel (1993) explained Knight's definition of risk and uncertainty. According to these authors, playing with a deck of cards entails risk, whose outcomes can be unpredictable, but all the requisite information is available;

therefore, risk can be measured perfectly. Uncertainty arises when information is incomplete (Langlois and Cosgel, 1993). We need more data before calculating risk (Daft and Lengel, 1986). We call this situation 'known-unknown' in the sense that you do not have enough information, but you know what to look for (Snowden and Boone, 2007; Courtney et al., 1997; Pich et al. 2002; Simchi-Levi et al. 2008).

And there is ambiguity. Ambiguity arises when available data provide incomplete and equivocal or conflicting information. Under this condition, more data availability is not necessarily helpful. This situation is called as 'unknown-unknown.' A situation is unknown and what information to look for is unknown. When faced with an "unknown-unknown" circumstance, managers should first create a framework to interpret the information and then the framework can make sense out of the unknown-unknown situation (Weber and Glynn, 2006; Weick, 1989; Snowden and Boone, 2007; Courtney et al.,1997; Pich et al. 2002; Simchi-Levi et al. 2008, pp 316; Subedi, 2017). In such conditions, qualitative data collection methods, such as face-to-face meetings (which provide verbal and nonverbal cues not captured by data), can be useful (Daft and Lengel, 1986; Bazerman and Moore, 2012, pp 76; Pich et al. 2002).

Level of Complexity

In Snowden and Boone's (2007) framework of complexity, the first category is called ordered complexity. It falls in the realm of risk. The ordered complexity is further divided into two levels. The first level is simple and is referred to as a stable environment. At this level, processes and outcomes can be measured and predicted. Prediction do not mean perfection, but it means processes are controlled enough to ensure that any diversions from the predetermined outcome are minimal. There are rules and policies in place to tackle any irregularities (Saffo, 2007; Courtney et al., 1997). Various tools of operations research and operations management, such as optimization, six-sigma, lean manufacturing and just-in-time, are successfully deployed in a simple and stable environment (Pich et al. 2002; Subedi, 2017).

The next level of complexity is called complicated. Any supply chain process can be complicated because it has multiple connections of nodes and arches. Demand forecasting is one among such example. Demands can be predicted but within a range of error. Similarly, while lead-time for production and delivery can be estimated, there will always be some error. This situation can be handled with extra inventory. Or, they can purchase option contracts with the suppliers, allowing the flexibility of ordering more than the initial base order once the demand becomes more clearer (Cachon and Terwiesch, 2013; Gunasekaran et al. 2015; Bozarth et al., 2009).

Another category in Snowden and Boone's (2007) framework is unordered. This category falls within the realm of 'uncertainty' and 'ambiguity.' It is also divided into two levels (Saffo, 2007; Bozarth et al., 2009). The first one is complexity. As defined above, the supply chain is complex. A 'bullwhip' effect is a well-known outcome of this complexity. It is called 'bullwhip', because a slight change in demand from the customers often leads to huge fluctuations in orders received by manufacturers. We should note that the orders

manufacturers receives do not represent the demand for the product. The first reason for this is the demand forecasts by intermediaries (e.g., retailers). These numbers reflect the intermediaries' understanding of their customer needs, padded with their own biases and judgements on the requirements of safety stocks, etc. Levels of safety stocks, in turn, are determined by their trust in suppliers' ability to fulfil the order in a timely manner. A slight uptick in demand may lead to bigger padding in forecast and their perceived need for the safety stocks. And when the demand falls just a little, the order for the manufacturer crashes down (Bozarth et al., 2009; Lee, Padmanabhan and Whang, 1997; Cachon and Terwiesch, 2013, pages; Simchi-Levi et al., 2008; Sheffi, 2005).

This is a case of uncertainty, a 'known-unknown' situation. Manufacturers in this case do not know actual data but know where to look for. They can collect undistorted data directly from the end customers. Once done, it will turn into regular risk (Snowden and Boone, 2007; Pich et al., 2002; Lee et al., 1997, Daft and Lengel, 1986; Courtney et al., 1997).

The last case is known as 'chaos.' A chaos is regarded as a highly turbulent situation, often described as crisis, wherein scientific methods of predictions and analysis do not help (Sanial, 2014). Here, the available information is ambiguous. There is no pre-established framework by experts or contingency plan to guide actions under chaos. This leads to an 'unknown-unknown' situation, meaning that you do not know where to look for the information. Management leadership should be able to take a cue from a weak signal and establish a framework to define the problem (Weber and Glynn, 2006; Weick, 1989). The solutions to a defined problem depends on what questions are being actually asked. Ambiguity requires 'rich information' based on verbal and nonverbal cues rather than just quantitative data (Snowden and Boone, 2007; Daft and Lengel, 1986; Courtney et al., 1997; Bazerman and Moore, 2012).

To illustrate, the situation created by a small-scale fire in a plant owned by Royal Philips Electronics plant in Albuquerque, New Mexico, in March of the year 2000, is one such example, as described above (Sheffi, 2005; Simchi-Levi et al., 2008, page 319; Chopra and Sodhi, 2004; Gunasekaran et al., 2015; Yang and Yang 2010; Sheffi and Rice, 2005). The well-reported fire is said to have lasted for less than 10 minutes. The plant's production of fabricated microchips was affected. However, the plant management's initial assessment, as suggested in their statement, was that it would be back to normal quickly. Two main customers of the chips manufactured by Royal Philips Electronics were Ericson and Nokia. Both of them were producers, competing in the growing cell phone market but the way they framed the problem led them to react in a different manner.

Nokia took the fire as an early indicator of looming disaster-well beyond what the situation of small-scale fire suggested. The company sent people to the plant for a face-to-face discussion to assess the situation. It also sent other people to different Philips and Non-Philips microchip producers to arrange for the suitable substitutes. Ericson took the statement from Philips in its face value. This proved to be disastrous. Philips lost around $40 million in that fire. Nokia proved more resilient. It could take away market share from

the rival, Ericsson. Overall, loss for Ericson was in the order of $2.3 billion (Sheffi, 2005; Simchi-Levi et al., 2008; Chopra and Sodhi, 2004; Gunasekaran et al., 2015; Yang and Yang 2010; Sheffi and Rice, 2005).

FLEXIBILITY AND RESILIENCE

An important rule in managing complexity is to reduce the level of complexity itself. Any reduction in complexity goes hand in hand with the reduced need for information processing and lower risk (Baldwin and Clark, 1997; Sanchez and Mahoney, 1996; Sanchez, 2003; Garud et al., 2003; Garud and Kumaraswamy, 1995; Ulrich, 1995; Simon, 1962; Galbraith, 1974). Thus, when the complexity in the supply chain is minimized, the residual unpredictability is managed by increasing flexibility (Trentin et al. 2012; Galbraith, 1974). Flexibility, in general, enables the system to cope up with the unpredictability in the market demand by allowing it to change the product mix and volume without incurring undue cost (Gerwin, 1993; Ulrich, 1995, Belis-Bergouignan and Lung, 1999). This is achieved by changing the structure of the product as well as the process of production (Garud et al., 2003; Ulrich, 1995; Baldwin and Clark, 1997).

Modular Product Design

A modular product structure is simpler as compared to the integral one. Under this structure, designing, production, and upgrading of each module can be done independently. Such modules communicate with each other using standard interactions and interfaces. Managers can understand and control the simpler system with the modular parts (Baldwin and Clark, 1997; Sanchez and Mahoney, 1996; Sanchez, 2003; Garud et al., 2003; Garud and Kumaraswamy, 1995; Ulrich, 1995; Simon, 1962).

General Motors provides a historic example of flexibility afforded by the simpler modular product design. When General Motors, for the first time in the 1920s, offered an automobile for "every purse and purpose" and started the trend of changing models every year, it was essentially a conglomerate comprising multiple brands of cars. Alfred P. Sloan streamlined the production process by developing platforms and parts common for multiple brands and multiple years. This simplified the production process of automobiles. In addition, it enabled GM to combine fewer types of parts and platforms to produce a wide number of different models (Chanaron and Lung, 1999; Raff, 1999).

Companies that use common parts and platforms enjoy the advantage of the economies of scope, lowering the cost of production (Baldwin and Clark, 1997; Ulrich, 1995; Jetin, 1999; Mishina 1999; Belis-Bergouignan and Lung, 1999; Chanaron and Lung, 1999; Raff, 1999). In addition, it can maintain the same level of services with fewer parts on hand, thus reducing the complexity and the cost of the inventory management (Simchi-Levi et al., 2008). Toyota had also increased its flexibility by utilizing general-purpose machines, tools, by training workers to multiple skills, and having u-shaped manufacturing cells (Cachon and Terwiesch, 2013; Fujimoto, 1999; Mishina, 1999; Ulrich, 1995; Trentin et al. 2012; Galbraith, 1974).

Modularity in Other Industries

Adoption of modular structure in the computer industry have been discussed extensively by Baldwin and Clark (1997), Simchi-Levi et al. (2008), Sheffi (2005), Yang and Burns (2003), and Yang and Yang (2010). Modularization of IBM's popular computer system/ 360 is an important historic example. It was their adoption of a modular system that made it easier for the corporation to update and develop alternative models. It allowed customers to streamline their system with software and peripheral hardware of their choices. In addition, it became a lot easier for IBM's customers to upgrade with new software and hardware (Baldwin and Clark, 1997).

One of the often-cited supply chain is that of Hewlett-Packard (HP) for printers. For years, HP printers served multiple markets in Europe, each of which has a unique language. HP developed a plain vanilla printer based on aggregate demands. The minor adjustments on fonts, manual, and packaging were postponed till the demands were precisely known (Olavson et al., 2010; Simchi-Levi et al., 2008; Sheffi, 2005; Yang and Burns, 2003; Yang and Yang, 2010). Similarly, with modular components, Dell could produce 'customized' products with lower costs of mass manufacturing (Simchi-Levi et al., 2008; Magretta, 1998).

Resilience with Modularity and Flexibility

When supply chain situations are 'unknown-unknown' types, they are called 'crisis.' Some note that under 'crisis' situations, modular product structures have proven to be helpful (Sheffi 2005; Sheffi and Rice, 2005; Sheffi, 2015). With fire disaster involving Nokia and Ericsson, Nokia benefitted from the modular product design. This allowed Nokia to change the microchips in its cell phones. Ericsson's design was integral. This is another important reason of success of Nokia over Ericsson (Sheffi, 2005; Simchi-Levi et al., 2008; Chopra and Sodhi, 2004; Gunasekaran et al., 2015; Yang and Yang 2010).

As noted earlier in the article, earthquake in Taiwan in September 1999 has been mentioned several times in the supply chain literature because of its impact in the computer industry in the United States. Both Apple and Dell had announced new products based on the supplies of parts from Taiwan. However, Dell, with its modular product design, could replace the chips coming from Taiwan with the ones that were available; but Apple could not adjust due to the shortage of chips from Taiwan and hence it lost its market share from the competitors (Yang and Yang, 2010; Sheffi 2005).

EFFECTIVE SUPPLY CHAIN

Organizations must perform effectively and efficiently to maintain its competitive advantage from a long-term perspective. Bozarth et al. (2009) used low cost, schedule attainment, customer satisfaction, and competitive performance as the measure of organizational performances. Meeting each of these goals depends on the organization's ability to manage the supply chain effectively (Bozarth et al., 2009). According to Quinn and Rohrbaugh (1983), an effective management requires a balancing of contradicting propositions in its supply chain. The most important of such values discussed below are Stability vs. Flexibility and Varieties in product vs. Complexity.

Stability versus Flexibility

Stability demands a simple system, where items are produced according to a production plan (Pich et al. 2002). Flexibility requires a system's ability to respond to variations in demand without undue difficulties or hurdles (Belis-Bergouignan and Lung, 1999; Chan, et al. 2009; Gerwin, 1993;.Sreedevi and Saranga (2017; Ulrich, 1995; Yu and Luo 2015) suggest that flexibility in a supply chain system can serve as an effective solution to the uncertainty generated by the highly increasing competitive global challenges. Many empirical studies have shown that flexibility in supply chain systems has led to an improved business performance in the face of uncertain and dynamic global environment (e.g., Merschmann and Thonemann 2011; Sanchez and Perez 2005; Sreedevi and Saranga 2017). The Toyota production system is considered as an example of the most efficient, flexible process, which is also known for its Total Quality Management (TQM). It also offers wide varieties compared to any other producers in the automobile industry. Toyota has achieved a higher level of profitability, and has gained market share, along with a higher level of customer satisfaction. It has achieved all of this with standardized working process, multi-skills training, and stable production volume, along with its modularization of products and outsourcing as discussed above (Fujimoto, 1999 page 46; Fujimoto, 1999b, Mishina, 1999; Holweg and Pil, 2004; Liker, 2004).

The level of inventory is another critical issue related to efficiency and flexibility of a supply chain system. The role of inventory is to decouple the individual activities, so that the supply chain process is less susceptible to breakdowns and disruptions. A proper inventory management allows the system to adjust to the change in market demand and makes it more flexible (Yin and Yang, 2010; Mishina, 1999). However, if taken too far, it can add to unnecessary complexity. Counting, stocking, managing, and retrieving stocks or inventories are complex processes. It becomes especially difficult when you have old inventories (Bozarth et al., 2009; Gunasekaran et al., 2015). Hendricks and Singhal (2009) found stakeholders take that excessive inventory as the sign of mismatch of demand and supply. Announcements of such mismatches can lead to the reduction of the stock values of the firms by as much as 7 percent or more.

Another related issue is the number of suppliers. Breaking up of a vertical supply chain structure is to order from outside suppliers at cheaper cost (Fine and Whitney, 1996). However, many suppliers can also add to complexity. With the increased number of suppliers comes the possibility of delay, breakdown and inferior quality seem to increase (Bozarth et al., 2009; Gunasekaran et al., 2105). So, success of many Japanese corporations (e.g., Toyota) is often attributed to the system of having fewer selected suppliers and developing close relationships with them. Now, many European and American companies seemed to have followed the Japanese corporate style when managing their supply chains (Sako and Helper, 1999; Fujimoto, 1999; Liker, 2004).

However, dealing with few suppliers may cause its own problem. It may mean higher cost or breakdown of one supplier in some corner may lead to disaster for the buyer. For example, because of failure of airplane wings in stress testing,

Boeing lost billions of dollars in cancelled orders, loss of market share and lowering of the company's share price (Mecham 2009; Wallace, 2007; Gunasekaran et al. 2015). Several empirical studies have shown that the announcements of disruptions in supplies or delays in introduction of new product due to supplier failure have resulted in substantial and sustained losses to the announcers (Hendricks and Singhal, 1997; Hendricks and Singhal, 2005). Toyota (and other Japanese companies) mitigated the possibility of unreliable suppliers by maintaining internal capability and having alternative suppliers to be ready as substitutes (Liker, 2004; Webb, 2016; Kubota, 2016; Fine and Whitney, 1996).

Maintaining a balance between efficiency and flexibility is a challenge for many corporations. Even Toyota, with the exemplar Toyota Production System, seemed to have struggled in achieving a balance between efficiency and flexibility in its supply chain system. After the massive loss in the earthquake of March 2011, Toyota came to realize the vulnerability of its lean supply chain. It put in place a system of redundancy, placing alternate suppliers ready in case of emergency. Even then, the disruption of Toyota's supply chain in the recent earthquake (of April 2016), was deemed to be excessive compared to those of other similarly affected companies (Webb, 2016; Kubota, 2016).

Varieties vs. Complexity:

Research have showed that a supply chain needs a balance between internal stability and external market demand to be effective (Quinn and Rohrbaugh, 1983). Internally, an organization is a socio-technical system. It demands routine, stability and harmony. Establishing such routine involves coordination amongst different (and sometimes incompatible) technologies, and groups of people with different priorities. Such effective routines are developed over time through trial and error (Quinn and Rohrbaugh, 1983; Frohlich, 1998; Chanaron and Lung, 1999).

Externally, ever-increasing competition and demanding customers lead to the demands of newer models, and wider varieties of choices even within a model (Fujimoto, 1999 page 46; Fujimoto 1999b; Mishina, 1999). A large variety of models in a system makes it difficult to achieve an economy of scale. The frequent changes in a system's setup can increase mistakes, cost, and lower quality for all those involved in the supply chain. This can also lead to unwanted increases in inventory and can cause mismatches between demands and supplies resulting in customer dissatisfaction. With experience and technology (modularity and flexible process as described above), the complexity and cost can become manageable, but they are still higher than it would otherwise be (Gunasekaran et al., 2015).

It is a common understanding that the added costs of complexity can be more than offset by increased market share, improved customer satisfaction and increased profit for the company (Bozarth et al., 2009; Fujimoto, 1999; Fujimoto 1999b; Mishina, 1999). However, just because companies are offering wide varieties of models and trims, etc., it will not automatically lead to the higher customer demands or satisfaction. Also, proliferation of choices makes comparison

and analysis more difficult for the customers, causing customers to ignore those choices (Langlois and Robertson, 1992). A study found that one plant of Toyota had the capability of producing one million varieties of cars and most of which are never produced. Among the choices that were produced, most of them were for one piece only. In fact, only 20% of the varieties covered 80% of the demand. Experts dubbed this 'fat design'. Thus, the cost and complexity of these extra varieties far exceeded any benefit Toyota might have received from extra market share or higher customer satisfaction (Fujimoto, 1999; Mishina, 1999, Fujimoto, 1999b). In fact, few of them suggested that the automobile industry can reduce the number of varieties offered. This would not only reduce complexity, cost, and the risk of mismatch between demand and supply, but it could also increase customer satisfaction. This reduced complexity can also make the production process flexible enough to offer mass-customized car, just like the advantage gained by Dell Computers in the computer market (Holweg and Pil, 2004).

According to Holweg and Pil (2004), the automobile industry never got its act together to make its production process flexible. Hewlett-Packard, after analyzing its products and demands, did just that. It purged unnecessary varieties and streamlined the process, improving not just efficiency and productivity, but also the customer satisfaction (Ward et al., 2010). Not that Toyota did not realize the cost and complexity imposed by 'fat design' besides the cost of engineering and quality (Fujimoto, 1999b), but the crisis of Toyota's braking system showed that their cost-cutting and simplifying efforts they undertook did not produce the desired effects (Cusumano, 2011). This is another example of a crisis induced by complexity.

IMPACT OF THE COVID-19 PANDEMIC ON COMPLEXITY, RISK, AND FLEXIBILITY IN SUPPLY CHAINS:

The impact of the COVID-19 pandemic has been far reaching and overwhelming for individuals and their families, profit- and non-profit organizations, and nations across the globe (Volkin 2020). Specifically, this global curse has impacted the various sectors of any nation's economy, including but not limited to, manufacturers, wholesalers, retailers, exporters and importers of goods and services   The negative effects of the pandemic have been particularly severe and profound for supply chains for health-related products (e.g., personal protective equipment) and hospital services (capacity and medical treatments for COVID-19), across the nations--industrialized, developing and underdeveloped nations (Dai, et al. (2020; Rajasekharan 2020; Ranney et al. 2020). According to Sharma et al. (2020), the economic, social, and political impact of the pandemic has created disruptions for many firms and many nations, thus leading to inefficiencies and ineffectiveness in supply chain systems across the globe.

In order to successfully cope and overcome the challenges and disruptions posed by the COVID-19 pandemic, it is imperative that academicians, researchers, and practitioners of supply chain management (SCM) must analyze and evaluate the current practices in an attempt to redesign and innovate SCM systems (Ranney et al. 2020). Such efforts can provide much needed strategic directions, adjustments, and improvements in global supply chain systems, necessary to defeat the pandemic. In light of such efforts, future research on supply chain networks should focus on assessment and evaluation of the current strategic and tactical adjustments made by various firms across the globe in their attempt to cope with the challenges posed by the pandemic. The outcome of research efforts can lead to insights and innovation in such areas of SCM as complexity, uncertainties (risk), and flexibility (Sengupta 2020; Sharma et al. 2020; . It will also initiate a much-needed culture of collaboration in SCM across firms, industries, and nations (Cao and Zhang 2011; Ranney et al. 2020).

In addition to conducting specific research studies on SCM, future research efforts can use a meta-analytic approach to assess the past and current practices in terms of complexity, risk, and flexibility (e.g., Golici and Smith 2013; Leuschner et al. 2013; Manhart et al. 2020; Serdarasan 2013). The proposed meta-analytic research direction should focus not only on the main effects of primary factors that support and influence SCM, but also review their moderating and mediating effects on complexity, risk, and flexibility, in local and global contexts, under the conditions of the COVID-19 pandemic.

CONCLUSION AND DISCUSSION:

The conclusion of this paper is presented in the casual loop diagram of Figure 1. While Figure 1 may not encompass all the details discussed in the articles, it displays the concepts, and their interrelations and interdependencies in a comprehensive and useful manner. For example, while not addressed in this article, the risks of fluctuations in rates of foreign exchanges, and in oil prices, can add to the complexity of the supply chains; and such future research should focus on investigating their role and impact on supply chain systems (Simchi-Levi et al., 2008; Gunasekaran et al., 2015). Another critical issue is that of long-term risk. Even with perfect supply chains, there are examples of companies who started at the top position, but only to lose their power and position to their suppliers (Simchi-Levi et al., 2008; Subedi, 2013). This issue should be examined in future research studies on supply chain.

The complexity, when properly managed by using modularity and outsourcing, can increase customer satisfaction and reduce cost(Figure 1). With modularity and outsourcing, companies can develop more varieties and add choices for their customers. Outsourcing and modularity can also lead to lower inventories, leading to lower cost and complexity. These are conclusions Bozarth et al. (2009) have drawn in their research.

In addition, Figure 1 shows that the relationships between complexity and performances in supply chain are themselves complex. The arrow shows the nonlinear relationships; plus, there are many feedback loops which can exacerbate complexity. Therefore, while adding variety can add to customer satisfaction, additional varieties can lead to extra inventory and increased complexity. Similarly outsourcing, which is a step taken to add efficiency, can also be the source of delays and breakdowns. While reducing inventory can be a

hallmark of the efficiency, but it is required not just to add flexibility, but also to mitigate the negative impact of delay and breakdowns. Other relationships in the figure can be interpreted accordingly.

Covid-19 pandemic has created a far-reaching impact on supply chain systems across the globe. Hence it is imperative that the relationships among complexity, risk, and flexibility must be examined withing the context of the challenges posed by the pandemic.

Finally, this leads to the assertion that while the goals of having control in a supply chain system and having flexibility,

managing complexity, and providing varieties, may sound conceptually opposite and mutually exclusive; however, an effective management of supply chain's complexity, flexibility, and variety can be mutually beneficial to each other (Quinn and Rohrbaugh, 1983). Figure 1 shows that the relationships in the complex networks are dynamic. We can find example of all in Toyota production system. While the lean or Toyota production system is widely admired, it has been struggling at various instances to attain these balances (Bozarth et al., 2009). So, balancing should be an ongoing endeavor in any supply chain system.

	REFERENCES
I.	Bala, K. (2014). Supply chain management: some challenges-a review. *International Journal of Current Engineering and Technology*, Vol. 4, No. 2, pp. 947-953.
ii.	Baldwin, Carliss Y, and Kim B Clark. (1997). Managing in an age of modularity. *Harvard Business Review*, September/October: pp 84-93.
iii.	Belis-Bergouignan, Marie-Claude and Yannick Lung (1999), The Progressive Emergence of Product Variety in the Japanese Automobile Industry, in Chanaron, Jean-Jacques and Yannick Lung ed. Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 58-80.
iv.	Bazerman, Max H, and Don A Moore (2012). Judgment in managerial decision making, eighth edition, Wiley.
v.	Bozarth, C. C., Warsing, D. P., Flynn, B. B., & Flynn, E. J. (2009). The impact of supply chain complexity on manufacturing plant performance. *Journal of Operations Management*, 27(1), 78-93.
vi.	Cachon, Gérard, and Christian Terwiesch (2013). Matching Supply with Demand: An Introduction to Operations Management. Third edition, McGraw-Hill Irwin.
vii.	Cao, M. and Zhang, Q. (2011). Supply chain collaboration: impact on collaborative advantage and firm performance. *Journal of Operations Management*, Vol 29, Issue 3, pp. 163-180.
viii.	Chanaron, Jean-Jacques and Yannick Lung (1999). Product variety, productive organization and industrial models, in Chanaron, Jean-Jacques and Yannick Lung ed., Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 3-31.
ix.	Chen, C-Y, Chen, T-L, and Chen Y-Y (2014). An analysis of the structural complexity of supply chain networks. Applied *Mathematical Modeling*. Vol. 38, pp. 2328-2344.
x.	Chan, F. T. S., Bhagwat, R., and Wadhwa, S. (2009). A study on suppliers' flexibility in supply chains: is real-time control necessary? *International Journal of Production Research*, Vol. 47, Issue 4, pp. 965-987.
xi.	Choi, T. Y. and Wu, Z. (2009). Triads in supply networks: theorizing buyer-supplier-supplier relationships. *Journal of Supply Chain Management*, Vol. 48, pp. 8-25.
xii.	Chopra, Sunil, and Man Mohan S Sodhi. (2004). Managing risk to avoid supply-chain breakdown. *MIT Sloan Management Review, Vol.* 46, pp. 1: 53.
xiii.	Courtney, Hugh, Jane Kirkland, and Patrick Viguerie (1997). Strategy under uncertainty. *Harvard Business Review, Vol* 7, No. 6, pp. 67-79.
xiv.	Cusumano, M. A. (2011). Technology strategy and management reflections on the Toyota debacle. *Communications of the ACM*, Vol. *54*, No. 1, pp. 33-35.
xv.	Daft, Richard L, and Robert H Lengel (1986). Organizational information requirements, media richness and structural design. *Management Science*, Vol.32. No. 5, pp. 554-571.
xvi.	Dai, T., Zaman, M. H., Pandula, W. V., and Davidson, P. M. (2020). Supply chain failures amid Covid-19 signal a new pillar for global health preparedness. *Journal of Clinical Nursing*, July Issue, pp: 1-3.
xvii.	Fine, Charles H, and Daniel E Whitney (1996). Is the make-buy decision process a core competence?_http://dspace.mit.edu/bitstream/handle/1721.1/1626/Make_Buy.pdf?sequence... as seen on Aug 29, 2014
xviii.	Fujimoto, Takahiro (1999). *The evolution of a manufacturing system at Toyota*. Oxford University Press.
xix.	Fujimoto, Takahiro (1999b), Capability building and over-adaptation: a case of 'Fat Design' in the Japanese auto industry, in Chanaron, Jean-Jacques and Yannick Lung Ed. Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 261-286.
xx.	Frohlich, M. (1998). How do you successfully adopt an advanced manufacturing? *European Management Journal*, Vol.16, No. 2, page:151.
xxi.	Galbraith, Jay R. (1974). Organization design: An information processing view. *Interfaces*, Vol. 4, No. 3: 28-36.
xxii.	Garud, Raghu, Arun Kumaraswamy, and Richard Langlois (2003). *Managing in the modular age: architectures, networks, and organizations.* in Garud, Raghu, Arun Kumaraswamy, and Richard N Langlois ed. "Managing in the Modular Age: Architectures." *Networks, and Organization, Malden, MA: Blackwell Publishers Ltd* (2003): *pp 1-14*.
xxiii.	Garud, Raghu and Arun Kumaraswamy (1995). *Technological and Organizational design for Realizing Economies of Substitution, Strategic Management Review, 16: pp. 93-109.* in Garud, Raghu, Arun Kumaraswamy, and Richard N Langlois ed. "Managing in the Modular Age: Architectures." *Networks, and Organization, Malden, MA: Blackwell Publishers Ltd* (2003): *pp 45-68.*
xxiv.	Gerwin, D. (1993). Manufacturing flexibility: a strategic perspective. *Management Science*, Vol. *39*, No. 4, pp: 395-410.
xxv.	Golicic, S. L. and Smith, C. D. (2013). A meta-analysis of environmentally sustainable supply chain management practices and firm performance. *Journal of Supply Chain Management*, Vol. 49, Issue 2, pp. 1-35.
xxvi.	Gunasekaran, A, N Subramanian and S Rahman (2015). Supply chain resilience: role of complexities and strategies. *International Journal of Production Research*, Vol 53, No 22, pp: 6809-6819.

xxvii. Hendricks, Kevin B, and Vinod R Singhal (1997). Delays in new product introductions and the market value of the firm: the consequences of being late to the market. *Management Science* Vol. 43, No. 4, pp: 422-436.

xxviii. Hendricks, Kevin B, and Vinod R Singhal (2005). An empirical analysis of the effect of supply chain disruptions on longrun stock price performance and equity risk of the firm. *Production and Operations Management*, Vol. 14, No. 1, pp: 35-52.

xxix. Hendricks, Kevin B, and Vinod R Singhal (2009). Demand-supply mismatches and stock Market reaction: evidence of excess market announcements. *Manufacturing and Service Operations Management*, Vol.14, No. 3, pp: 509-524.

xxx. Holweg, M and F.K. Pil (2004), The second century: reconnecting customer and value chain through build-to-order, moving beyond mass and lean production in the auto industry, MIT Press.

xxxi. Jetin, Bruno (1999). The historical evolution of product variety in the auto industry: an international comparative study, in Chanaron, Jean-Jacques and Yannick Lung Ed. Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 111- 145.

xxxii. Kubota, Yoko (2016). Japan's earthquake rattles Toyota's vulnerable supply chain, *The Wall Street Journal,* April 19.

xxxiii. Langlois, Richard N, and Metin M Cosgel (1993). Frank Knight on risk, uncertainty, and the firm: a new interpretation. *Economic inquiry*, Vol. 31, No. 3, pp: 456-465.

xxxiv. Langlois, R and P L Robertson (1992). *Networks and Innovation in a Modular System: Lessons from the Microcomputer and Stereo Component Industries, Research Policy, 21, pp 297-313*. in Garud, Raghu, Arun Kumaraswamy, and Richard N Langlois ed. "Managing in the Modular Age: Architectures." *Networks, and Organization, Malden, MA: Blackwell Publishers Ltd* (2003): *pp 45-68*.

xxxv. Lee, H. L., Padmanabhan, V., & Wang, S. (1997). The bullwhip effect in supply chain. *Sloan Management Review*, Vo. *38, No.* 3, pp: 93-102.

xxxvi. Liker, Jeffrey L (2004), The Toyota Way, 14 Management Principles from the world's greatest manufacturer, Tata McGraw-Hill Edition, New Delhi

xxxvii. Magretta, J. (1998). The Power of Virtual Integration: An Interview with Michael Dell, *Harvard Business Review*, Vo. *76, No.* 2, pp: 72-84.

xxxviii. Manhart, P., Summers, J. K., and Blackhurst, J. (2020). A meta-analytic review of supply chain risk management: assessing buffering and bridging strategies and firm performance. *Journal of Supply Chain Management*, Vol. 56, Issue 3, pp. 66-87.

xxxix. Manuj, I. and Sahin, F. (2011). A model of supply chain and supply chain decision-making complexity. *International Journal of Physical Distribution and Logistics Management*, Vol. 41, No. 5, pp. 511-549.

xl. Mecham, Michael (2009). Starts and fits. *Aviation Week & Space Technology*, Vol 170, Issue 26, pp: 24-27.

xli. Merschmann, U. and Thonemann, U. W. (2011). Supply chain flexibility, uncertainty and firm performance: an empirical analysis of German manufacturing firms. *International Journal of Production Economics*, Vol. 130, No. 1, pp. 43-53.

xlii. Mishina, Kazuhiro (1999), Beyond Flexibility: Toyota's Robust Process Flow Architecture, in Chanaron, Jean-Jacques and Yannick Lung Ed. Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 149-180.

xliii. Pich, Michael T, Christoph H Loch, and Arnoud De Meyer. (2002). On uncertainty, ambiguity, and complexity in project management. *Management Science*. Vol. 48, No.8, pp: 1008-1023.

xliv. Quinn, Robert E, and John Rohrbaugh. (1983). A spatial model of effectiveness criteria: towards a competing values approach to organizational analysis. *Management Science, Vol.* 29, No.3, pp: 363-377.

xlv. Raff, Daniel M.G (1999)."GM and Evolving Industrial Organization of American Automobile Manufacturing in the Interwar Years," in Chanaron, Jean-Jacques and Yannick Lung Ed. Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 35- 57.

xlvi. Rajah, N., Musa, H., Nipis, V., Krishan, P. K., Suppiah, S., & Ahmed, A. I. N. (2018). Global supply chain management: challenges and solutions. *International Journal of Engineering & Technology*, Vol. 7, No. 34, pp. 447-454.

xlvii. Rajasekharan, M. (2020). The Covid-19 supply chain impact-avoiding the bullwhip effect. Located at *www.sdcexec.com/sourcing-procurement.*

xlviii. Ranney, M. L., Valerie, G., and Jha, A. K. (2020). Critical supply shortages—the need for ventilators and personal protective equipment during the Covid-19 pandemic. *New England Journal of Medicine*, Vol. 382, pp: 41-49.

xlix. Saffo, Paul (2007). Six rules for effective forecasting. *Harvard Business Review,* Vol. 85, No.7/8, pp: 122

l. Sako, Meri and Helper Susan R (1999). "Supplier Relations and Performance in Europe, Japan and the US: The Effect of Voice/ Exit Choice", in Coping with Variety Flexible productive systems for product variety in the auto industry, Ashgate Publishing: pp 287- 314.

li. Sanchez, Ron, and Joseph T Mahoney (1996). Modularity, flexibility, and knowledge management in product and organization design. *Strategic Management Journal*, Vol. 17, Issue S2, pp: 63-76

lii. Sanchez, Ron (2003). "Commentary" on Garud, Raghu, Arun Kumaraswamy, and Richard N Langlois. "Managing in the Modular Age: Architectures." *Networks, and Organization, Malden, MA: Blackwell Publishers Ltd*: 380-389.

liii. Sanchez, A. M. and Perez, P. (2005). Supply chain flexibility and firm performance: a conceptual model and empirical study in the automotive industry, *International Journal of Operational and Production Management*, Vol. 25, No. 7, pp. 681-700.

liv. Sanial, Gregory (2014). Exploring US Coast Guard organizational preparedness through chaos and complexity theories. *Emergence: Complexity and Organization*, Vol. 16, No. 4, pp: 23-38

lv. Schwab, Klaus *(2016). The Fourth Industrial Revolution. New York: Crown Publishing Group (published in 2017).*

lvi. *Sengupta, A. (2020). Impact of Covid-19 on Global supply chains and opportunities in the post-COVID world. Located at* www.entrepreneur.com.

lvii. Sheel, Ashutosh (2016). Supply chain complexity drivers and its management. *Journal of Business and Management,* Vol. 18, Issue 1, pp. 39-43.

lviii. Sheffi, Yossi (2005). The resilient enterprise: overcoming vulnerability for competitive advantage. *MIT Press Books*.

lix. Sheffi, Yossi (2015). Preparing for disruptions through early detection. *MIT Sloan Management Review*, Vol. 57, No.1, pp:31.

lx. Sheffi, Yossi, and James B Rice Jr. (2005). A supply chain view of the resilient enterprise. *MIT Sloan Management Review*, Vol. 47, No.1, pp: 41.

lxi. Simchi-Levi, David, Edith Simchi-Levi, and Philip Kaminsky (2008). *Designing and managing the supply chain: Concepts, strategies, and cases*. New York: McGraw-Hill.

lxii. Simon, H., (1962), "The architecture of complexity," Proceedings of the American Philosophical Society, 106, pp. 467-82, in Garud, Raghu, Arun Kumaraswamy, and Richard N Langlois Ed. "Managing in the Modular Age: Architectures." *Networks, and Organization, Malden, MA: Blackwell Publishers Ltd* (2003): 15-38.

lxiii.	Snowden, David J, and Mary E Boone (2007). A leader's framework for decision making. *Harvard Business Review*, Vol. 85, No.11, pp: 68.
lxiv.	Sreedevi, R. &Saranga, H. (2017). Uncertainty and supply chain risk: the moderating role of supply chain flexibility in risk mitigation. *International Journal of Production Economics*, Vol. 193, pp. 332-342.
lxv.	Subedi, Deepak (2013). Explaining supply chain as an "opportunistic coalition. *Competitiveness Review: An International Business Journal*, Vol. 23 Is: 1, pp.41 - 54.
lxvi.	Subedi, Deepak (2017). Understanding Innovation from Information Processing View. *Journal of Competitiveness Studies*, Vol 25(1), page 23-39.
lxvii.	*Serdarasan, S. (2013). A review of supply chain complexity drivers. Computers and Industrial Engineering, Vol. 66, Issue 3, pp. 533-540.*
lxviii.	*Touboulic, A., Matthews, L. & Marques, L. (2018). On the road to carbon reduction in a food supply network: a complex adaptive systems perspective. Supply Chain Management: An International Journal, Vol. 23, pp. 313-335.*
lxix.	*Touboulic, A., McCarthy, L. & Matthews, L. (2020). Re-imagining supply chain challenges through critical engagement research. Journal of Supply Chain Management, Vol. 56, No. 2, pp. 1-23.*
lxx.	Trentin, Alessio, Cipriano Forza, and Elisa Perin (2012). Organization design strategies for mass customization: an information-processing-view perspective. *International Journal of Production Research*, Vol. 50, No.14, pp: 3860-3877.
lxxi.	Ulrich, Karl (1995). "The role of product architecture in the manufacturing firm." *Research policy* 24.3: 419-440, in Garud, Raghu, Arun Kumaraswamy, and Richard N Langlois Ed. "Managing in the Modular Age: Architectures." *Networks, and Organization, Malden, MA: Blackwell Publishers Ltd* (2003): 117- 145.
lxxii.	Volkin, S. (2020). How has COVID-19 impacted supply chains around the world? Located at www.hub.jhu.edu/2020/04/06/goker-audin-global-supply-chain.
xxiii.	Wallace, James (2007). Dreamliner to be delivered late, Boeing confirms. *Chinese American Forum*, Volume XXIII, No 2, pages 39-40.
lxxiv.	Ward, J, Bin, Z, Jain, S, Fry, C, Olavson, T, Mishal, H, Amaral, J, Beyer, D, Brecht, A, Cargille, B, Chadinha, R, Chou, K, DeNyse, G, Qi, F, Padovani, C, Raj, S, Sunderbruch, K, Tarjan, R, Venkatraman, K, & Woods, J (2010), 'HP Transforms Product Portfolio Management with Operations Research', *Interfaces*, vol. 40, No. 1, pp. 17-32.
lxxiv.	Webb, Jonathan (2016), Toyota's 'Quake-Proof' Supply Chain That Never Was, Forbes April 16, http://www.forbes.com/sites/jwebb/2016/04/26/toyotas-quake-proof-supply-chain-that-never-was/#62d038b42638, as seen on 1/15/2017
lxxv.	Weber, Klaus, and Mary Ann Glynn (2006). Making sense with institutions: Context, thought and action in Karl Weick's theory. *Organization Studies*, Vol. 27, No.11, pp: 1639-1660.
lxxvi.	Weick, Karl E (1989). Theory construction as disciplined imagination. *Academy of Management Review*, Vol.14, No.4, pp: 516-531.
lxxvii.	Williamson, O. E. (1996). Economics and organization: a primer. *California Management Review*, Vol. *38, No. 2*, pp: 131-146.
lxxviii.	Yang, Biao, and Ying Yang (2010). Postponement in supply chain risk management: a complexity perspective. *International Journal of Production Research*, Vol. 48, No.7, pp: 1901-1912.
lxxix.	Yang, Biao, and Neil Burns (2003). Implications of postponement for the supply chain. *International Journal of Production Research*, Vol. 41, No.9, pp: 2075-2090.
lxxx.	Yu, K. and Luo, B. N. (2015). Operational flexibility review and meta-analysis. *International Journal of Production Economics*, Vol. 169, pp. 190-202.

Annexure:
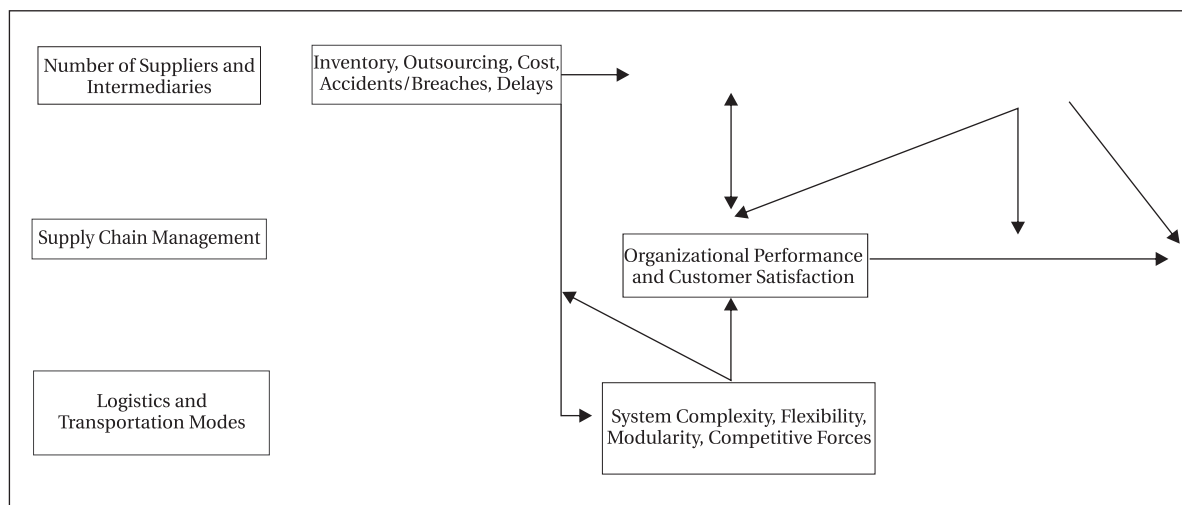
Figure 1: Supply Chain Management Paradigm

Business Intelligence Success in Selected Organizations in the Energy Sector in India: An Analysis

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ABSTRACT

A report by the International Energy Agency (IEA), 2020, has indicated that India should make energy data efforts to ensure its management, monitoring and data reporting to accomplish energy demand and sustainability targets. The energy sector organizations address these concerns using Business Intelligence (BI) to gain insight for their various operations and support decision making. However, BI project's low success rate has been raising a question about its adoption; hence, there is a need to relook at the current BI Success model. In this study, we aimed to find the constituents of the Business Intelligence success model under different decision environments in organizations in the energy sector, using a survey of business intelligence users in the managerial positions. The study results found that interaction of systems, quality of data, user access to BI and risk level of the organization have a significant role to place in business intelligence success in organizations. This study's findings will be valuable for managers, policymakers, and researchers in the domain of business intelligence and energy sector and allied organizations.

***Key Terms:** Business Intelligence, Success, Model, Energy Sector, Organizations*

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INTRODUCTION

India is globally third-largest consumers of energy. It imports 80% of crude oil to meet the growing need, Varghese, G., & Eapen, L. M. (2016). In other forms of energy also India needs to upgrade its infrastructure to serve its ever-growing population. The Indian energy sector provides scope for large investment from investor both from India and abroad but several challenges on this front, most important being the inadequate technological infrastructure, defer investors from investing, Varghese, G., &Eapen, L. M. (2016). Public sector companies in India's energy sector are the largest contributor to its Gross Domestic Product (GDP). Still, recent series of disinvestments in several public sector companies has brought profitability of many of these organizations under the scanner. The ever-increasing demand for energy has compelled organizations in the energy sector to heed to the issues surrounding efficient use, production, and distribution of energy. The International Energy Agency (IEA), (2020) stated that India should take measures so far energy data management, monitoring and reporting are concerned with attaining sustainability targets.

Companies in the energy sector using Business Intelligence (BI) to gain awareness for their enterprises to address their business concerns. Using BI, organizations gain a good advantage, operational efficiency improvement, and profitability through data collaboration and analysis systems found as the intermittent layer between the business process and data collection. Having adequate BI infrastructure in the organization and its utilization in decision-making can give the organization a competitive advantage. Corporations that have implemented business intelligence have shown growth in businesses' revenue.

Nevertheless, incidentally, Gartner's report of 2017 from a survey carried out on enterprises across the globe have been pointing at the low success rate of Business Intelligence project. Though several BI success models proposed still, BI project's low success rate has raised its adoption question. Hence there is a need to relook the current Model to understand the impact of various BI constituents on BI success.

NERGY SECTOR IN INDIA: AN OVERVIEW

An analysis of the annual reports of the last five years of the nine biggest companies in India's energy sector indicated that companies had allocated a large amount of their budget in deploying or upgrading their technological infrastructure. Upon further analysis of the annual report, we observed that all the organizations under Maharatnas category had implemented BI infrastructure in their premises.

The energy sector in India comprises of both public and private organizations. The public sector organizations also called the PSUs are grouped into Mining, Manufacturing and Electricity. The Government of India established Maharatna status for PSUs corporations with annual profit over three years more than 2500 crores. These groups are further divided into subgroups, Coal and Lignite, Crude Oil, Petroleum, Power generation and power transmission, as shown in Figure 1.
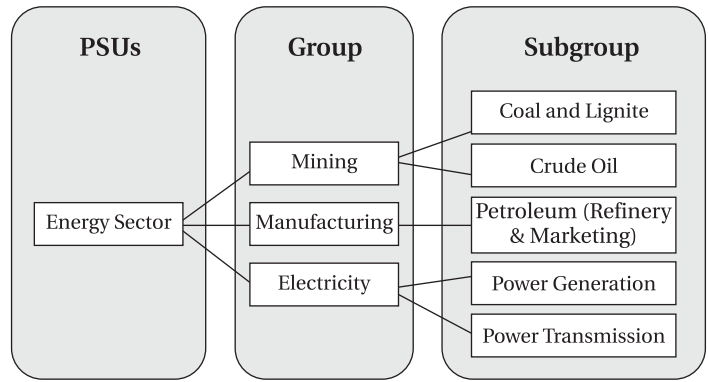
Figure 1: Energy sector in India

Source: As per the information received from the Department of Public Enterprise

Each of these group comprises of several companies. These corporations categorized as Miniratna, Navratna and Maharatna based on their yearly turnover. Among these companies, the Maharatna have the most significant turnover over the previous three years. As of year, 2019, ten companies are part of the Maharatna group. Out of the ten companies, nine companies are in the energy sector.

ITERATURE REVIEW:

Business Intelligence Capabilities and Business Intelligence Success

Howard Dresner (1989), gave the phrase Business Intelligence (BI) and defined BI as a domain to suggest process used to support decision making. Solomon Negash (2004) defined BI applications as mode data gathering, storage and knowledge management to elaborate on crucial business information to business decision-makers and planners. The various BI definitions had a technological perspective as well as an organizational perspective. It indicated that BI, as an approach, uses technology to help the organization achieve its long-term goals by aligning the business with the organization strategy.

Studies have indicated that the concept of Business Intelligence Capability constitutes Technological Capabilities and Organizational Capabilities of organizations. Studies have also shown that different decision environments have a moderating effect on the impact of Technological Capabilities and Organisational Capabilities on Business Intelligence Success in the organization. However, over the last few years, the rapid advancement in technology and shift in business paradigm has created need to redefine what constitutes technological capability and organization capability for today's organization. Watson et al. (2004), defined BI as a tool assisting enterprise in realizing the strategy and advocating in decision-making about organizational processes. Negash (2004), extended this classification and described BI systems as a tool for data gathering, storage, and knowledge management to present complex internal and economic information to planners and decision-makers. The various definitions of BI point that BI helps enterprises utilize the data to gain their business insight. A recent report from Gartner (2019) mentioned that organizations intend to spend trillions

of dollars on their BI infrastructure to gain competitive advantage.

Measuring Business Intelligence Success

Business Intelligence success defined in terms of net benefit gained from BI capabilities studied from organizational and technological perspectives Isik (2009). Numerous types of research have characterized BI success in terms of BI capabilities encompassing organizational capabilities (Eckerson, (2003), Watson and Wixom, (2007) and technological capabilities. Interestingly, despite the proposition of various models for achieving BI success, several organizations can still not accomplish BI success, Jourdan et al., (2008). Isik (2009) suggested that this may be because of the influence of the decision environment on BI success. However, the study showed a lot of scales related and various other limitations. Hence re-examining this relationship is appropriate because BI's primary purpose is to support organizations' decision-making, Eckerson, (2003).

Table 1: Variables for Business Intelligence Success

Variable	Sources
Decision Support	OyukIsik (2009)
Precise Information	Petter S., DeLone W. and McLean E.(2008), Søilen, K. S. (2012).
Timely information	Petter S., DeLone W. and McLean E.(2008), OyukIsik (2009), Søilen, K. S. (2012).
Overall satisfaction	Petter S., DeLone W. and McLean E.(2008), OyukIsik (2009), Hou, C. (2012), Søilen, K. S. (2012).

Source: A literature review

Moreover, in the last few years, the rapid advancement in technology and the shift in business paradigm has led to the need to redefine what constitutes technological capability and organization capability for today's organization, Olszak and Ziemba (2003). Furthermore, as discussed before, Gartner (2017) reports that the BI project's success rate is still meagre. In this context, it becomes imperative to re-examine the factors that contribute to BI success in organizations. Business Intelligence success was measured using a construct comprised of five items: information quality, user-friendly and overall satisfaction, Søilen, K. S. (2012). Hawking, P., &Sellitto, C. (2015) have indicated that although BI is seen as vital for utility companies, achieving success with BI is still an area of exploration. Table 1 shows the various other factors used to measure BI Success.

Measuring Technological Capabilities

OyukIsik (2013)'s research provided an improved understanding of BI success by proposing a framework that explores technological capabilities that comprise data source quality, data type, systems interaction, reliability of data, and ease of user access to BI in the organization. A study by Popovic, A., Hackney, R., Coelho, P. S., & Jaklic, J. (2012) emphasized understanding how Business Intelligence System

(BIS) dimensions are interrelated and how they affect BIS use. Nevertheless, information content quality is more significant as compared to information access quality. Pretorius A. and Wijk J. (2009), article proposed that while creating information visualization techniques, one needs to focus on the data. A new awareness acquired about end-user needs and simultaneously, more recent requirements known with this approach. Ramakrishnan, T., Jones, M. C., & Sidorova, A. (2012), the paper explores the factor that governs organization BI goals and their data collection strategy. It also provides them with a model to support decision making. Sangar A., A.Iahad N. (2013), the study pointed out that many BIS implementations are not successful because they are time-consuming and expensive. They also proposed a framework for critical success factor for BI success based on project implementation life cycle. Radenkovic, M., Lukic, et al. (2018), the study found current literature fails to inform about methodologies and best practices for designing BI solutions, incorporating all the specifics of rapidly evolving energy markets. Table 2 indicates the various constructs used to measure Technological Capabilities.

Table 2: Constructs for Technological Capabilities

Constructs	Sources
Data source	Isik, O. (2009)
Data reliability	Isik, O. (2009), Popoviè, A., Hackney, R., Coelho, P. S., &Jakliè, J. (2012).
Quality of Data	Hostmann et al. (2007), Isik, O. (2009), Ramakrishnan, T., Jones, M. C., & Sidorova, A. (2012)
Information system interaction	Abdinnour-Helm, S., Lengnick-Hall, M. L. and Lengnick-Hall, C. A. (2003), Hostmann et al. (2007), Isik, O. (2009), Deng, X., & Chi, L. (2012)
User access (2007), Isik, O. (2009)	Eckerson (2003), Hostmann et al.

Source: A literature review

Measuring Organizational Capabilities

Yeoh, W., Koronios, A., & Gao, J. (2009), study developed a critical success factor framework that consists of essential factors for BI system success. This framework's unique aspects emphasized the need to have a business-focused championship and balanced project team composition. It also emphasized the strategic and extensible technical requirements and sustainable data quality and governance in the framework. Their idea was further extended by incorporation of issues like employee resistance and change management because of the lack of success in the BI system and hence call for adequate attention and review as discussed in the study by Seah, M., Hsieh, M. H., & Weng, P. (2010). Ghazanfari, M., Jafari, M., & Rouhani, S. (2011), the paper also proposed a tool that comprises six factors for evaluating BI system competitiveness. This tool's distinctive features focused on the need to have Integration with Environmental Information and Stakeholder Satisfaction. Adamala S. and Cidrin L. (2011) showed that the non-technological matters in BI systems success were more challenging to solve than

technological problems. It also appraised the need to keep the end-user in mind while devising a BI system success system. Farrokhi V. and Pokoradi L. (2013), research discussed the concept for assessing BI readiness for achieving BI system success. This concept revealed the gaps in areas where the company is not ready to proceed with its BI effort. Olszak, C. M. (2014), work explores the social factor: the organization's employees at the operational level and have the precious intelligence assets they possess early and interpret information about the business environment. This information should effectively be utilized in the BI process to integrate into strategic management smoothly. A study by Harison, E. (2012) emphasized the need to understand various organizational capabilities in the energy sector to achieve success with BI. OyukIsik (2009), emphasized the role of organizational flexibility and risk-taking capability as a contributing factor in overall BI success. Table 3 indicates the various organization capabilities used in this study.

Table 3: Construct: Organizational Capabilities

Constructs	Sources
Intuition Involved	Hostmann et al. (2007), OyukIsik (2009)
Flexibility	Imhoff (2005), OyukIsik (2009)
Risk Level	Gonzales (2005), OyukIsik (2009)

Source: A literature review

Measuring Decision Environment

The organization's decision environment described as the processes and methods employed by an organization to decide its various activities Isik (2009). Several studies have extolled the importance of information quality provided by BI for quality decision making in the organisation. Visinescu (2016) highlighted that the quality of the information in an organization is directly proportional to the value it gave to decision-making based on its information. Table 4 indicates the various constructs used for defining Decision Environment.

Table 4: Decision Environment Construct

Constructs	Sources
Decision Types	Isik, O. (2009), Clark (2010)
Information Processing, Needs	Eckerson, (2003), Isik, O. (2009), Visinescu (2016)

Source: A literature review

A study of Clark, (2010) also strengthened the argument, wherein he concluded that BI practitioners' perception about decision determines what organisation and technological intervention used. In another research, Kokin, (2013), verified that BI capabilities positively correlated with BI success. However, Isik et al., (2013) showed how this BI success was modified when another factor like decision environment explored. Their study discussed the effect of the decision environment on the utilisation of BI capability.
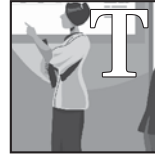
HEORETICAL FRAMEWORK

Following the review of the literature, the following model adopted for further investigation.
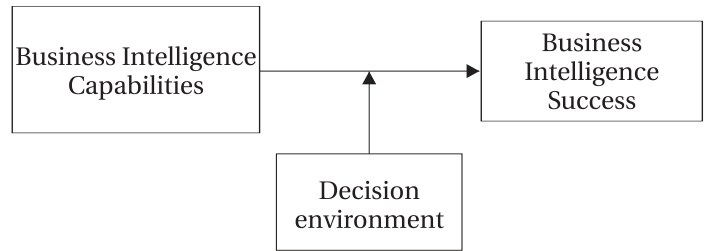
Figure 2: Business Intelligence Success Model

Source: OyukIsik, 2009

We have adopted a Business Intelligence Success model given by OyukIski, (2009), for our study in the Energy sector, as mentioned in the paper. The study aimed to find the constituents of technological capabilities and organizational capabilities and analyze their influence on Business Intelligence success under different decision environments in organizations.

Objectives:

l To identify the different constructs of Business Intelligence capabilities and the impact on Business Intelligence Success in Energy Sector

l To identify the different constructs of Decision Environment and the impact of Business Intelligence capabilities in the presence of different types of Decision Environment on Business Intelligence Success in Energy Sector

l To develop BI Success model for public sector enterprises in the Energy Sector.

ESEARCH METHODOLOGY:

The study has used a mixed-method, involving qualitative and quantitative methods to investigate and understand the topic. The questionnaire's face or content validity conducted through the literature review and expert's judgment from various PSUs in the energy sector. They had some comments on the length and the clarity of each question. Their suggestions incorporated into the final version of the questionnaire. Questionnaire's reliability ensured using a pilot test done on a sample of seventy-five BI users in managerial positions from three organizations in the energy sector. Following the pilot study, the scale revised in terms of final constructs used and rephrasing the statements and retested for validity and reliability. Following constructs were dropped from the survey as they had the same response from all the users: Data source, Data reliability, and Intuition. The final survey resulted in Cronbach's α estimated to be 0.83 (greater than 0.7), which implies the instrument's good reliability. Reliability of the various construct of the revised survey was checked using SPSS software and found to be over

0.80, indicating that constructs developed, and data received from the respondent are reliable enough to go for factor analysis and the Model's fitness. Construct reliability above 0.6 means convergent fitness of the Model Bagozzi and Yi, (1988). The Levene's Test for Equality of Variance reveals F value over 0.5, based on which validity is assured.

Discriminant validity assessed examining the correlations among factors using Pearson's correlation coefficient. None of the correlations exceeds the .50 threshold, which suggests adequate discriminant validity of the measures. The final survey instrument is available in the annexure section of this paper.

The study used a proportionate random sampling method and selected BI system users in the organisations. The investigator divides a finite population into subpopulations in the proportional sampling method and then applies random sampling techniques to each subpopulation. A sample size of 270 individuals occupying different managerial roles from different energy sectors asked to participate in this study by answering a questionnaire. The respondents' opinions were measured using a five-point Likert scale, also known as a summated scale. Confirmatory factor analysis and descriptive techniques used to analyse the data.

DATA ANALYSIS, FINDING AND DISCUSSION:

As shown in Table 5, the respondent profile analysis showed that the sample chosen for the study comprises 68 per cent of the male respondent and 32 per cent female respondent. Work experience wise categorization of the sample shows that 23.3 per cent of the employees had greater than 20 years of work experience and around 23 per cent of the employees had 8 to 10 years of work experience. Also, around 11 per cent of employees were having 16 to 18 years of work.

Table 5: Respondent Profile

S.No.	Topic	Category	Frequency	Per cent	Cumulative Percent
1	Gender	Male	184	68.1	68.1
		Female	86	31.9	100.0
2	Work Experience	4-6 years	19	7.0	7.0
		6-8 years	28	10.4	17.4
		8-10 years	62	23.0	40.4
		10-12 years	22	8.1	48.5
		12-14 years	21	7.8	56.3
		14-16 years	11	4.1	60.4
		16-18 years	29	10.7	71.1
		18-20 years	15	5.6	76.7
		Greater than 20 years	63	23.3	100.0
3	Area	General management	72	26.7	26.7
		Human resource management	110	40.7	67.4
		Finance	28	10.4	77.8
		IT	36	13.3	91.1
		Marketings & Sales	15	5.6	96.7
		Others	9	3.3	100.0
4	Level	Executive management	119	44.1	44.1
		Middle management	106	39.3	83.3
		Junior management	45	16.7	100.0
5	Education	Graduate	54	20.0	20.0
		Postgraduate	86	31.9	51.9
		Professional courses	106	39.3	91.1
		PhD	24	8.9	100.0
6	Industry	Manufacturing	120	44.4	44.4
		Mining	60	22.2	66.7
		Electricity	90	33.3	100.0
7	Company	CIL	30	11.1	11.1
		GAIL	30	11.1	22.2
		NTPC	30	11.1	33.7
		IOCL	30	11.1	44.4
		ONGC	30	11.1	55.6
		BPCL	30	11.1	66.7
		HPCL	30	11.1	77.8
		BHEL	30	11.1	88.9
		PGI	30	11.1	100.0

Source: Primary data analysis

Experience and around 10.4 per cent employees found to be having 6 to 8 years of work experience. Around 8.1 per cent of employees found to be having 10 to 12 years of work experience. Around 7.8 per cent of employees found to be having 12 to 14 years of work experience, those having 4 to 6 years of work experience form around 7 per cent of the total employed surveyed.

Area wise classification of respondents showed that around 40.7 per cent of employees were from the human resource department, and around 26.7 per cent were from general management. Also, 13.3 per cent of the employees formed the IT department and around 10.4 per cent were from the finance department. Only 5.6 per cent of the employees found to form the Marketing and Sales department, and the remaining 3.3 per cent of the employees were from other departments in the organization.

Management level-wise categorization of employees showed that 44 per cent of the employees were form executive or senior management, as expected since business intelligence services are maximally utilized by senior management for decision-making purposes. Middle management level employees formed around 39.3 per cent of the total employees surveyed. Also indicating that business intelligence utilized for tactical decision making. The remaining 16.7 per cent of the employees formed junior management, indicating that Business Intelligence services are not much employed in the day-to-day operational task, the reason may be because last-mile analytics were still not used in organizations.

The educational categorization of employees showed that around 39.3 per cent of the employees had professional level qualifications like MBA and 32 per cent of the employees had postgraduate level qualification hence were well-versed in BI usage in decision making. Only 9 per cent of the employees found to be having PhD qualification. Moreover, around 20 per

cent of the employees found to be having graduate-level qualification.

The industry-wise categorization of employees from the sample analyzed showed that 44.4 per cent were from companies in the Manufacturing group organization in the energy sector, because four companies that are HPCL, BPCL, IOCL and GAIL form the manufacturing group organization in the energy sector. 22.2 per cent of employees formed Mining group companies that were ONGC and Coal India. The remaining 33.3 per cent of employees were from the Electricity group of NTPC, Power Grid Corporation, and BHEL in the energy sector.

Table 6: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.856
Bartlett's Test of Sphericity	Approx. Chi-Square	11742.361
	df	528
	Sig.	.000

Source: Primary data analysis

The Confirmatory factor analysis results using principal component analysis with varimax rotation of the sample collected showed KMO test to assess data adequacy value 0.856, which is over a value of .6, a suggested minimum as shown in Table 6. Bartlett's Test of Sphericity's chi-square value found to be significant (chi sq.= 11742.361, p=. 000), which means the factor analysis is acceptable. The confirmatory factor analysis generated nine components with eigenvalues above 1 with total variance explained 86.13%. The varimax rotation clubbed the items on nine components, as shown in Table 7. Cronbach alpha corresponding to each identified factor found to be high as shown in Table 7

Table 7: Rotated Component Matrix and Cronbach Alpha

Factors obtained		Component									Cronbach alpha
		1	2	3	4	5	6	7	8	9	
Business Intelligence Success (BIS)	BIS1				0.785						0.922
	BIS2				0.764						
	BIS3				0.758						
	BIS4				0.843						
Information Processing needs (Info Proc)	IP1		0.828								0.943
	IP2		0.881								
	IP3		0.89								
	IP4		0.888								
Decision Type (Decision Type)	DT1									0.835	0.820
	DT2									0.803	
	DT3									0.886	
Quality of Quantitative data (Quality Quant Data)	DTy1						0.832				0.912
	DTy2						0.729				

Factor	Item						
	DTy3				0.735		
	DTy4				0.820		
Quality of Qualitative data (Quality Quant Data)	DTy5		0.791				0.952
	DTy6		0.872				
	DTy7		0.861				
	DTy8		0.897				
User Access (User Access)	UA1			0.885			0.994
	UA2			0.882			
	UA3			0.878			
Interaction with systems (Interation Systems)	IS1					0.807	0.94
	IS2					0.852	
	IS3					0.586	
Flexibility (Flexibility)	F1	0.878					0.975
	F2	0.868					
	F3	0.871					
	F4	0.858					
Risk level (Risk Level)	RL1			0.919			0.914
	RL2			0.791			
	RL3			0.909			
	RL4			0.909			

Source: Primary data analysis

The following factors have drawn: Business Intelligence Success, Quality Quantitative Data, Quality Qualitative Data, User Access, Risk Level, Decision type and Information Processing Needs. The construct Quality of Data, Isik, O. (2009) separated into two different factors. It hence was named as Quality of Quantitative Data and Quality of Qualitative data following their constituent analysis.

Based on exploratory factor analysis, a diagram depicting the preliminary measurement model designed, as shown in Figure 3
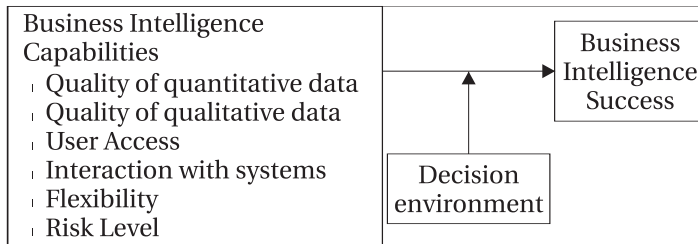
Figure 3: Proposed Business Intelligence Success Model for Energy Sector

Source: Primary data analysis

The impact of various factors on Business Intelligence Success in different decision environment types was analyzed using Linear Regression Technique using hierarchical regression. More variables added to the Model in separate steps called "blocks". The blocks enable to statistically control specific variables' effect to check whether adding a variable impact the Model's predict strength and explores its moderating effect.

The Model Summary provides information about each step/block of the analysis, as shown in Table 8. The Block 1 (i.e., Model 1) has an R Square value of .489 which implies that Technological factors like interaction with systems, User Access, Quality of quantitative data and Quality of qualitative data scores account for 48.9 % of the variance in Business Intelligence Success. Following the addition of the two Organizational factors like Flexibility and Risk level scores in Model 2, R Square's value increased to .500 (50% of the variance in Business Intelligence success scores accounted for by the Model's six variables). Furthermore, the Decision environment factors that are Decision type and Information Processing need lead to R square's value increased to .560. To ascertain whether this is a statistically meaningful increase, Sig. F change value was analyzed using a cut-off of $p < .05$; it noted that the first step/block was statistically significant (p is less than .001). However, the additional variable(s) did not account for a statistically significantly increased amount of variance in Business Intelligence Success. Upon the inclusion of the interaction term for Decision type and Information processing needs in the third step/block does lead to the value of R square increased to .560 and was statistically significant (p is less than .001), implies that the inclusion of the additional variable(s) produces a statistically significant increase in variance accounted for in the outcome/criterion variable (i.e., Business Intelligence success which supports that a moderating effect of Decision Environment is present in the Model

Table 8: Hierarchical Linear Regression Analysis:
Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.699[a]	.489	.482	.53191	.489	63.454	4	265	.000
2	.707[b]	.500	.488	.52850	.010	2.714	2	263	.068
3	.748[c]	.560	.547	.49741	.061	17.955	2	261	.000

a. Predictors: (Constant), Quality Quali Data, Interaction Systems, Quality Quant Data, User Access

b. Predictors: (Constant), Quality Quali Data, Interaction Systems, Quality QuantData, User Access, Risk Level, Flexibility

c. Predictors: (Constant), Quality Quali Data, Interaction Systems, Quality Quant Data, User Access, Risk Level, Flexibility, Decision Type, Info Proc

d. Dependent Variable: BIS

Source: Primary Data Analysis

Table 9:Unstandardized Coefficients and Standardized Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.900	.186		4.834	.000
	User Access	.083	.045	.108	1.853	.065
	Interaction Systems	.372	.044	.464	8.434	.000
	Quality Quant Data	.150	.060	.146	2.514	.013
	Quality Quali Data	.141	.053	.138	2.637	.009
2	(Constant)	.597	.226		2.643	.009
	User Access	.074	.045	.096	1.642	.102
	Interaction Systems	.347	.045	.433	7.680	.000
	Quality Quant Data	.133	.061	.129	2.166	.031
	Quality Quali Data	.113	.057	.111	1.997	.047
	Flexibility	.026	.056	.027	.472	.638
	Risk Level	.136	.061	.111	2.231	.027
3	(Constant)	1.854	.466		3.974	.000
	User Access	.087	.042	.113	2.048	.042
	Interaction Systems	.296	.045	.370	6.604	.000
	Quality Quant Data	.107	.058	.104	1.830	.068
	Quality Quali Data	.117	.053	.115	2.191	.029
	Flexibility	-.012	.054	-.012	-.228	.820
	Risk Level	.140	.057	.114	2.441	.015
	Info Proc	.228	.053	.208	4.281	.000
	Decision Type	-.420	.098	-.178	-4.294	.000

Source: Primary Data Analysis

The significance value for Technological factors like the interaction of systems with other systems, Quality of Qualitative and BI User Access is less than 0.05. Hence, in the organization Interaction of systems with other systems, Quality of Qualitative and the extent of the BI User access to various Business Intelligence systems significantly impact its Business Intelligence Success. From Organizational factors, Risk Level found to be significant. Risk happens in every type of business, but it noticed that organizations that have specific and well-defined problems to solve may have a low tolerance for risk and may have a more successful BI with a risk-averse system (Hostmann et al., 2007). On the other hand, different options for user access, via desktop, mobile or web-enabled, to various BI systems, impact BI usage in the system. Hence, more are the access methods more to BI's utilization in the organization, Isik, (2009).

The Decision Environment factors found to be statistically significant, implying that the impact of Technological capabilities and Organizational capabilities get moderated in the presence of different decision environments. The model for Business Intelligence Success in the energy sector, thus shown in Figure 4.
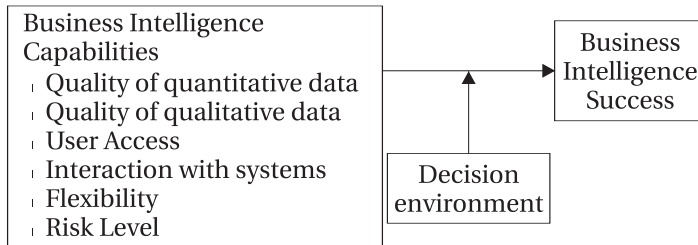

Figure 4: Business Intelligence Success Model for Energy Sector

Source: Primary data analysis

CONCLUSION:

The present study reveals the influence of various business intelligence capabilities on business intelligence success in energy sector organizations. The study found that the interaction of systems, quality of data, user access to BI and risk level of the organization has a significant role in placing in Business Intelligence Success in organizations in the energy sector. The findings will also help elucidate BI success based on business requirements across similar and allied sectors and industries. Moreover, the finding will assist as a road map for the BI solution development team developing BI solutions for organizations. It provides a knowledge base from whereon to BI researchers. They can take up further empirical research for analysis and project managers and BI solution developers. It serves as a guide to formulate an operative and software development strategy.

	REFERENCES
i.	Adamala, S., &Cidrin, L. (2011). Key success factors in business intelligence.
ii.	Almeida, J., Barros, M. J., &Maravilhas-Lopes, S. (2020). A business intelligence maturity evaluation model for management information systems departments. *Handbook of research on emerging technologies for effective project management* (pp. 255-270) IGI Global.
iii.	Bagozzi, R. P., &Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of marketing science, 16*(1), 74-94.
iv.	Clark, J. W. (2010). Business intelligence and decision making: Understanding BI as a theory-performing discipline of decision improvement.
v.	Dawes, J. (2008). Do data characteristics change according to the number of scale points used? an experiment using 5-point, 7-point and 10-point scales. *International Journal of Market Research, 50*(1), 61-104.
vi.	Dresner, H. (1989). Business intelligence. *Gartner Inc,*
vii.	Ghazanfari, M., Jafari, M., & Rouhani, S. (2011). A tool to evaluate the business intelligence of enterprise systems. *Scientia Iranica, 18*(6), 1579-1590.
viii.	Eckerson, W. (2003). The rise and fall of spreadmarts. *Information Management, 13*(9), 28.
ix.	IEA (2020), India 2020, IEA, Paris https://www.iea.org/reports/india-2020
x.	Harison, E. (2012). Critical success factors of business intelligence system implementations: evidence from the energy sector. *International Journal of Enterprise Information Systems (IJEIS), 8*(2), 1-13.
xi.	Hawking, P., &Sellitto, C. (2015). Business intelligence strategy: a utilities company case study. *International Journal of Enterprise Information Systems (IJEIS), 11*(1), 1-12.
xii.	Hostmann, B., Bitterer, A., & Burton, B. (2007). Magic quadrant for business intelligence platforms, 1Q07. Gartner RAS Core Research Note G, 145507.
xiii.	Isik, O. (2009). Business intelligence success: An empirical evaluation of the role of BI capabilities and organisation's decision environment. *AMCIS 2009 Doctoral Consortium,* 13.
xiv.	Işýķ, Ö., Jones, M. C., & Sidorova, A. (2013). Business intelligence success: The roles of BI capabilities and decision environments. *Information & Management, 50*(1), 13-23.
xv.	Jourdan, Z., Rainer, R. K., & Marshall, T. E. (2008). Business intelligence: An analysis of the literature. *Information Systems Management, 25*(2), 121-131.
xvi.	Kokin, S., &Wang, T. (2013). Development of business intelligence success evaluation framework. *Japsc, 13*(9), 1657-1660.
xvii.	Lee, H., Long, J., &Visinescu, L. (2016). The relationship between a business simulator, constructivist practices, and motivation toward developing business intelligence skills. *Journal of Information Technology Education: Research, 15*, 593-609.
xviii.	Olszak, C. M. (2016). Toward a better understanding and use of business intelligence in organisations. *Information Systems Management, 33*(2), 105-123.
xix.	Popoviè, A., Hackney, R., Coelho, P. S., &Jakliè, J. (2012). Towards business intelligence systems success: Effects of maturity and culture on analytical decision making. *Decision Support Systems, 54*(1), 729-739.
xx.	Pretorius, A. J., &Van Wijk, J. J. (2009). What does the user want to see? what do the data want to be? *Information Visualization, 8*(3), 153-166.
xxi.	Radenkoviæ, M., Lukiæ, J., Despotoviæ-Zrakiæ, M., Labus, A., &Bogdanoviæ, Z. (2018). Harnessing business intelligence in smart grids: A case of the electricity market. *Computers in Industry, 96*, 40-53.
xxii.	Ramakrishnan, T., Jones, M. C., & Sidorova, A. (2012). Factors influencing business intelligence (BI) data collection strategies: An empirical investigation. *Decision Support Systems, 52*(2), 486-496.
xxiii.	Sangar, A. B. (2014). *Measurement Metrics for Measuring Success of Business Intelligence System,*
xxiv.	Sangar, A. B., &Iahad, N. B. A. (2013). Critical factors that affect the success of business intelligence systems (BIS) implementation in an organisation. *Intelligence, 12*(2), 14-16.
xxv.	Seah, M., Hsieh, M. H., &Weng, P. (2010). A case analysis of savecom: The role of indigenous leadership in implementing a business intelligence system. *International Journal of Information Management, 30*(4), 368-373.

xxvi.	Solomon, N., & Paul, G. (2004). Business intelligence. *Communications of the Association for Information Systems, 13*, 450.
xxvii.	Sparks, B. H., & McCann, J. T. (2015). Factors influencing business intelligence system use in decision making and organisational performance. *International Journal of Sustainable Strategic Management, 5*(1), 31-54.
xxviii.	Varghese, G., &Eapen, L. M. (2016). Power sector in India-recent challenges and measures undertaken. *Asian Journal of Research in Business Economics and Management, 6*(1), 33-46.
xxix.	Vashisht, V., Kamya, S., &Vashisht, M. (2020). Defect prediction framework using neural networks for business intelligence technology-based projects. Paper presented at the *2020 International Conference on Computer Science, Engineering and Applications (ICCSEA)*, 1-5.
xxx.	Watson, H. J. (2009). Tutorial: Business intelligence—past, present, and future. *Communications of the Association for Information Systems, 25*(1), 39.
xxxi.	Yeoh, W., Gao, J., &Koronios, A. (2009). Empirical investigation of CSFs for implementing business intelligence systems in multiple engineering asset management organisations. *Information Systems Research Methods, Epistemology, and Applications*, 247-271.

<div align="center">

Annexure

SURVEY INSTRUMENT

</div>

Please share an opinion based on anyone BI system used in your organisation.

Part I-BI Success Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking a tick in only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 Business Intelligence (BI) system in your organisation supports your decision making.					
2 Business Intelligence (BI) system in your organisation provide precise information for use					
3 Business Intelligence (BI) system in your organisation provide the required information on time					
4 Overall you are satisfied with the Business Intelligence (BI) available in your organisation.					

Part II-Information Processing Please indicate your opinion with regards to the nature of the information required for the decisions you make	Low 1	2	3	4	High 5
1 Information granularity requirement is					
2 Information accuracy requirement is					
3 Frequency of the use of the information is					
4 The currency of the information is					

Part II-Decision Type Please indicate your opinion with regards to the nature of the information required for the decisions you make	Unstructured	Somewhat unstructured	Both	Somewhat structured	Structured
1 The nature of the decision I make is					
	Low 1	Somewhat low2	Neither3	Somewhat high4	High5
2 My role in decision-making id					
	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
3 The decision I make requires judgement and Intuition					

Part III A-Data Type Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 Your BI system provides accurate quantitative data					
2 Your BI system provides comprehensive quantitative data					
3 Your BI system provides consistent quantitative data					
4 Your BI system provides high-quality quantitative data					
5 Your BI system provides high-quality qualitative data					
6 Your BI system provides accurate qualitative data					
7 Your BI system provides comprehensive qualitative data					
8 Your BI system provides consistent qualitative data					

Part III B-User Access Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 Access to BI in your organisation is easy					
2 You are authorised to access the information you need from BI in your organisation					
3 You can access BI for all types of decision you make in your organisation					

Part III C-Interaction with other systems Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 BI in your organisation provide a unified view of business data and processes					
2 BI in your organisation provides a comprehensive electronic catalogue of the various enterprise information resources in the organisation					
3 BI in your organisation provide easy and seamless access to data from other applications and systems					

Part IV A-Flexibility Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 BI in your organisation is compatible with another tool that you use (e.g. Microsoft Suite, security infrastructure, portal technology or databases)					
2 BI in your organisation can accommodate changes in business requirements quickly					
3 BI in your organisation make it easier to deal with exceptional situations					
4 BI in your organisation is organised and integrated to allow for rapid changes					

Part IV B-Risk Level Please indicate your opinion regarding the Business Intelligence and Business Intelligence systems in your organisation by marking only one box against each question.	Strongly dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
1 BI in your organisation support decision associated with a high level of risk (e.g., entering a new market, hiring a new manager)					
2 BI in your organisation helps minimise uncertainties in your decision-making process					
3 BI in your organisation helps manage risk by monitoring and regulating the operations (e.g., monitoring key performance indicators (KPIs), customising alerts or creating dashboards)					
4 BI in your organisation integrates with other e-governance applications (ERP/Customized IT Solution/SCADA/GIS etc.)					

Part V

Please share the information asked below by marking only in one option against each question.

1	Gender: Male	Female
2	A number of years of experience in the current organisation: 0-2 years 2-4 years 4-6 years 6-8 years	8-10 years 10-12 years 12-14 years 14-16 years 16-18 years 18-20 years Greater than 20 years

EFFICIENCY TESTING OF INDIAN CRUDE OIL FUTURES

* Neetu Chadha

ABSTRACT

Crude oil is the backbone of any economy. The volatility in the oil prices can disturb the economic activities in the entire economy worldwide. Checking the performance of crude oil derivative products is the main area of concern now a days. The main purpose of the current study is to empirically inspect that whether Indian Crude Oil futures market is efficient and govern the way of information flow between the spot and futures of crude oil. Applied Econometric tests on time series daily data of closing spot and future prices of crude oil from January 2012 to December 2019 indicates that both crude oil spot and future markets are cointegrated and error correction also happens in both the markets. This study explored that in short run unidirectional causation flows from crude oil spot prices to Future crude prices and also proved long run association between both the variable series.

Key Terms: *Crude oil, Spot, Futures, Efficiency, Cointegration, Relationship, Correction*

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INTRODUCTION

Crude oil is an imperative requirement of a modern man that makes it inelastic. The availability of crude oil and its price fluctuations in the international market plays a crucial role in the stability of the currencies of many countries. Oil price fluctuations account for the fluctuations of all other commodities directly or indirectly; thus, playing a significant role in the stability of economies of the world. Since India is reliant on imported oil, any flare up in prices can have thoughtful consequences on our economy. Increasing domestic inflation is the main concern and this will stop RBI from reducing rates further. Oil Exporting and exploration companies will gain and rest other sectors that uses crude oil derivatives will be negatively impacted like coal, natural gas, etc. Continuously rising crude oil prices also increases the fiscal deficit of the oil importing countries. As crude oil is getting costlier, there might be some short-term profit booking.

With India spending $111.9 billion on oil imports in the year 2019, analysts were expecting a perfect storm in the energy markets that would have helped major consumers such as

and fiscal pressures in their economy but negatively impact the oil exporting countries by reducing their exports, trade balances and increasing their fiscal deficit in those nations. Not only this investor sentiments are also affected by continuous decline in oil prices that will ultimately affect the different projects in the economy. Lowering oil prices in oil importing countries advances policy reforms, maintaining oil subsidies and increasing different taxes.

Following Figure 1 clearly depicts the Yearly Average Spot Prices of Crude Oil in India. It shows ups and down in the oil prices in the different years starting from 2012 till 2019.

From 2010 onwards there was an upward trend in the oil prices which lasted till 2014. From 2010 to 2011 the crude oil price increased heavily due to the heavy demand by the countries who were importing, and hence crude oil prices rose during the first quarter of 2012 as concerns about possible international supply disruptions pushed up the petroleum prices. The shift toward a stronger U.S. dollar in 2013 played a significant part in reducing oil and gas prices in 2014. India was adversely affected by rupee depreciation. A falling rupee adds to inflation but aids exports growth despite it not being an

Figure 1: Yearly Average Spot Prices of Crude Oil in India
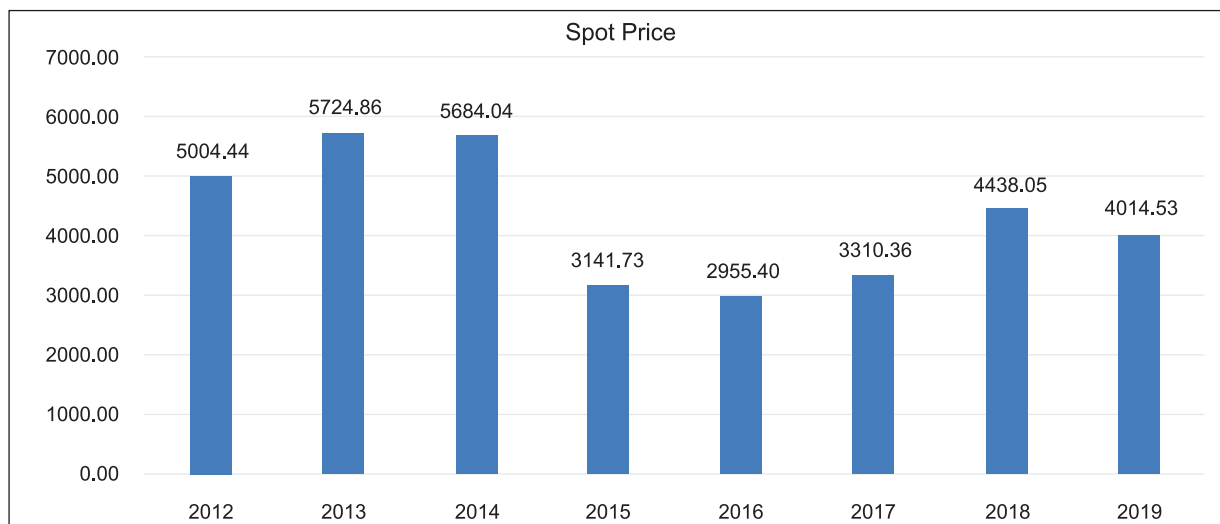
India manage inflationary and fiscal pressures. India is the world's third-largest oil buyer, and the fourth-largest liquefied natural gas (LNG) importer. The cost of the India's crude basket, which averaged $56.43 and $69.88 per barrel in the years 2018 and 2019 respectively, averaged $65.52 in December 2019.Throughout 2019, increases in U.S. petroleum production put downward pressure on crude oil prices. Iraq maintained its position as the largest crude oil supplier to India in 2018-2019, supplying more than 46.61 Million Tonnes (MT) of crude oil last financial year ended March 2019, Iraq's crude oil exports to India rose 2 per cent in the year beyond the prospects of manufacturers, investors and policy analysts. Demand-supply dynamics, geo-political events, and OPEC policy interventions are the important drivers of crude oil price fluctuations. Major variations in crude oil prices sternly influence oil trading countries. Hike in oil prices undesirably effect oil importing countries but support oil exporting countries in their progress. Any fall in oil prices strengthen the growth of importing countries by reducing the inflationary

enough condition. In the year 2013, the rupee fell more than 24% against the dollar during the period, amplifying the price rise in the domestic market. In the international markets, crude oil jumped from $92.02 per barrel in April to $106.57 per barrel in August. In September 2013 automatic correction takes place and crude oil prices reduced more than 10% compared to fall in August in the same year on MCX trading.

Crude Oil prices declined almost by 50% in the years 2014 to 2015, i.e., prices of oil fell from $110 a barrel in June 2014 to $65 a barrel in December 2015; this fall was mainly due to the excess supply and also the decision taken by OPEC in November 2014, not to curtail crude production of oil that continued to be the reason for the drop in later years.

After 2014, the price fell drastically due to the fall in the demand by the importing countries and by the surprise decision of OPEC countries. In the year 2015, internationally around 61 million barrels per day of crude oil was traded. Oil

prices are notoriously volatile, and their actions in 2016 were no exception. Slowing growth in emerging markets, most importantly in China, had led to sharp drops in commodity prices almost across the board. Declining oil prices suggests that mounting supply is as imperative as dwindling demand. Year 2017 was no exception as oil prices dipped various times in the year in the worldwide market. Increasing demand along with various interferences and decisions of OPEC taken oil prices to $66 a barrel by end of 2017, which is more than twice the price experienced during 2016 lows.

Year 2018 proved to be another year of mixed fortunes for the oil and gas industry, with prices firming up to levels that were more common pre-2014, before dipping down in November as fears of global oversupply, amid retrenchment in global economic growth, began to kick in. Prices fell primarily because supply of crude oil had outstripped its demand. The sharp fall in crude helped cut India's import bill by Rs 2 lakh crore and reduced India's import bill and inflation. In the month of May 2018 crude oil price reached $80 per barrel which further impacted Indian Current Account Deficit.

The crude oil market has experienced numerous fluctuations over time and is considered to be one of the most volatile commodity markets. As such, it is essential for oil market participants to identify the main reasons for oil price jumps and the degree of such oil price changes when faced with specific triggers. Whenever there is an oil supply shock caused by political unrest, it would be expected that oil prices would experience a sharp increase over the period, and as such, investors can integrate this kind of behavior as part of their portfolio management strategies.

The different shifts and fluctuations in crude oil prices highlight the significance of interpreting the connection between the prices of oil-futures contracts and market expectations. Definitely, it is common for policymakers and market analysts to understand the price of the crude oil-futures contract traded in the market as a yardstick of market expectations of the future spot price of oil.

LITERATURE REVIEW

Various researchers and academicians examined price discovery and efficiency of commodity futures market in India and compared it with spot market. Gupta & Singh (2007) explored that in comparison to cash market, future market is more volatile and arbitrage opportunities exists in Indian futures markets which makes it inefficient in short run. Roy & Chakraborty (2020) using Johansen cointegration test, vector error correction model (VECM) and impulse response functions proved long run relationship between stock futures and underlying stocks. Both spot and future markets work for price discovery and there is possibility of arbitrage opportunities between stock futures and the underlying spot market when transactions costs are negligible because of auto correction in short run by spot prices. Bhatt (2014) explored bidirectional association among spot and futures market in India. Impact of futures on spot is comparatively high and this also provides profitable opportunities to traders.

Numerous policy makers made an attempt to forecast and make accurate inferences about specific commodity futures market efficiency. Sahi & Raizada(2006) studied the wheat future market efficiency for one week to three month futures and indicated that wheat future market is inefficient in short run and expansion of commodity future market in India has an impact on Indian inflation. Kumar and Pandey (2013) investigated the short run and long run efficiency of future market for eleven commodities and concluded that eight commodities futures are efficient predictors of their spot prices. In certain commodities of near month futures, futures prices are biased but efficient in long run and where trading activity is less, there are inefficiencies prevailing in the future market. Inani (2018) using daily data from January 2009 to October 2015 revealed that spot prices are highly cointegrated for all the ten commodities selected in the study. In case of six selected agricultural commodity, futures prices leads the spot prices but in the case of remaining selected four commodities, spot prices leads the future prices. Futures market is more efficient in price discovery in case of agricultural commodities. Sharma (2018) indicated that both the chilly spot and future prices are highly cointegrated and there is unidirectional causality flowing from Indian Chilly future prices to their spot prices and long run association was also found among spot and futures of Chilly. Nath et al (2019) concluded that the gold market price discovery happens in futures market not in spot market as spot prices are adjusted to follow long run equilibrium and future prices.

Extensive literature relating to futures markets is available, but only few studies have been carried out on efficiency testing of Crude oil Futures in India. Behra (2015) using daily futures and spot closing price series of gold, silver, copper, and crude oil from the year 2005 to 2011 proved that the price discovery happens firstly in the futures market then flows to spot market. In case of Gold market does not seems to be efficient as all information is not incorporated in their prices .Jiang et al. (2014) investigated that in short run WTI crude oil future market is inefficient only when major events like Oil price crashes and Gulf war, else future crude oil future market is efficient. Mensi et al. (2012)by adopting Symbolic Time Series Analysis with the Shannon entropy analyzed data from 1987 to 2012 and found weak form efficiency of oil market with varying time trends. Gulen (1998) empirically analysed the system of spot-futures-posted prices using the data of 1983 to 1985 and concluded that indicate that the futures price of crude oil traded at NYMEX shows a noteworthy role in price detection. Wang, Y., & Wu, C. (2012) using multifractality degree found that crude oil futures markets are efficient in the short-term but in the long-term the market is inefficient. Sharma(2017) checked the informational efficiency of Indian and US Crude Oil Future market and concluded that actually US market is informational supplier in short run. Diffferent trading strategies adopted by hedgers only provides limited profitable opportunities and on day to day basis both Indian and US crude oil futures markets are efficient but US market seems to be more efficient

OBJECTIVE OF THE STUDY

The objective of this study is to empirically inspect the efficiency of Indian Crude Oil futures market and also to find the way of flow of information between the crude oil spot and futures.

METHODOLOGY

The current study employed daily closing spot and futures prices of crude oil from January 2012 to December 2019. The time series data was retrieved from Investing and MCX India, leading commodity exchange of India. Total 2096 observations were examined for this study.

The Augmented Dickey- Fuller (ADF) test is used to check the stationarity of the spot and Future price series of crude oil. For analysis purpose data is converted into log of daily closing spot and future prices of crude oil. The first differences of both the series i.e.spot and future log prices were taken to calculate the returns.

Further Johansen Co-integration test is applied to determine whether spot prices of crude oil in the market is co-integrated with the future prices of crude oil or not. If instead of two series stationarity their linear combination will not be stationary, then this means they are cointegrated with each other. If chosen data will be assimilated of similar order, then cointegration technique will be used to test the presence of long run association within the variables under study. Johansen Co-integration test further needs the right lag length to be chosen. For lag length selection both Akaike's information criterion (AIC) and final prediction error (FPE) are considered. Maximal Eigen value and trace test statistics values are further used to find that whether cointegration exists among variables or not that confirms the presence of long run relationship between spot and Futures of crude oil.

A Granger causality test is also applied on data series of Spot and futures of crude oil for checking the Lead lag association between two time series of variables

Deviations in short span of time is possible therefore it is required to adjust those deviations. For the purpose of adjusting the deviations VECM is essential. VECM investigate temporary deviationsand explore the relationship between the two-variable series by analyzing the variables' responses. Post identification of cointegrated equation between crude oil spot and future prices, a VECM is projected.

To inspect the coefficients of VECM, impulse response function and variance decomposition are used that help us to show the impact of variations in the value of one variable to another.

RESULTS & DISCUSSION

Descriptive statistics of Crude Oil Spot and Futures Daily Price series are brief descriptive coefficients that summarize the data series with the help of the statistical measures. The mean for Crude Oil Futures is 4315.14 and for Crude Oil spot is 4335.24. This means average of spot prices of Crude oil are

Table 1: Descriptive Statistics of Crude Oil Spot and Futures Daily Price Series

Series	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
Spot	4335.242	1161.775	0.182628	2.297536	54.74654
Futures	4315.149	1177.643	0.266820	2.175150	84.28963

greater than the average prices of Crude Oil Futures. But the values of standard deviation in the table 1 reflects that the standard deviation for future prices is greater than spot prices. The kurtosis for both the series indicates that the distribution is leptokurtic. Jarque-Bera test statistic measures the difference of the skewness and kurtosis of the series with those

Table 2: Augmented Dickey Fuller Test(ADF)

Series	t-statistics	Probability
Spot Price	-1.605434	0.4796
Futures Price	-1.479323	0.5441
Returns of Spot	-51.34869	0.000
Returns of Futures	-47.17418	0.000

from the normal distribution. Values of Jarque-Bera statistic indicates that both the series are not normally distributed.

Table 2 results specify that the crude oil Spot prices and future prices series are not stationary at level and for the purpose of further analysis both the series are converted into stationary by using log of closing prices of spot prices and future prices and the results indicate that the null hypothesis is rejected. Thus, series of return of spot and futures in their first difference are stationary.

Figure 2: Daily Spot and Future Prices of Crude Oil
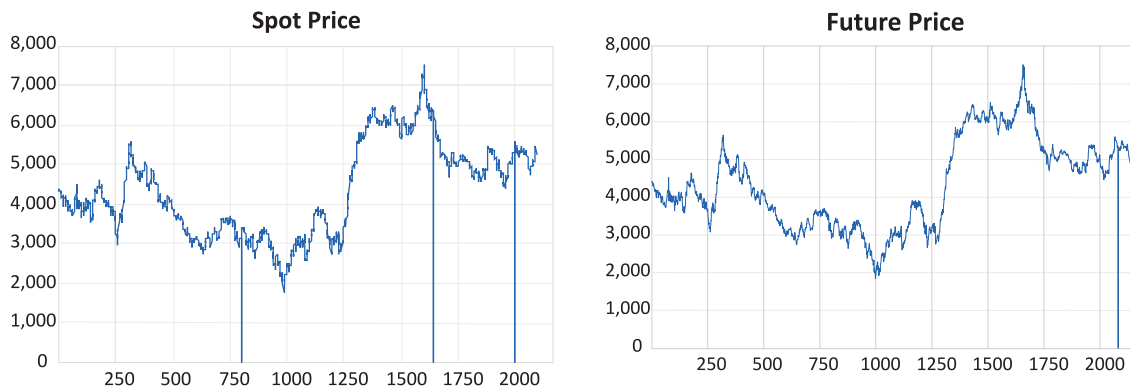
Source: Author's Own Compilation

Figure 3: Daily Spot and Future Returns of Crude Oil
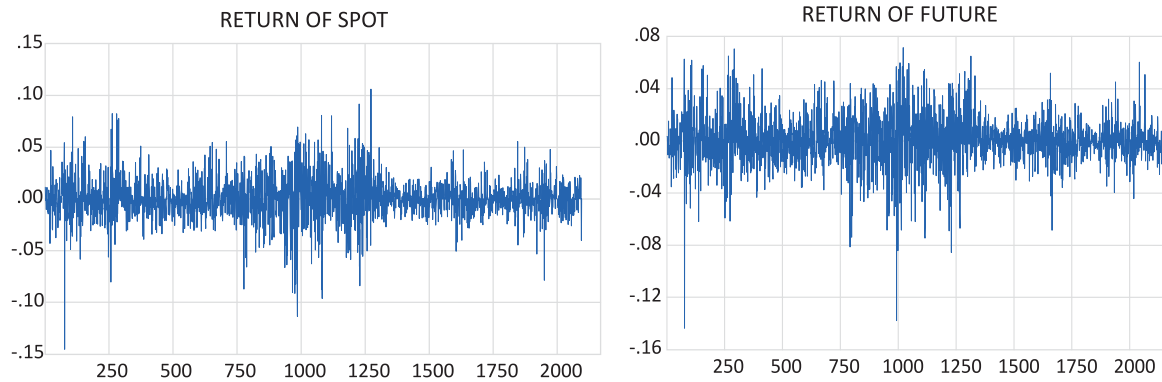
Source: Author's Own Compilation

For additional acumens about the dynamics of crude oil prices, we portray in Figures 2 and 3 the daily crude oil spot and future prices and their daily logarithmic differences (returns) of Spot and futures. And we detect noticeable signs of price and return persistence which are episodic by some periods of strong fluctuations. This specifies the possible chances of conditional heteroscedasticity in the series of oil prices and returns.

Figure 4 clearly shows that the daily movements of Spot and Future prices of crude oil are almost similar which further proves that there is high level of cointegration between both the variables and that can also be tested by using Johansen Cointegration test

Cointegration test is used to verify whether there is any long-run relationship among the crude Oil futures and spot prices. For the study total 2096 observations are taken having a lag of 4. The results of the Johansen cointegration test are based on trace statistics and maximum eigen values test. The results of trace statistics and eigen values reflects that there exists more than 1 cointegrating equation and null hypothesis of no cointegration equation among variables is rejected. Both the values i.e. trace statistic and Eigen values value are greater than their critical value as shown in Table 3. This proves long run association among Crude oil Futures and spot prices.

Test results indicate that spot and futures prices are governed by the same set of fundamentals, such as the exchange rate, macroeconomic variables and demand and supply conditions, which are similar and interrelated in other markets for crude oil. As stated above, cointegration implies the existence of a long-run relationship between two or more non-stationary series. Therefore, it is related to arbitrage which is a representation of a long-run steady-state equilibrium relationship in a particular market. Arbitrage can be formally defined as any activity that would generate a riskless profit through substitutability between spot and futures markets. If two markets are cointegrated, in the long run arbitrage is the force that brings these markets together As oil spot and futures prices are cointegrated, the potential for making riskless excess profits on, say, the WTI spot market based on information from the Brent futures market is limited in the long run which further represents the efficiency of markets.

Figure 4: Daily Movements of Spot and Future Prices of Crude Oil

Source: Author's Own Compilation

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Table 3: Johansen Cointegration Test

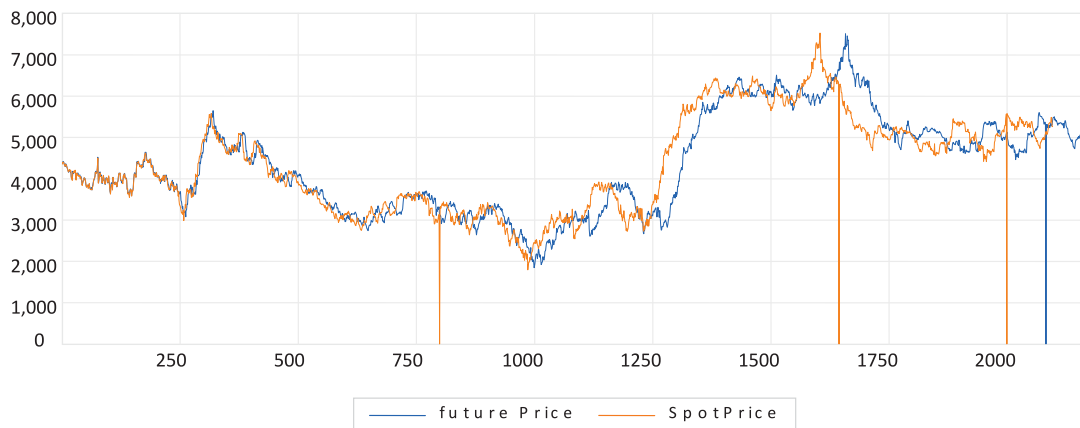| VARIABLES		Number of Hypothesised Equations	Maximum EIGEN Value	Critical Value at 0.05 Level	TRACE Statistic	Critical Value at 0.05 Level	Probability
Crude Oil Spot Prices	Crude Oil Futures Prices	None	380.7443	14.2646	731.5246	15.4947	0.000
Crude Oil Spot Prices	Crude Oil Futures Prices	Atmost 1	350.7804	3.84146	350.7804	3.84146	0.000

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The table 4 indicates that lag 4 is the optimal lag that is advised by the lag order length criteria and Akaike information criterion. Akaike's information criterion (AIC) and final prediction error (FPE) are better than the other criterions as they lessen the probability of under valuation while maximizing the chance of selecting the true lag length. So, Lag 4 is used to apply the Johansen Cointegration test. Optimum lag length is used for applying VECM.

Table 4: Lag Order Length Criteria Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	10187.14	NA	1.63e-07	-9.951287	-9.945792	-9.949272
1	10205.63	36.92736	1.61e-07	-9.965445	-9.948960*	-9.959399*
2	10206.57	1.860106	1.62e-07	-9.962448	-9.934973	-9.952371
3	10211.33	9.487671	1.61e-07	-9.96319	-9.924725	-9.949083
4	10218.25	13.78814	1.61e-07*	-9.966048*	-9.916593	-9.94791

Table 5: Estimates of Vector Error Correction Model

D(SPOTPRICE) = C(1)*(SPOTPRICE(-1) - 0.956140256965
   *FUTURE_PRICE(-1) - 209.464784687) + C(2)*D(SPOTPRICE(-1))
   + C(3)*D(SPOTPRICE(-2)) + C(4)*D(SPOTPRICE(-3)) + C(5)
   *D(SPOTPRICE(-4)) + C(6)*D(FUTURE_PRICE(-1)) + C(7)
   *D(FUTURE_PRICE(-2)) + C(8)*D(FUTURE_PRICE(-3)) + C(9)
   *D(FUTURE_PRICE(-4)) + C(10)

	D(DSP)	D(DFP)		D(DFP)	D(DFP)
CointEq 1	-0.008771 (0.01147) [-0.76504]	0.062355 (0.00756) [8.25288]			
S1	-0.682623 -0.02413 [-28.2877]	-0.060847 -0.0159 [-3.82636]	F1	0.002574 -0.0331 [0.07775]	-0.514464 -0.02181 [-23.5841]

S2	-0.457126 -0.02734 [-16.7218]	-0.037634 -0.01801 [-2.08908]	F2	-0.002402 -0.03696 [-0.06499]	-0.2795 -0.0244 [-11.4741]
S3	-0.272271 -0.02671 [-10.1919]	-0.02372 -0.0176 [-1.34741]	F3	-0.003336 -0.03692 [-0.09037]	-0.1424 -0.0243 [-5.85256]
S4	-0.126736 -0.02212 [-5.72878]	-0.010547 -0.01458 [-0.72348]	F4	0.001623 -0.03272 [0.04960]	-0.0417 -0.0216 [-1.93238]

Note: Standard error is given in ( ) and t-statistics in [ ]

The term, error correction, narrates that the last period deviation from long-run equilibrium (the error) influences the short-run dynamics of the dependent variable. Thus, the coefficient of ECT, is the speed of adjustment, because it measures the speed at which one variable returns to equilibrium after a change in another variable. The results of VECM model shown in table 5 indicate that the coefficient of cointegrating equation is statistically significant. The coefficient of error correction term is negative, and the series move downhill to the balance. Since the error correction term in futures equation is greater than that in the spot equation, it implies that the spot prices of crude oil respond rapidly and leads to price detection. Error correction terms for both the spot prices and future prices series are significant in the elongated term. We find bidirectional causality among spot and future price of crude oil in the long term. This implies in case of crude oil, both spot and future markets respond to restore the balance whenever there is price inconsistency.

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. The results indicate that crude oil spot returns granger causes future returns of spot prices. This suggests that variations in spot price leads to future pricefluctuationsbut future prices fluctuations do not lead to change in spot prices. There is short term causality flowing from spot price to Future price.

Table 6: Granger Causality/ Block Exogeneity Wald Test

Null Hypothesis	F-statistics	Chi-Square	Probability
Crude Oil Future does not granger cause Crude Oil Spot	1.25627	5.025095	0.2851
Crude Oil Spot does not granger cause Crude Oil Future	3.71205	14.84820	0.0051

Figure 5: Response to Cholesky One SD Innovation
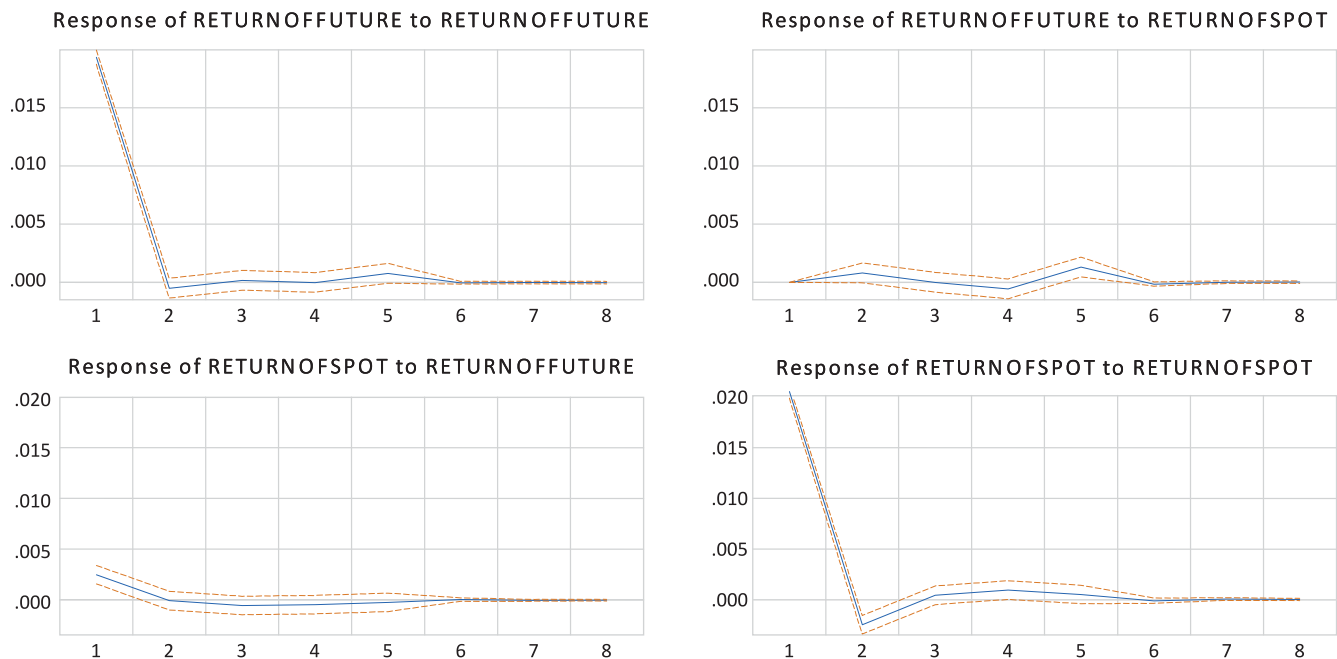
Source: Author's Own Compilation

Impulse response is used to discover the outcome of tremors on the variables. In response to future there is a decline in 2nd period again at 4th period and after 6th period it declined. The futures response to spot is significant and declined at 2nd and 4th period. In response of spot to future there is a decline from 2nd period but at 6th period it was positive rest it was negative during other periods. The spot response to spot there is a sharp decline in 2nd period and thereafter the prices rose and were positive and were constant from 6th period.

Variance decomposition

Variance decomposition aids in knowing what percentage of variation exists in both spot and future returns i.e. whether spot returns fluctuate due to its shocks against future returns shocks and vice versa.

Table 7: Variance Decomposition of Return of Spot

Period	S.E.	Return of Spot	Return of Future
1	0.020693	100.0000	0.000000
2	0.020842	99.99162	0.008379
3	0.020854	99.90043	0.099575
4	0.020881	99.81673	0.183269
5	0.020889	99.79190	0.208097
6	0.020889	99.79179	0.208212
7	0.020890	99.79018	0.209820
8	0.020890	99.78957	0.210432
9	0.020890	99.78949	0.210505
10	0.020890	99.78949	0.210505

Table 8: Variance Decomposition of Return of Future

Period	S.E.	Return of Spot	Return of Future
1	0.020693	100.0000	0.000000
2	0.020842	99.99162	0.008379
3	0.020854	99.90043	0.099575
4	0.020881	99.81673	0.183269
5	0.020889	99.79190	0.208097
6	0.020889	99.79179	0.208212
7	0.020890	99.79018	0.209820
8	0.020890	99.78957	0.210432
9	0.020890	99.78949	0.210505
10	0.020890	99.78949	0.210505

The table 7 indicates that when return of spot is taken as dependent variable then in the short run in the third year impulse or shock to return to spot causes 99.90 percent variation because of the fluctuation in the return of spot itself, shock to future can cause 0.09 percent fluctuation in return of spot prices. And in the long run spot prices can cause 99.78

percent fluctuation in spot price itself i.e. a little less as compared to short run, shock to future can cause 0.21 percent fluctuation in spot prices i.e. slightly more as compared to short run.

The table 8 highlights that when return of future is the dependent variable then in the short run in the third-year innovation to return of future brings 98.44 percent fluctuation in the return of future itself and 1.55 percent fluctuation in return of spot. And in the long run future prices cause 97.84 percent fluctuation in future price itself i.e. a less compared to short run, shock to spot can cause 2.15 percent fluctuation in future prices i.e. a slight increase as compared to short run.

CONCLUSION

Crude oil is one of the most volatile commodities apart from Gold. Large corporate houses HPCL, ONGC, IOC are the main players in the Crude oil Futures and these players have great underlying exposures because of fluctuations in Oil prices and they always use crude oil futures to hedge their risk. Crude oil futures offer a best opportunity to participants to participate in the movement of crude oil prices. From the year 2014 Crude oil prices started falling sharply as the economics of oil started changing as US heavily spend on extraction of oil and supply started coming in the market. Technology also makes cars more fuel efficient which reduced the demand in the market. All this exerted downward pressure on crude oil making it more volatile as global factors play important role in determining the volatility of the crude oil. Although India is a very small player in crude oil production but fastest expanding market for oil demand.

The present study examined the efficiency of crude oil futures markets found the way of flow of information between the crude oil spot and futures using Johansen Co-integration test, Granger Causality, VECM, Impulse response and variance decomposition models. This study observed the short run unidirectional causality flowing from spot prices to Future crude prices and long run co-movements and association between crude spot and Futures prices. Error correction terms for crude oil spot and futures price series are statistically significant. Error correction in the market helps in restoring the balance in both the markets which further indicates market efficiency.

Study results propose that spot and futures prices are administered by the same set of fundamentals, which are similar and interrelated in other markets for crude oil. Cointegration implies the existence of a long-run relationship between two or more non-stationary series. Therefore, it is related to arbitrage which is a depiction of a long-run steady-state equilibrium relationship in a market. If two markets are cointegrated, in the long run arbitrage is the force that takes these markets together. As oil spot and futures prices are cointegrated, the potential for making riskless excess profits based on information from the futures market is limited in the long run. If two markets are cointegrated each market contains information on the common stochastic trends which bind the stock market prices together, meaning that the predictability of each stock market can be enhanced through using information contained in the other stock market. The

findings of this research might be useful for the regulators, government, exchange and policy makers to form market structure policies and guidelines for the commodity markets in emerging economies.As the crude oil prices are continuously fluctuating and are naturally more volatile, on average, than stock or currency prices, it is decisive for successful investors and traders to have good evidence foundations that provide description about the various factors than can influence oil prices. Crude oil trading offers outstanding opportunities to yield excellent returns in nearly all market conditions due to its unique standing within the world's economic and political systems.

REFERENCES

i. Behra, C. (2015), Price Discovery and Market Efficiency in Indian Futures Market, *International Journal of Innovative Research in Engineering &Management*, 2(4), 40-47

ii. Bhatt, R. B. (2014), Price Volatility and Market Efficiency of Futures Market in India, *IOSR Journal of Business and Management*, 16(3), 11-18.

iii. Gülen, S. G. (1998), Efficiency in the crude oil futures market. *Journal of Energy Finance & Development, 3(1), 13–21.* doi:10.1016/s1085-7443(99)80065-9

iv. Gupta, K. & Singh, B. (2007), Investigating the Pricing Efficiency of Indian Equity Futures Market, *Management &Labour Studies*, 32(4), 486-512

v. Inani, S. K. (2018), Price Discovery and Efficiency of Indian Agricultural Commodity Futures Market: An Empirical Investigation, *Journal of Quantitative Economics*, 16, 129–154

vi. Jiang, Z.-Q., Xie, W.-J., & Zhou, W.-X. (2014), Testing the Weak-Form Efficiency of the WTI Crude Oil Futures Market, *Physica A: Statistical Mechanics and Its Applications*, 405, 235–244. doi:10.1016/j.physa.2014.02.042

vii. Kumar, B., & Pandey, A. (2013), Market Efficiency in Indian Commodity Futures Markets. *Journal of Indian Business Research*, 5(2), 101–121. doi:10.1108/17554191311320773

viii. Liew, Venus Khim-Sen (2004), Which Lag Length Selection Criteria Should We Employ?, *Economics Bulletin*, 3(33), 1"9.

ix. Nath, G., Dalvi, M., Pawaskar, V., Rajaram, S., & Pacheco, M. (2019), An Empirical Analysis of Efficiency in The Indian Gold Futures Market,*Macroeconomics and Finance in Emerging Market Economies*, 1–30. doi:10.1080/17520843.2019.1604556

x. Roy, P. S. & Chakraborty, T. (2020), Efficiency of Indian Equity Futures Market—An Empirical Analysis with reference to National Stock Exchange, *Global Business Review*, 1-21. DOI: 10.1177/0972150920920462

xi. Sahi, G. S., &Raizada, G. (2006). Commodity Futures Market Efficiency in India and Effect on Inflation,*SSRN Electronic Journal*, doi:10.2139/ssrn.949161

xii. Sharma, P. & Sharma, T. (2018), A Study of the Efficiency of Chili Futures Market in India, *The IUP Journal of Financial Risk Management*, XV(3), 32-43.

xiii. Sharma, S. (2017),Market Efficiency between Indian & US Crude Oil FutureMarket,*Procedia Computer Science*, 122, 1039–1046.

xiv. Walid Mensi, ChakerAloui, Manel Hamdi & Duc Khuong Nguyen, Crude oil market efficiency: An Empirical Investigation via The Shannon Entropy, *International Economics* 129 (2012), 119-137.

xv. Wang, Y., & Wu, C. (2012), Efficiency of Crude Oil Futures Markets: New Evidence from Multifractal Detrending Moving Average Analysis, *Computational Economics*, 42(4), 393–414, DOI 10.1007/s10614-012-9347-6

Contagious COVID 19: Leading to Hysteria in Indian Stock Markets and Sectoral Indices Performance

Divya Jain

ABSTRACT

The eruption of the novel corona virus in India has led to the outflow of panic due to high media coverage. This unparalleled broadcast of news has led to swift flow of information to investors and reactions can be assessed with increased volatility in financial markets. EGARCH (1,1) Model is applied to determine the relationship between the market returns of different industries along with the panic generated due to media coverage about the corona virus outbreak. Imposition of mobility control in terms of Lockdown has exerted the significant impact on stock market and sectoral indices returns. And depending on the nature of the business associated, different sectors have performed in a different way to this corona virus outburst. Even if returns are not affected directly then conditional volatility pervasiveness can easily be detected. So, the news burdened with panic and negative sentiment has definitely contributed to a prodigious level of volatility in the sectors professed to be most affected by the corona virus outbreak in India.

Key Terms: *Corona virus, COVID-19, Sectoral Indices Performance, EGARCH Model, Conditional Volatility, Panic Index, Nifty 50, Media Coverage*

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INTRODUCTION

The outbreak of Corona Virus (SARS-COV-2) popularly known as COVID-19 has its inception roots in Wuhan, China and has created a never seen before situation across the globe in all realms of life. To no one's astonishment, market capitalization of trillions of dollars has been gone away and it is too early to predict when and how this scenario is going to be changed.

The crisis ascended by this unexpected and new virus has shaken the global economies and stock markets are no exception to it. Numerous breathes have been claimed by this Covid-19 and it has dominated countries across the globe. Considerable fluctuations in financial markets have also been observed with different sectors countering to the disaster differently.

India has definitely curtailed the widespread of the pandemic as compared to other countries by taking various early policy measures but the economic impact cannot be ignored. Economic instability has major association with the periods which are highly volatile in nature. The lockdown decision taken by government to maintain social distancing and to dodge the outburst of virus in the country even when cases were not very high in number. This lockdown has reflected a huge economic loss to the country and have plunged the growth rates and GDP(Gross Domestic Product) to very low figures. India's GDP growth rate has plunged down to 3.1% for the current quarter Q4 of financial year (FY20) where as it was 4.1% for last quarter Q3 as compared to 5.7% for same quarter of last fiscal year. The overall FY20 GDP has declined to 4.2% from 6.1% of FY19, which is reported as lowest for past 11 years. The unemployment rate has also witnessed quite a surge to 23.48 % in the month of April 2020 which is again quite a high from previous many years.

Now a days, there is instant flow of information across countries. Access to news about any event across globe is one of the major sources of information and it is observed that individuals are unable to evaluate the economic viability of the dispersed information. Literature supports that news plays a very important role in deciding trading strategies. There is significant portion of volatility in financial markets because of news announcements. (Ederington& Lee,1996; Barberis et al., 1998; Groß-Klußmann & Hautsch, 2011). Also, apart from traditional theories and models, there is an impact of some other factors like media coverage, any emergent situation prevailing in country or any health crisis which have effect on behaviour and psychology of the investor on market returns and stock prices.

The purpose of study stems from the ongoing pandemic situation where massive shocks are generated in financial markets. Present scenario, can be considered as an ideal environment to investigate the dynamics of unpredictability and extreme fluctuations in this time of financial crisis. The study aims to comprehensively evaluate the effect on market returns and volatility for the Indian Stock Market Index (Nifty 50) and different sectoral indices (Nifty Auto, Nifty Pharma, etc.) during this pandemic time from the investor's sentiment perspective. The study explores association of panic created among individuals due to media coverage of the pandemic and unseen volatility in market returns due to this negative global sentiment. Volatility profiling in different sectors of an economy is different depending on the nature of business it is associated with. The panic induced from media coverage makes financial markets more volatile. In finance literature, EGARCH models are extensively used in understanding the volatility of stock markets. The EGARCH model developed by (Nelson, 1991) is suggested as better fit for determining volatilities. The study is undertaken in the inception phase of the outbreak of the virus in the country India and can further be explored in upcoming times depending on the further blow-out of virus in the country. The current study can be extended to compare this with the volatility during more tranquil periods. The next section deliberates the literature associated and in further sections methodology and empirical results are discussed.

ITERATURE REVIEW

Though the literature related to the virus is in emerging phase, the outbreak of novel coronavirus has attracted researchers from all the domains to scale its effect in their fields. There is not even a single life which remains untouched by the effect of the virus.To identify the financial and economic effect, various researchers, academicians and policy personnel's have undertaken studies on relative effect of increasing cases and deaths due to the virus on stock markets, currency exchange rates, GDPs of countries under influence, prices of various commodities like Oil, Gold, etc.(Corbet et al., 2020;Villarreal-samaniego, D. 2020).

China is the country which is considered responsible for the outbreak of the virus and its worldwide spread. A lot of interest has been developed by economists and researchers to identify the impact on Chinese Stock Markets. With strict measures of containment, China curtailed the outspread within the country but badly affected the production and economy. In order to quantify the pandemic effect on performance of Chinese Stock Markets (Liew & Puah, 2020) applied regression with EGARCH specification to analyse the performance of Chinese Stock Market represented by Composite Index of Shanghai Stock Exchange and its component sectoral indices. They introduced a lockdown dummy, cases of COVID-19, and a particular date dummy for 3th Feb 2020 (date of reopening after Chinese New Year holidays) in the regression analysis. There were certain sectors which were much affected due to this pandemic like IT, telecommunication services and healthcare whereas other sectors like energy and financial sectors have not shown a greater impact for the outbreak of the pandemic.

The interlinkage and interdependence of global financial markets, has led to flow of crisis from one country to another. And high cross correlation is witnessed in the stock markets. The another country which has been majorly affected after China is US (United States of America) (Onali, 2020) identified that there is presence of conditional heteroskedasticity for US Stock markets with the increase in number of cases and number of deaths due to COVID 19. Data for almost one year has been collected for 7 countries which has daily deaths of more than 1000 people and includes US, China, Italy, Spain, UK, Iran, France. Stock market returns of US (S&P 500 and Dow Jones are not directly affected and only persistence of

conditional heteroskedasticity is positive except for China cases. GARCH(1,1) modelling is used to identify this impact whereas VAR model identified the negative impact of France and Italy's reported death's on US Market returns (Dow Jones) and VIX has positive effect of the ongoing crisis. Similarly, (Baig et al., 2020) identified the association of COVID-19 cases and deaths with increase in volatility and illiquidity in the US equity markets. Contribution of restrictions imposed and lockdown to decreased mobility leading towards decline in liquidity of markets is studied with the help of OLS regression. (Zhang et al., 2020) identified that due to outbreak, significant loses are suffered by investors during this duration of pandemic outbreak.

Various studies over a period of time has been conducted to identify the relationship of stock market movements to any global announcement or any situation which has a macroeconomic impact. Studies related to effect on market returns in relation to natural disasters, disease prone crisis, and terrorist attacks, are conducted in limited number. Literature has not reported so strong impact of outbreak of any infectious disease to this extent on the market volatilities. (Baker et al., 2020) used automated and human readings of articles from newspapers to quantify the importance and role of news in relation to outbreak of infectious disease. Various major infectious diseases from past like SARS, Ebola were taken into consideration to gauge the market movements related to developments of pandemic. The market volatility is very minutely associated, but in case of Covid-19 news it has been a major driver of movements in US Stock Markets. (Tetlock, 2007) iterated that news related to infectious diseases can cause alarm and influences investors sentiments. (Haroon & Rizvi, 2020) discovered that the unparalleled coverage of news regarding the virus has heightened the volatility in the ambiguous stock markets.

DATA & METHODOLOGY

This study is an attempt to determine the returns and volatility of Indian Stock Market Index Nifty 50 and other Nifty Sectoral Indices during the outbreak of this novel corona virus. The sectoral indices by Nifty represents the benchmark data for the given industry or sector which allows investors to track the stock markets for that particular industry. Nifty 50 is a flagship index which comprises of 50 stocks of the index from 12 different sectors. Nifty sectoral index is a gauge of companies falling under the one particular sector. Like Nifty Auto reflects the performance and behaviour of automobile sector and comprises of 15 stocks that are listed on National Stock Exchange (NSE). Now a days, artificial intelligence also plays an important role in determining investor sentiments. So, Indexes like Panic Index, Sentiment Index and Media Coverage Index from Ravenpack Finance has been taken as representative variables to discover the news related sentiment effect on returns of the market index as wells as these sectoral indices. The association of these indexes with Covid-19 cases and deaths has been detected by running the regression equation and EGARCH (1,1) model is developed to gauge the returns and model volatility of financial markets. A lockdown dummy is introduced for the lockdown period to instrument the effect of mobility control.

The daily data of closing prices of Indian Stock Market Index NIFTY 50 along with other 11 Sectoral Indices namely NIFTY Auto, NIFTY Bank, NIFTY Pvt. Bank, NIFTY PSU Bank, NIFTY Metal, NIFTY FMCG, NIFTY Pharma, NIFTY IT, NIFTY Realty, NIFTY Financial Services, NIFTY Media has been collected for the period beginning from 31st January 2020 (when first case of Coronavirus was detected in Kerala, India) till 15th May 2020 from the NSE website. Daily returns are calculated for all the Indices by taking log of the daily closing prices and subtracting it with the previous day closing price of the same index.

$$Return_{(i,t)} = \log(P_{i,t}) - \log(P_{i,t-1}).$$

To identify the effect of increasing daily cases of Coronavirus and daily deaths of Coronavirus patients on volatility and returns in Indian Stock Market Index and other sectoral Indices, the data for daily cases and deaths for the same period (31st Jan to 15th May 2020) has been collected from the website of statista. com. Recent studies of (Haroon & Rizvi, 2020; Baig et al., 2020 & Rogone et al., 2020) have utilized various Indexes like Sentiment Index, Panic index, Media Coverage Index and many others from Ravenpack Finance for the purpose of conducting research. These indexes help in understanding the sentiment originated from news and its association with stock market volatility. The details and visual representation of data collected from these is represented in Figure 2, 3 and 4.

Natural logarithms(log) of all values of covid-19 cases and deaths and all of the above mentioned indexes(Panic index, sentiment index and media coverage index) are taken for the calculations. Unit root test ADF (Augmented Dickey Fuller Test) is conducted to check the stationarity of the calculated returns and log series of variables and indexes and data is utilised at first level difference where all the series were stationary. Throughout the Sentiment Index data is negative, so for log calculations absolute values are considered.

The ARCH family models are used for prediction and forecasting purposes. Also, these can be used to model the present volatility pertaining in the markets. Engle (1982), developed ARCH Model, which undertakes the changing variance into account for the time series data. Bollerslev (1986), elaborated ARCH Model and developed GARCH Model which introduced conditional variance equation. In 1991, Nelson to overcome the limitations of GARCH Model further proposed a model known as EGARCH Model which is capable of capturing the asymmetric effect on the variance caused by positive and negative market news.

Here in the study, first of all OLS Regression is run to determine the relatedness of these 3 Indexes (Panic Index, Sentiment Index and Media Coverage Index) to the reported cases and related deaths of COVID-19. The equations for the same is:

$$Panic\ Index(ln)_{t} = \alpha_0 + \alpha_1 (ln\ Cases)_{t} + \varepsilon_t \quad 1(a)$$

$$Panic\ Index(ln)_{t} = \alpha_0 + \alpha_1 (ln\ Deaths)_{t} + \varepsilon_t 1(b), \text{ where}$$

Panic Index is taken as dependent variable and independent variables are total cases and total deaths reported respectively in equation 1(a) and 1(b). All values are taken in log form for the basic assumption of stationary of the data.

Similarly, equations for other two indexes are:

$Sentiment\ Index(ln)_t = \alpha_0 + \alpha_1\ (ln\ Cases)_t + \varepsilon_t\ 2\ (a)$

$Sentiment\ Index(ln)_t = \alpha_0 + \alpha_1\ (ln\ Deaths)_t + \varepsilon_t\ 2\ (b),$

$Media\ Coverage\ Index(ln)_t = \alpha_0 + \alpha_1\ (ln\ Cases)_t + \varepsilon_t\ 3\ (a)$

$Media\ Coverage\ Index(ln)_t = \alpha_0 + \alpha_1\ (ln\ Deaths)_t + \varepsilon_t\ 3\ (b)$

After identifying the relationship among them, these indexes are primarily used to model the EGARCH(1,1) equation to estimate the returns of various sectoral indices, and volatility persisting in markets. For this purpose, both mean and variance equation are taken into consideration. Also, lockdown dummy (LD) from the date of beginning of first lockdown i.e. 22nd March 2020 has been introduced to identify the effect of mobility control, economic loss and panic associated with it. For observations from the date of lockdown 22nd March 2020, LD has taken value as 1 till end of the study period i.e. 15th May 2020 and otherwise the value of LD is 0.

Conditional Mean Equation,

$Return_t = \alpha_0 + \alpha_1 LD + \alpha_2 MCI + \alpha_3 PI + \alpha_4 SI + \varepsilon_t\ where,$

$Return_t$ is the return of Indian Stock Market Index Nifty 50 and other sectoral indices like Nifty Auto, Nifty pharma, Nifty Bank,

Conditional Variance Equation,

$Log(\sigma^2 t) = \beta_0 + \beta_1\ (|\varepsilon_t\text{-}1|/\sigma_t\text{-}1) + \beta_2\ (\varepsilon_t\text{-}1/\sigma_t\text{-}1) + \beta_3 log\sigma^2 t\text{-}1 + \beta_4 LD,$ where

$Log(\sigma^2 t)$, is the log (Garch),

β takes values from 0 to 4, the coefficients of parameters,

$|\varepsilon_t\text{-}1|/\sigma_t\text{-}1$, is the absolute residual (-1) divided by square root of Garch (-1),

$\varepsilon_t\text{-}1/\sigma_t\text{-}1$, is the Arch effect measuring the leverage effect which defines the absorption of good and bad developments in the market,

$log\sigma^2_{t-1}$, is the Garch effect measuring the perseverance of volatility in the markets.

LD, is lock-down dummy taken as variance regressor.

MPIRICAL ANALYSIS & RESULTS

The above figure represents the percentage change in the daily closing prices of the benchmark Index considered under study for
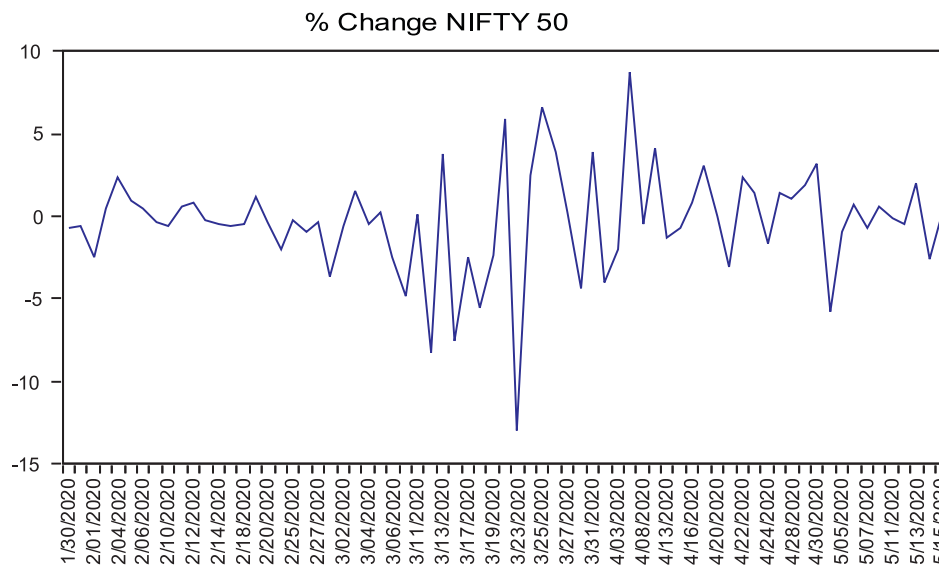
% Change NIFTY 50

Figure 1 : Percentage Change in Nifty 50

Source: Author's own compilation with E-views

etc, all 11 sectoral indices mentioned above.

α takes values from 0 to 4 , the coefficients of the parameters to be estimated,

LD, is lockdown dummy, MCI, is Media Coverage Index, PI, is Panic Index

SI, is Sentiment Index, and

ε_t is the error term

the period 31st January 2020 -15th May 2020. With a concern about economic consequences, market began to react to the news and information in very initial stage only. A major movement can be witnessed in the month of March where in the shock started flowing in the form of news from the other countries. The announcement of pandemic by WHO also played its role in market fluctuations. The elevated anxiety because of the announcement of the lockdown and increase in panic has clearly demonstrated panic effect of mobility control on market prices and returns.
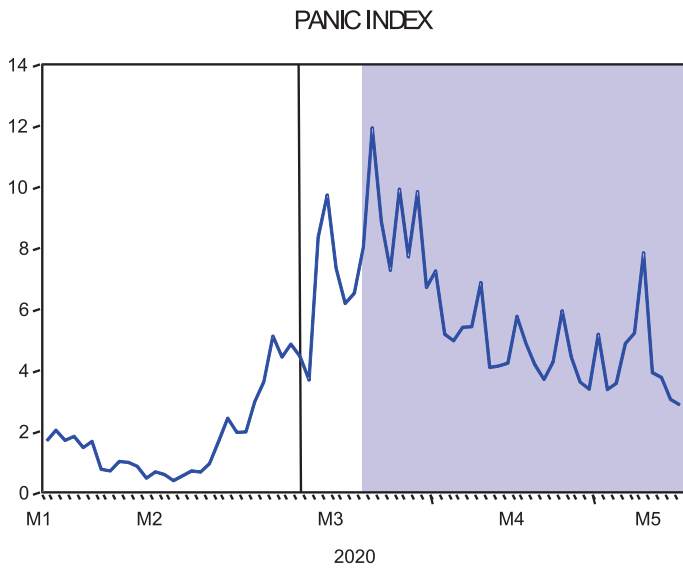
PANIC INDEX

Figure 2 : PANIC INDEX
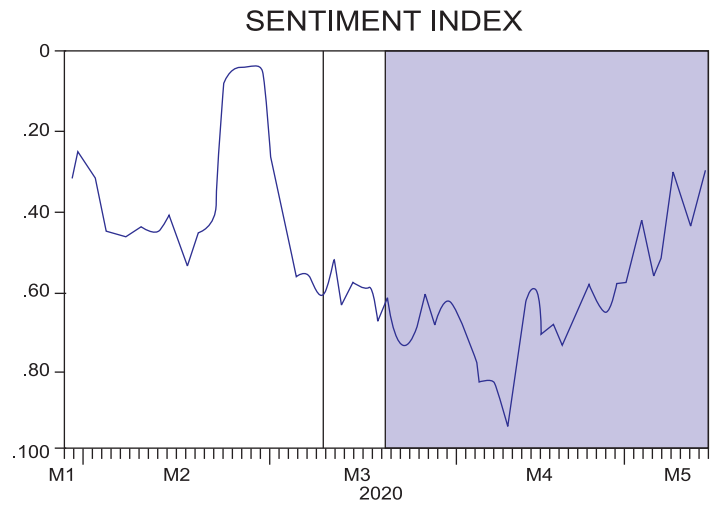
SENTIMENT INDEX

Figure 3 : SENTIMENT INDEX

MEDIA COVERAGE INDEX
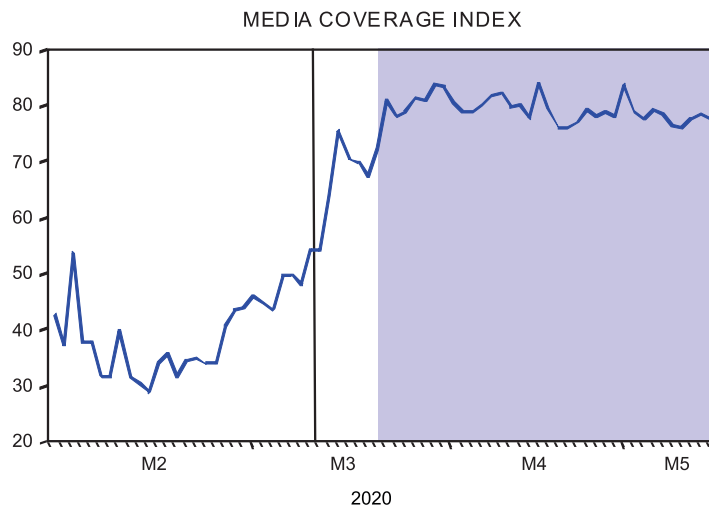
Figure 4 : MEDIA COVERAGE INDEX

Source: Author's own compilation with E-views

The Coronavirus Panic Index by Ravenpack Finance measures the level of news which is related to coronavirus and panic. The values range from 0 to 100 depicting 10.0 value as 10 percent of total of news globally making buzz and panic related to coronavirus. It can be extracted for country specific Information as well (Here values are taken for India only). As the value increases it implies the increased level of panic in media regarding the Covid-19. So, it can be observed here that as WHO declared Coronavirus as "pandemic" on 11th March 2020, a sharp increase in panic created can be witnessed here reaching to value up to 9.8 by 16th March 2020. Then, as the government of India announced Lockdown as a precautionary measure for social distancing to curb the virus dissemination on 20th March 2020 to be started from 22nd March 2020, the panic index was at its peak high in this duration at 11.9.

Similarly, sentiment across all entities mentioned in the news alongside the coronavirus is measured through the Sentiment index and values ranges between 100 to -100, -100 depicting most negative. Here, overall sentiment witnessed is negative over the data period with most negative at the time of lockdown 2.0 announcement on 13th April 2020. Media Coverage Index provides percentages of corona news among all sample news sources with values between 0 to 100. After the declaration by WHO as pandemic, the coverage in media has seen an increasing trend.

Table : Regression results for Panic, Sentiment & Media Coverage dependence on Covid-19

OLS Eq.	Panic Index (ln)		Sentiment Index (ln)		Media Coverage Index (ln)	
	$\alpha_0 + \alpha_1 (ln\ Cases)_t + \varepsilon_t$	$\alpha_0 + \alpha_1 (ln\ Deaths)_t + \varepsilon_t$	$\alpha_0 + \alpha_1 (ln\ Cases)_t + \varepsilon_t$	$\alpha_0 + \alpha_1 (ln\ Deaths)_t + \varepsilon_t$	$\alpha_0 + \alpha_1 (ln\ Cases)_t + \varepsilon_t$	$\alpha_0 + \alpha_1 (ln\ Deaths)_t + \varepsilon_t$
Constant (α_0)	-0.025605 (-0.5564)	-0.137277 (0.0135)*	-0.06527 (-0.1774)	-0.050362 (-0.1297)	0.00043 (-0.9762)	-0.0086 (-0.3881)
Covid-19 Cases (α_1)	0.185809 (-0.2175)		0.408743 (0.0158)*		0.05084 (-0.3095)	
Covid-19 Deaths (α_1)		0.676149 (0.0009)*		0.174168 (-0.1378)		0.09192 (0.0120)*
R^2	0.26	0.24	0.08	0.05	0.01	0.14

*(Notes: the values in parentheses are p-values and identifies the significance level at 1%, 5% & 10% as *, **, *** respectively, and corresponding coefficients are reported)*

The above table represents the results of OLS Regression run to determine the relationship between the indexes taken under consideration (panic index, sentiment index and media coverage index) and the total reported number of cases and deaths due to Covid -19 in India. For every Index two equations are tested, one with the Covid cases and other with the number of deaths associated with Covid. So, in all six equations are reported vertically in Table 1. The regression results from the table reveal that panic index and media coverage index is significant to the number of deaths and not to the number of cases, whereas sentiment index is significant to number of cases reported. It can be iterated that even the numbers of cases and deaths are not very high in terms of Indian context as compared to other countries like US, but mortality is the reason for panic and media coverage. The negative sentiment is because of contagiousness of the disease and not the mortality.

Table 2: Regression Results EGARCH(1,1) MODEL Mean and Variance Equation

Dependent Variable →	NIFTY 50	NIFTY AUTO	NIFTY BANK	NIFTY METAL	NIFTY REALTY	NIFTY EMCG
Conditional Mean Equation	$Return_t = \alpha_0 + \alpha_1 LD + \alpha_2 MCI + \alpha_3 MPI + \alpha_4 SI + \varepsilon_t$					
Lockdown Dummy(LD)	1.980654 (0.0038)*	1.681503 (0.0969)**	-0.282976 (-0.3676)	-0.601692 (0.0004)*	-0.6593 (0.0000)*	0.21603 (0.0016)*
Media Cov. Index(ln)	-1.919077 (-0.6266)	-2.397785 (-0.5202)	1.21516 (-0.5124)	0.421498 (-0.7653)	-1.0232 (-0.5315)	0.38527 (0.0000)*
Panic Index(ln)	2.705331 (0.0219)*	1.705982 (-0.2672)	0.29753 (-0.637)	0.428038 (-0.4537)	1.16804 (0.0001)*	0.47021 (0.0000)*
Sentiment Index(ln)	0.617385 (-0.7594)	0.644276 (-0.7198)	-0.293307 (-0.6893)	-1.129934 (0.0000)*	-0.739 (0.0031)*	-0.0189 (-0.2551)
Conditional Variance Equation	$Log (\sigma^2_t) = \beta_0 + \beta_1 (\mid \varepsilon_{t-1}\mid/\sigma_{t-1}) + \beta_2 (\varepsilon_{t-1}/\sigma_{t-1}) + \beta_3 log^2_{t-1} + \beta_4 LD$					
L.arch (β_2)	0.429796 (0.0211)*	0.051258 (-0.7559)	0.005341 (-0.9786)	0.029657 (-0.746)	0.31187 (0.0213)*	0.255 (0.0000)*
L.garch (β_3)	-0.498612 (0.0127)*	-0.702307 (-0.1243)	-0.21419 (-0.8616)	-0.783994 (0.0000)*	-0.552953 (0.0053)*	-0.687974 (0.0000)*
Lockdown dummy (VR) (β_3)	1.160687 (0.0756)***	2.12178 (0.0141)**	0.341524 (-0.6479)	-1.650583 (0.0502)***	-1.031353 (-0.184)	0.030277 (-0.9528)
Constant(β_0)	-0.887903 (0.0564)***	-1.180578 (0.0196)*	0.231286 (-0.2671)	0.673857 (0.0000)*	0.327568 (0.0000)*	-0.143032 (0.0000)*

Dependent Variable →	NIFTY 50	NIFTY AUTO	NIFTY BANK	NIFTY METAL	NIFTY REALTY	NIFTY EMCG
Conditional Mean Equation	$Return_t = \alpha_0 + \alpha_1 LD + \alpha_2 MCI + \alpha_3 PI + \alpha_4 SI + \varepsilon_t$					
Lockdown	-0.401601	-0.181736	-0.022221	0.444255	-0.20883	-0.570652
Dummy(LD)	(-0.1403)	(0.0238)*	(-0.8618)	(0.0290)*	(-0.4855)	(-0.305)
Media Cov.	1.897853	-0.113655	0.459246	-4.59246	1.106421	1.79029
Index (ln)	(-0.2164)	(-0.8256)	(-0.4627)	(0.0000)*	(-0.5182)	(-0.5014)
Panic	0.244231	0.742886	-1.510269	0.12828	0.39072	-1.021401
Index (ln)	(-0.6351)	(0.0000)*	(0.0000)*	(-0.8069)	(-0.5252)	(-0.3816)
Sentiment	0.088792	-0.134788	-0.617241	-0.394099	-0.370801	-1.309217
Index (ln)	(-0.8123)	(-0.1192)	(0.0000)*	(-0.2033)	(-0.6682)	(-0.1576)
Conditional Variance Equation	$Log\,(\sigma^2_t) = \beta_0 + \beta_1 (|\varepsilon_{t-1}|/\sigma_{t-1}) + \beta_2 (\varepsilon_{t-1}/\sigma_{t-1}) + \beta_3 log^2_{t-1} + \beta_4 LD$					
L.arch (β₂)	-0.005451	0.014507	-0.137419	-0.196971	0.000546	-0.601525
	(-0.9797)	(-0.9047)	(-0.6185)	(-0.1574)	(-0.9977)	(0.0150)*
L.garch (β₃)	-0.573577	0.475824	-0.149212	-0.776287	-0.145577	-0.32886
	(0.0975)***	(0.0000)*	(-0.48)	(0.0000)*	(-0.9121)	(-0.4283)
Lockdown	0.661208	0.081368	1.416949	0.337033	0.40202	-0.570652
dummy(VR) (β₄)	(-0.4894)	(0.0981)***	(0.0153)*	(-0.6803)	(-0.6165)	(-0.305)
Constant (β₀)	0.102135	-0.040588	0.194377	-0.130457	0.207079	0.204002
	(-0.6384)	(0.0998)***	(0.0041)*	(-0.2161)	(-0.2935)	(-0.4696)

(Notes: the values in parentheses are p-values reported and identifies the significance level at 1%, 5% & 10% as *, **, *** respectively, and corresponding coefficients are reported. Variables Lockdown Dummy(LD), Panic Index, Sentiment index & Media Cov. Index, all are mean equation variables and Variables L.arch and L.garch defines the conditional variance equation and represents values of β₂ & β₃ defining leverage effect and persistence in volatility and lockdown dummy(VR) represents β₄ which is the coefficient for lockdown dummy as variance regressor)

The above table (Table 2) describes the influence generated by panic, sentiments and media coverage in the market returns and volatility of different sectoral indices considered for the purpose of analysis under study. Panic Index is measuring the significance of panic created due to media coverage in returns. And has been proved significant for the sectors like Realty, FMCG, IT, Pharma, and the benchmark index Nifty 50. Media Coverage Index coefficient is significant for only two sectors. So, the more proportion of news related to Covid-19 in media does not impact the market returns to great extent with the exceptions for the sectoral indices returns for FMCG as well as Media. Overall, the sentiment index during the study period is defining the negative sentiment pertaining in the market as depicted in graph (Figure 2). The coefficients of conditional mean equation found significant for the Indices of Metals, Realty and Pharma.

Introduction of lockdown dummy (LD) for the lockdown period beginning from 22nd March 2020 till the study period ending on 15th May 2020 has also proved significant for returns of various sectoral indices. Sectors including Auto, Metals, Realty, FMCG, IT and Media are the ones with strong influence of mobility control (lockdown dummy) on their returns. The returns of Nifty 50 have also shown significant results for the dummy variable. The lockdown dummy (LD) has also been introduced as a variance regressor as well while modelling the EGARCH(1,1) effect and its coefficient is identified as significant for returns of sectoral indices like Auto, Metals, IT and Pharma. Again Nifty 50, the benchmark index is found significant as well. For FMCG, Realty and Media it was significant in conditional mean equation but not as variance regressor whereas its vice versa for Pharma sector where it is significant as a variance regressor and not in the conditional mean equation.

Interestingly, returns of sectoral indices related to financial services, banking sector including both private banks as well as public sector banks have witnessed insignificant impact of all mean equation variables but persistence of conditional volatility and absorption of negative news from the market can be found significant in coefficients of conditional variance equation. The coefficients represented as L.arch and L.garch in the table under conditional variance equation defines the presence of leverage effect as well as perseverance in conditional volatility irrespective of market movements. The negative and significant coefficient for PSU Bank for arch effect pertains to absorption of negative news from the market and generation of risk associated during the study period.

Returns of few sectors may or may not be directly impacted but underlying conditional heteroscedasticity and presence

of conditional volatility can be witnessed in almost all sectors. And Indian stock market return Index Nifty 50 has been identified significant for nearly all variables of mean equation as well as the variance equation except for sentiment and media coverage index.
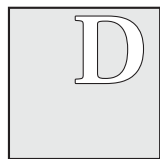
DISCUSSION

As there is fallout in global markets, the sentiment in financial markets is unwelcoming across the globe. And in line with the global market trends, the gloomy financial markets in India are witnessing sharp volatility. Across various historical economic events it has been observed that Indian Stock Markets has a history of crash and retrieval. For instance, during "Asian Crisis" in the year 1996, Sensex witnessed a fall of 40% in 4 years but within a span of 1 year improved by 115%. Similarly, during "Tech Bubble" in 2000, there was a crash of 56% in approximately 2 years and depicted recovery of 138% in 3 years. The 2008 financial crisis also crashed Sensex by 61% within a year but soon recovered by 157% in 1.5 years. In current scenario, the crash is of almost 30% within a very short span of 3 months. COVID 19 is in its inception phase, so endgame of this crisis is not known and many are relating this event to Black Swan Event.

This study is a contribution to the emerging literature related to financial market returns and volatility during this pandemic. Use of artificial intelligence mechanisms to estimate the sentiments also explores a new field of research and further the same can be exploited as an intriguing field of research. The different industries are affected by the pandemic to varying degrees and their responsiveness also varies. The study comprehensively evaluates the effect on market returns of different sectoral indices and volatility witnessed in the current crisis situation. Investors could be resourced with the information provided in the paper regarding the market sentiments and its association with several sectoral indices returns. Statistically, the weight given to such news should be low in number to gauge return results but behaviourally individuals have great significance of such information and news in their lives and hence overreaction is demonstrated in their actions. Only thing is investors have to safeguard themselves from catching the falling knife.
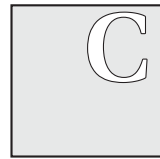
CONCLUSION

The uncertainty associated with the outbreak is of course one of the major reason for high unpredictability and volatility in the financial markets during this course of time. Majority of sectoral indices have influence of mobility control and announcement of lockdown (LD) has been significant both as dummy variable and variance regressor. Returns may or may not be affected for some particular sectors but underlying conditional heteroskedasticity with negative coefficients predicts the effect of negative news more on the markets. The indices of sectors including Metals, FMCG, IT, Realty, Pharma and Nifty 50 have most coefficients significant, lesser coefficients significant for Media and least for financial services and banking sector. So, the news burdened with panic and negative sentiment has definitely contributed to an unusual level of volatility in the sectors stated to be most affected by the corona virus outbreak in the country India. On the other hand, announcement of various economic relief programs by government to calm the market at different points in the period of pandemic has reassured investors to a little extent. What form economies or financial markets all around the world will actually take place is very early to predict now as still the virus is in dissemination phase and to what extent it will damage the lives is unpredictable. It is true that people are absorbing information and panic association would be less as compared to initial outbreak but definitely the shock created by the outspread is large in magnitude and massive uncertainty in the financial markets can be visualized for the near time.

	REFERENCES
i.	Al-awadhi, A. M., Alsaifi, K., Al-awadhi, A., &Alhammadi, S. (2020). Death and contagious infectious diseases/ : Impact of the COVID-19 virus on stock market returns. *Journal of Behavioral and Experimental Finance*, *27*, 100326. https://doi.org/10.1016/j.jbef.2020.100326
ii.	Angabini, A., &Wasiuzzaman, S. (2011). GARCH Models and the Financial Crisis-A Study of the Malaysian. *The International Journal of Applied Economics and Finance*Vol. 5 No, 3, 226-236
iii.	Baig, A. S., Butt, H. A., Haroon, O., Aun, S., & Rizvi, R. (2020). Deaths , Panic , Lockdowns and US Equity Markets/: The Case of COVID-19 Pandemic. *SSRN Electronic Journal* , April, 1-14. https://dx.doi.org/10.2139/ssrn.3584947
iv.	Baker, S. R., Bloom, N., Davis, J., Kost, K., Sammon, M., &Viratyosin, T. (2020). The unprecedented stock market reaction to Covid-19. *The National Bureau of Economic Research*, *1*(DP 14543), 33–42. Working Paper available at https://marcosammon.com/images/StockMarkets_COVID.pdf
v.	Barberis, N., Shleifer, A., &Vishny, R. (1998). A model of investor sentiment. *Journal of financial economics,* 49(3), 307-343.
vi.	Casas Monsegny, M., & Cepeda Cuervo, E. (2008). Modelos ARCH, GARCH y EGARCH: aplicaciones a series financieras. *Cuadernos de economía*, 27(48), 287-319.
vii.	Corbet, S., Larkin, C. J., & Lucey, B. M. (2020). The Contagion Effects of the COVID-19 Pandemic: Evidence from Gold and Cryptocurrencies. *Financial Research Letters*. https://doi.org/10.2139/ssrn.3564443 Ederington, L. H., & Lee, J. H. (1996). The creation and resolution of market uncertainty: the impact of information releases on implied volatility. *Journal of Financial and Quantitative Analysis*, 31(4), 513-539. Ezzat, H. (2012). The application of GARCH and EGARCH in modeling the volatility of daily stock returns during massive shocks: The empirical case of Egypt. *International Research Journal of Finance and Economics,*96, 143-154
viii.	Groß-Klußmann, A., &Hautsch, N. (2011). When machines read the news: Using automated text analytics to quantify high frequency news-implied market reactions. *Journal of Empirical Finance*, 18(2), 321-340.
ix.	Liew, V. K., & Puah, C. H. (2020). Chinese stock market sector indices performance in the time of novel coronavirus pandemic. *May*, 1–23. https://doi.org/10.20944/preprints202005.0279.v1
x.	Nelson, D.B. (1991). Conditional heteroscedasticity in asset returns: a new approach. *Econometrica*, 59, 347–370.

xi.   Onali, E. (2020). COVID-19 and Stock Market Volatility. *SSRN Electronic Journal, February*, 1–24. https://doi.org/10.2139/ssrn.3571453

xii.   Rizvi, S. A. R., & Arshad, S. (2018). Understanding time-varying systematic risks in Islamic and conventional sectoral indices. *Economic Modelling*, *70*(October), 561–570. https://doi.org/10.1016/j.econmod.2017.10.011

xiii.   Rogone, L., Hyde, S., & Zhang, S.S. (2020). News sentiment in the cryptocurrency market: An empirical comparison with Forex. *International Review of Financial Analysis*. 69, 101462

xiv.   Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139-1168.

xv.   Villarreal-Samaniego, Dacio. (2020). COVID-19, Oil Prices, and Exchange Rates: A Five-Currency Examination. *SSRN Electronic Journal*, May ,https://ssrn.com/abstract=3593753 or http://dx.doi.org/10.2139/ssrn.3593753

xvi.   Westerlund, J., & Narayan, P. (2015). Testing for predictability in conditionally heteroskedastic stock returns. *Journal of Financial Econometrics*, *13*(2), 342–375. https://doi.org/10.1093/jjfinec/nbu001

xvii.   Zhang, D., Hu, M., & Ji, Q. (2020). Financial markets under the global pandemic of COVID-19. *Finance Research Letters, April*, 101528. https://doi.org/10.1016/j.frl.2020.101528

xviii.   https://www.statista.com/search/?q=coronavirus+case
         Source: Johns Hopkins University; WHO; Worldometers; Ministry of Health and Family Welfare (India)

xix.   https://coronavirus.ravenpack.com/india/Source: Ravenpack Finance

Vocational Education: Determinants of Skill and its Relationship with Employability

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ABSTRACT

The focus on Vocational Education and Training (VET) for skill development has increased in the recent years. This paper investigates the constructs of skill development that affect employability skills of workforce after completing their VET Programme. It also examines the association of skill development and employability. The current study undertaken on the retail sector workers confirms the constructs of skill development - Integration Theory and Practice (ITS), Initiative and Enterprise Skills (IES), Workplace Skills (WS), Professional Practice and Standards (PPS) and Interpersonal Skills (IPS) earlier identified and confirmed for the student population. The paper identifies that employability skills of the workforce in the retail sector are enhanced by the skill development

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INTRODUCTION

Vocational education and Training (VET) are essentials in the country's education initiative. It involves applied courses through which one learns skills and gains knowledge associated to their jobs. It supports them to seek better job prospects. VET Courses are progressively becoming important as employers expect new entrants to possess all the applied knowledge to start work and for those who must take care of their kin, directly after completing their schooling.

The growth of the Technical and Vocational Education and Training (TVET) sector in India is in response to challenges faced on account of conventional education. Though elementary education in India is almost general, the country encounters major trials at the secondary level, National Education Policy (NEP) 2020 aims to enhance gross enrollment ratio in higher education by 50%. Increase in dropout rates affects the ability of large young populace contribute productively to the economy. The right to education has enabled in the development of the secondary and tertiary education systems. The absence of right skills for seeking meaningful employment in the formal sectors along with decrease in the job opportunities in the rural areas has led to high levels of urban migration with most of them seeking employment in the unorganized or informal sectors which currently employs about 90% of all workers.

The TVET system is considered a policy lever believed to act as a policy formulated to enhance equality & decrease rates of unemployment especially in youth, balance the demand for higher education, equip with skills to keep pace with technological changes for building Knowledge Economy. The TVET encounters with multiple obstacles and is losing ground on account of diverse political, social, and economic factors. The current policy initiatives of the government by introducing the NEP will provide the necessary impetus to Vocational education.

The NEP (2020) unveiled the role of vocational education by introducing, Pre-vocational education for children starting from 6th Class onwards. It aims to merge vocational with conventional education. National Committee for the Integration of Vocational Education (NCIVE) will be formulated by The Ministry of Education comprising of experts from vocational education, Ministries representatives, and industry to investigate different aspects. National Higher Education Qualification Framework (NHEQF) and National Skill Qualification Framework (NSQF) in synchronization will work to integrate vocational and higher education. According to the Annual Report National Skill Development Corporation (NSDC) 2019-20, since the commencement of NSDC in 2009, till 2020 approximately 2.5 crore have received skill development training through NSDC partnerships, Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and Pradhan Mantri Kaushal Kendra (PMKK). In the year 2019-20 the performance of Short Term Training Scheme indicates that of the 7,68, 915 students who successfully completed their training 4,60,087 were placed while in the case of Special Project Scheme of the 64,497 students successfully completed 33,519 were placed. The UNESCO 2020 State of Education Report India on TVET states that the current annual training capacity of NSDC is above 5 million. Further the amount spent on training is around US $200 million from the National Skill Development Fund (NSDF) of MSDE along with over US $ 430 million private sector funds. The stimulus given to TVET will aid the workforce in also upskilling reskilling and lifelong learning. The current paper aims to confirm the Skill Development (S.D) constructs that influence employability skills in Vocational Education and identify the association amongst the identified factors of SD and Employability Skills of employed personnel after completing their VET.

LITERATURE REVIEW

Vocational education is any high school, junior college, or adult education program that purposefully intends at structured manner acquisition of knowledge, skills, abilities, attitudes & understanding that are essential for entry and successful progression in any occupation or job family. VET is formulated for preparing individuals for a trade or a specific occupation and is associated distinctly with the competitiveness and productivity of nation. VET can be segregated as under:

Pre-Employment VET: Most countries deploy contemporary VET in schools for entry level employment. They are also visible at workplaces and normally overseen by National Ministry of Education.

Upgrade Training: Employed individuals receive add on training, as their jobs change, to stay in tandem with changing technology and increasingly complex work environment on account of career progression.

Retraining: Aimed at reskilling people who are out of the job or to help those who choose new career prospects.

Remedial VET: Training provide to marginalized, inexperienced or unemployed personnel to seek meaningful employment

Working in this direction helps to have a continuous flow of skilled labour and enhances the employability of work force. Meaningful partnering of policies and academic shapers of TVE can be utilized for growth & upliftment of skilled workers. The major issue in TVE which has come to the forefront is Apprenticeship Evaluation and Use of Information & Communication Technology. Educational Institutions must promote TVE and conduct more studies at the grass root level to identify and meet current and future demands. (Yasin et al. 2013). The concept of employability being the notable outcome of VET is gaining attention. Enhanced training results in greater earnings which improves quality of life, job-related safety (Hartl,2009). VET is intended to train employees who will fit into diverse fields of economy. Olayinka &Oyenuga (2010) opined that the curriculum for technical institutes in Nigeria expect graduates to undertake services, diagnose, test & repair. It is observed that Generic skills are the ones focused on University levels for enhancing employability. Generic skills like data literacy, oral and written communication, teamwork, and technology proficiency. Bennett (2002) investigated the relation between common skills and employability, researchers have examined graduate career announcements. Collective efforts are required from all stakeholders to equip individuals with personal skills and

employment qualities in order to handle the challenges of fast paced economy (Wye& Lim, 2009). Scholten & Tiben (2017) conducted a study in Germany found that pre-tertiary qualifications in vocational training serve as a security net in the event of loss of job. Students having pre-tertiary vocational qualification get jobs easily as compared to other counterparts. Agrawal & Agrawal (2017) investigated the labor market consequences of the vocationally trained Indian populace using the statistics from a nationwide study on employment and unemployment. They found that a vast segment of people in the age group of 15–59 years do not possess any form of formal training. Majority is accounted for by non-formal trainees. Further, earning of general education was found to be less than the earnings of vocational education. Kumar et. al, (2019) identified constructs which can affect contribution of an individual into VET. Secondly authors used logit and multi-nominal logit model to measure the outcome of formal training on pay of the respondents. They found that urban dwellers are more active in participation in comparison to their rural counterparts which indicates lack of proper vocational training amenities in the rural areas. (Banik& Kumar 2017) emphasized on quality, employability, and Government's role in vocational education programme implementation. (Ahmed, 2016) investigates wages, unemployment, and employment status in Indian Labour market post completion of VET and identified a significant positive return of VET to pay & individuals participating in salaried work is also significant. Further males are more participative as compared to females. Tiwari & Mdots, 2022 conducted study on students pursuing retail vocational education course and identified factors for skill development which includes Initiative and Enterprise Skills (IES), Workplace Skills (WS), Professional Practice and Standards (PPS), Interpersonal Skills (IPS) and Integration Theory and

Practice (ITP) using exploratory and confirmatory factor analysis. (Scharnhorst & Kammerman, 2020) discusses the role, challenges, and effectiveness of VET with respect to the addition of susceptible groups in Switzerland. Further they suggested that equity and inclusion of persons with a migration background in VET have been promoted but can be improved.

Retail sector touched 950 billion US dollars in 2018 and is expected to reach 1.1 trillion US dollars by 2020 as per report of IBEF published in the year 2019 for retail sector in India. But because of COVID pandemic it has witnessed a huge decline of 19% in January-March 2020. It started showing signs of improvement by showing growth of 1.6% in July-September 2020. Also, Foreign Direct Investment of 3.35 billion US dollars during April 2000- September 2020 has been received by Indian retail industry.

India witnesses a lower Organized Retail Penetration (ORP) in contrast to different nations. This validates the enormous growth potential for organized retail in India. Growing skill gaps in the retail sector have been detected with a projected requirement of 107 lakhs trained manpower by 2022. This is ranked second after construction sector thus enhancing the requirement for vocational education. Government of India is also emphasizing on employable skill and knowledge considering diverse demography of Indian population. As per the MSDE Annual report 2019-20, incremental human resource requirement for 2017-2022 is highest in building and real estate sector which is 30.7 million followed by retail sector which is 10.7 million and beauty and wellness is ranked third at 8.2 million whereas Incremental Training Need across all these sectors is 320 lakhs, 107 lakhs and 82 lakhs (overlapping with other sectors) respectively. Table 1 and Table 2 summarizes and support formulation of objective and hypothesis.

Table 1: Literature Summary

Authors	Region/ Country	Summary
Melo & Das, 2020)	India	Skill development in non-farm sector impacts employment and income generation whereas one-year-long skill development training was found to be more effective than less-than-a-year-long training.
(Kumar et al., 2019)	India	Paper derives that formal VET is linked with higher incomes with the effect being the highest in the primary sector. It also proposes that there are high economic returns with formal vocational training, and hence, it makes sense to invest resources in vocational training.
Ornellas et al., 2019)	Europe	It identifies a model that proves authentic learning approaches work as a catalyst to boost employability skills of higher education graduates
Karmel & Fieger, 2012)	Australia	Success of TVET depends upon objective of student, if the student wishes to be employed after training or intends to pursue further study or concerned about a job, then completion pays off (profitability) is around 98%, 99.9% and 60% respectively. Hence depicting the importance of completion of training.
(Ali et al., 2018)	Malaysia	The paper identifies graduate employability skill dimensions: skill applications, self-efficacy, metacognition, entrepreneurial skills, and soft skills. It also uses Technical and vocational education through the development of a model of graduates' employability.

(Raimi & Akhuemonkhan, 2014)	Nigeria	Authors found a limited impact of TVET on employability; however, they identified that its efficiency is hindered by funding, expertise, synergy with industry and public perception of TVET. Thus, they suggested that policymakers need to improve on the policy implementation and curriculum harmonization and all the above-mentioned parameters to stimulate employability through TVET.
(Aggarwal, 2016)	India	Study assessed skill capacity in traditional as well as vocational training. To make skill development programme successful, policy makers should take initiatives to overcome hindrances/ challenges.

Table 2: Descriptions of Measurement of Constructs for the Study Dimensions

	Constructs	Items	Sources	
Skill Development	Integration Theory and Practice (ITP)	I link together different theoretical perspectives when working on a workplace or professional task or problem	McLeish (2002), Jackson (2010), Idris et al. (2012), Smith et al. (2014), Harvey et al. (1997) Pool & Sewell (2007), Law & Watts (1977), UKCES (2010) report, Moon (2004),	Tiwari & Malati (2020)
		I set goals, plan and manage my time, money and other resources to achieve my goals.		
		I understand the practices and methods used in my discipline		
		I recognize and value the role of theoretical ideas in work or professional contexts.		
		I understand the theories and principles in my discipline		
		I am pretty good at balancing the demands of home and work		
		I apply knowledge and skills gained in my studies to the workplace.		
	Interpersonal Skills (IPS)	I collaborate with people representing diverse backgrounds or viewpoints		
		I Interact appropriately with people from different levels of management/ leadership/ seniority in workplace		
		I am independent and take initiative in identifying problems and solving them		
		I can transfer effectively between individual work and teamwork		
		I can peak clearly and directly		
		I can read and understand information in words, graphs, diagrams, or charts.		
		I give clear instructions or advice to colleagues to achieve an outcome.		
		I am able to share information using various communication technologies, like voice mail, e-mail and computers.		
	Professional Practice and Standards (PPS)	I present myself effectively in selection interviews and processes.		
		I like to take responsibility		
		I acknowledge and praise my co-workers		
		I can adapt to new circumstances or information.		
		I am honest toward the organization		
		I respect the thoughts, opinions and contributions of others.		
		I am the kind of person who has the energy to get the job done.		
	Initiative and Enterprise Skills (IES	I can better appraise the quality of information obtained e.g., from the web, from books or from other people.		
		I use information and my professional or workplace knowledge to come to rational decisions and then act on these.		
		I bring about a change in practices that will benefit the organization or enterprise that employs me		
		I seek clarification when I do not understand an instruction.		
	Employa- bility Skills	Taking part in the scheme has given me new skills	Blades et al. (2012), Harvey (2001)	
		I feel more confident after doing my retail vocational education course		
		I feel that the things I have been doing will help me in the future		
		I feel more positive about the future, compared to previous year		
		I have clearer ideas about what I want to do in the future		

OBJECTIVES OF THE STUDY

The study has the following objectives in Indian context:

1. To study the current trends in vocational education.

2. To confirm the constructs of skill development for the employed workforce

3. To identify the impact of skill development on employability skills for the employed workforce after completing their VET.

HYPOTHESIS

For attaining the above-mentioned objectives, the understated hypotheses are framed:

1. There is a positive significance of interpersonal skills (IPS), initiative and enterprise skills (IES), workplace skills (WS), professional practice & standards (PPS) and integration theory & practice (ITP) on skills development (SD) for employed workforce.

2. Skill development of workforce positively impact their employability skills.

DATA COLLECTION AND CLEANING

The modified, final questionnaire was distributed to respondents who completed their retail vocational education course. Schedules were sent to different retails outlets in NCR and through convenience sampling a data of 513 personnel working in retail industry after completing their retail vocational education course was obtained. Screening of data to ensure the usability, reliability, and validity of data for testing relationship among variables was undertaken. Cases with high missing values and unengaged responses were removed which resulted in 453 usable responses. Thereafter, the socioeconomic profile of the 453 responses is given in Table 3.

Table 3: Socioeconomic Characteristics of Respondents

Socioeconomic Characteristics		Frequency	Percentages
Gender	Male	277	61.10%
	Female	176	38.90%
Age	18-20 years	76	16.80%
	21-23 years	192	42.40%
	More than 24 years	185	40.80%
Family Income (per month)	Less than 5000	0	0.00%
	5001-10000	77	17.00%
	10001-15000	132	29.10%
	15001-20000	116	25.60%
	More than 20000	128	28.30%
Members in Family	Less than 5	254	56.10%
	8-May	166	36.60%
	More than 8	33	7.30%
Number of family members earning	1	143	31.60%
	2	225	49.70%
	3	64	14.10%
	4	15	3.30%
	5	6	1.30%
Inspired to join retail vocational education course	Friends	286	63.10%
	Family member	117	25.80%
	Governmental advertisement	13	2.87%
	Others	30	6.62%
Place of Birth	National Capital Region	410	90.50%
	Outside Delhi	43	9.50%

C ONFIRMATORY FACTOR ANALYSIS

To establish the validity of scale formulated by Tiwari & Malati (2020) confirmatory factor analysis (CFA) was performed on working population using AMOS 21 to evaluate the dimensionality and adequacy of the items that connect to corresponding latent variables.

Confirmatory Model: CFA was performed for the factors of skill development and employability skill. The preliminary was compared with alternative models to check goodness-of-fit of the preliminary. The constructs as identified by principal component analysis were then subjected to CFA on a sample of 453 respondents.

Figure 1 represents the output of the preliminary model. The model fitness of all the confirmatory models was assessed using fit indices such as chi square (χ^2) statistics, the root mean squared error of approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Normed Fit Index (NFI).

Chi square (χ^2) statistics is 7176.068 and preliminary model is subjected to non-positive definite sample covariance matrices. Also, the preliminary model does not fit in the standardized values of the fit indices it satisfies the concerns of both convergent and discriminant validity as mentioned in Table 4.

Table 4: Convergent and Discriminant Validity, Construct Reliability of Preliminary CFA

Employability	CR	AVE	MSW	MaxR (H)	Employability	ITP	IPS	PPS	WS	IES
Employability	0.857	0.554	0.440	0.891	**0.745**					
ITP	0.921	0.629	0.403	0.957	0.635	**0.793**				
IPS	0.855	0.429	0.299	0.966	0.141	0.198	**0.655**			
PPS	0.864	0.476	0.268	0.972	0.138	0.371	0.399	**0.690**		
WS	0.868	0.528	0.299	0.977	0.224	0.323	0.547	0.518	**0.726**	
IES	0.799	0.499	0.440	0.979	0.663	0.609	0.126	0.209	0.286	**0.706**
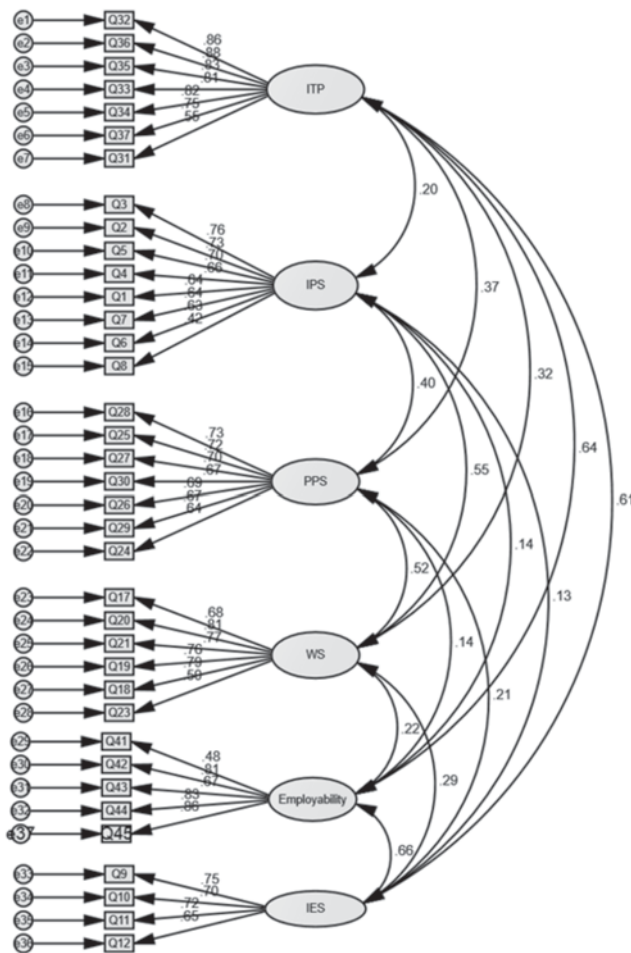
Figure 1: Output of Preliminary Model

Table 4 demonstrates that average variance extracted (AVE) for all the factors except IES, IPS and PPS is more than the threshold value of 0.5 (Hair et al. 2015). Construct reliability (CR) is as greater than the threshold value 0.7 (Hair et al. 2015). Discriminant Validity is established if variance estimates are greater than the squared correlation estimate (Fornell&Larcker, 1981). Thus, convergent and discriminant validity along with construct reliability has been established for preliminary model.

Modification indices and factor loadings were used to modify preliminary model. Firstly, big modification indices values were used to identify problems with construct. Secondly factor loading was used to identify unidimensionality of the construct, those items were dropped from the preliminary model to achieve final CFA model with a better fit as given in figure 2.

Output of the final CFA model is given in figure 2. goodness of fit indices (GOF) of measurement models was χ^2 statistics is 580.217, RMSEA is 0.048, CFI is 0.953, TLI is 0.946, and NFI is 0.912. All observed GOF indices were found to be significant as per threshold values except χ^2 value (Bagozzi & Yi, 1988; Bentler & Bonett, 1980).

Table 5 shows that average variance extracted (AVE) all four latent constructs is greater than threshold value of 0.5 (Hair et al. 2015). Construct reliability (CR) for all four constructs is greater than the threshold value of 0.7 (Hair et al. 2015). Discriminant Validity is established if variance estimates are greater than the squared correlation estimate (Fornell&Larcker, 1981). Thus, measurement model represented in figure 2 is an over identified model with GOF indices achieving threshold values having convergent and discriminant validity along with construct reliability.

Table 5: Convergent and Discriminant Validity, Construct Reliability of Final CFA Model

Employability	CR	AVE	MSW	MaxR (H)	Employability	ITP	IPS	PPS	WS	IES
Employability	0.877	0.642	0.387	0.890	**0.801**					
ITP	0.928	0.682	0.387	0.956	0.622	**0.826**				
IPS	0.803	0.506	0.295	0.963	0.123	0.144	**0.711**			
PPS	0.808	0.513	0.246	0.968	0.121	0.343	0.392	**0.716**		
WS	0.874	0.581	0.295	0.974	0.227	0.333	0.543	0.496	**0.763**	
IES	0.774	0.533	0.366	0.976	0.605	0.594	0.064	0.196	0.284	**0.730**
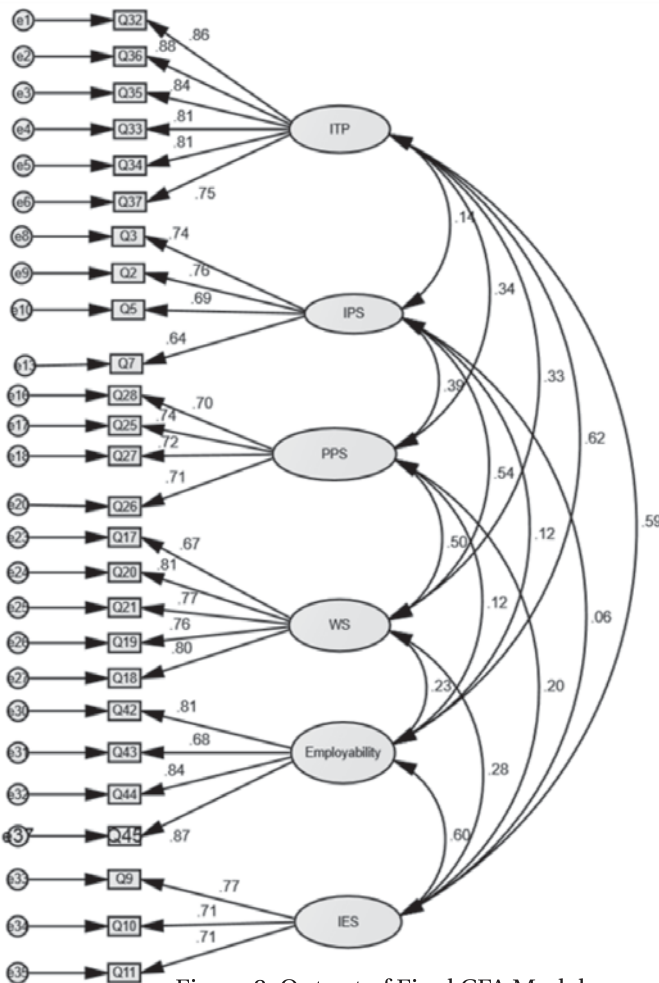
Figure 2: Output of Final CFA Model

Table 6: Confirmatory Factor Analysis: Items and Standardized Loadings

Construct and Scale Items	Standardized Loadings
Integration Theory and Practice (ITP)	
• Q32 I link together different theoretical erspectives when working on a workplace or professional task or problem	0.856
• Q36 I set goals, plan and manage my time, money and other resources to achieve my goals.	0.882
• Q35 I understand the practices and methods used in my discipline	0.839
• Q33 I recognize and value the role of theoretical ideas in work or professional contexts.	0.810
• Q34 I understand the theories and principles in my discipline	0.815
• Q37 I am pretty good at balancing the demands of home and work	0.748
Interpersonal Skills (IPS)	
• Q3 I collaborate with people representing diverse backgrounds or viewpoints	0.743
• Q2 I interact appropriately with people from different levels of management/ leadership/ seniority in a workplace	0.759
• Q5 I am independent and take initiative in identifying problems and solving them	0.695
• Q7 I can read and understand information in words, graphs, diagrams, or charts.	0.643
Professional Practice and Standards (PPS)	
• Q28 I present myself effectively in selection interviews and processes.	0.697
• Q25 I like to take responsibility	0.738
• Q27 I acknowledge and praise my co- workers	0.717
• Q 26 I am honest toward the organization	0.711
Workplace Skills (WS)	
• Q17 I am ready to take on new challenges at workplace	0.671
• Q20 I interpret and follow workplace procedures	0.807
• Q21 I demonstrate an awareness of the legislative and regulatory context in which the enterprise / profession operates.	0.770
• Q19 I identify the standards of performance or practice expected in the workplace / my profession.	0.757
• Q18 I can use professional knowledge for decision making	0.800
Initiative and Enterprise Skills (IES)	
• Q9 I can better appraise the quality of information obtained e.g., from the web, from books or from other people.	0.771
• Q10I use information and my professional or workplace knowledge to come to	0.707

reasonable decisions and then act on these.	
• Q11 I bring about a change in practices that will benefit the organization or enterprise that employs me	0.710
Employability Skills	
• Q45: Taking part in the scheme has given me new skills	0.866
• Q44: I feel more confident after doing my retail vocational education course	0.840
• Q42: I feel that the things I have been doing will help me in the future	0.809
• Q43 : I feel more positive about the future, compared to previous year	0.676

All the factor loadings (standardized regression coefficients in Table 6) ranging from 0.643 for Q7 to 0.882 were highly significant and exceeded the 0.5 level which is meaningful in factor analysis approach. The R^2 Statistic for Q36 (I set goals, plan and manage my time, money and other resources to achieve my goals.) was found to be highest (0.778) for **Integration Theory and Practice (ITP)**, R^2 Statistic for Q2 (I interact appropriately with people from different levels of management/ leadership/ seniority in a workplace) was found to be highest (0.576) for **Inter Personal Skills (IPS)**, R^2 Statistic for Q25 (I like to take responsibility) was found to be highest (0.545) for **Professional Practice and Standards (PPS)**, R^2 Statistic for Q20 (I interpret and follow workplace procedures) was found to be highest (0.651) for **Workplace Skills (WS)** R^2 Statistic for Q9 (I can better appraise the quality of information obtained e.g. from the web, from books or from other people) was found to be highest (0.594) for **Initiative and**

Enterprise Skills (IES) and, R^2 Statistic for Q45(Taking part in the scheme has given me new skills) was found to be highest (0.75) for **Employability Skills (ES)**.

Measurement Model

Six constructs and twenty-six observed items were involved in the measurement model. Initially model was tested using SEM with AMOS. Output of the initial SEM model is given in figure 3. GOF indices for the initially SEM model presented an acceptable fit with the data (RMSEA = .060, CFI = .925, IFI = .925, TLI = .917; χ^2 (393) = 763.697, p< .00; χ^2 /df = 2.606). Therefore, the model was modified to achieve better model fit to the data based on the modification index. A revised SEM model was obtained. The revised model (figure 4) was compared with initial SEM model based on GOF indices. The revised model proved to have a better GOF indices (RMSEA = .056, CFI = .934, IFI = .935, TLI = 0.926; χ^2 (289)= 700.567, p < .00; CMIN = 2.424). χ^2 difference test: comparing the initial and revised SEM models based on χ^2 difference statistic ($\Delta \chi^2$), indicated that the χ^2 difference was statistically significant ($\Delta \chi^2$ =63.13, Δdf=4). Thus, the revised SEM model was more parsimonious and fit the data better, making it superior to the proposed model. Table 7 shows the overall fit indices of initial and revised structural model.

Significance of Skill Development on Identified Factors

To examine the significance of skill development on IES, IPS, PPS, ITP and WS in the revised SEM model. Unstandardized regression coefficients for the same are given in Table 8. P value in Table 8 illustrates that the all factors -IES, IPS, IPS, ITP, PPS, ITP and WS are significant for Skill Development.

Table 7: Goodness of Fit Indices Initial and Revised Structural Models

GOF Indices	Initial SEM Model	Revised SEM Model	Characteristics of Fit Indices demonstrating Goodness of Fit For N > 250 and < 12 < 30
χ^2 (df)	763.697 (293)	700.567 (289)	*Significant p – values expected*
CMIN	2.606	2.424	(3 good; < 5 Moderate
RMSEA	0.06	0.056	< 0.07
CFI	0.925	0.934	Above 0.92
IFI	0.925	0.935	Above 0.92
TLI	0.917	0.926	Above 0.92

Table 8: Regression Coefficient (Unstandardized) and its Significance

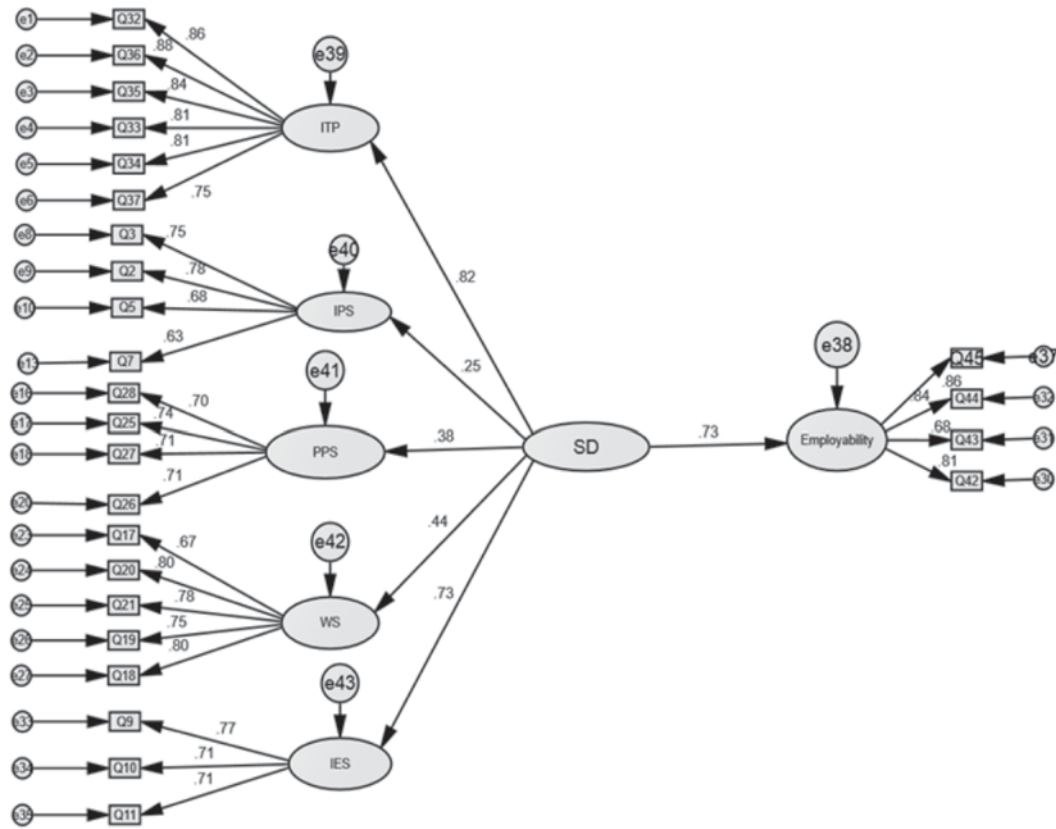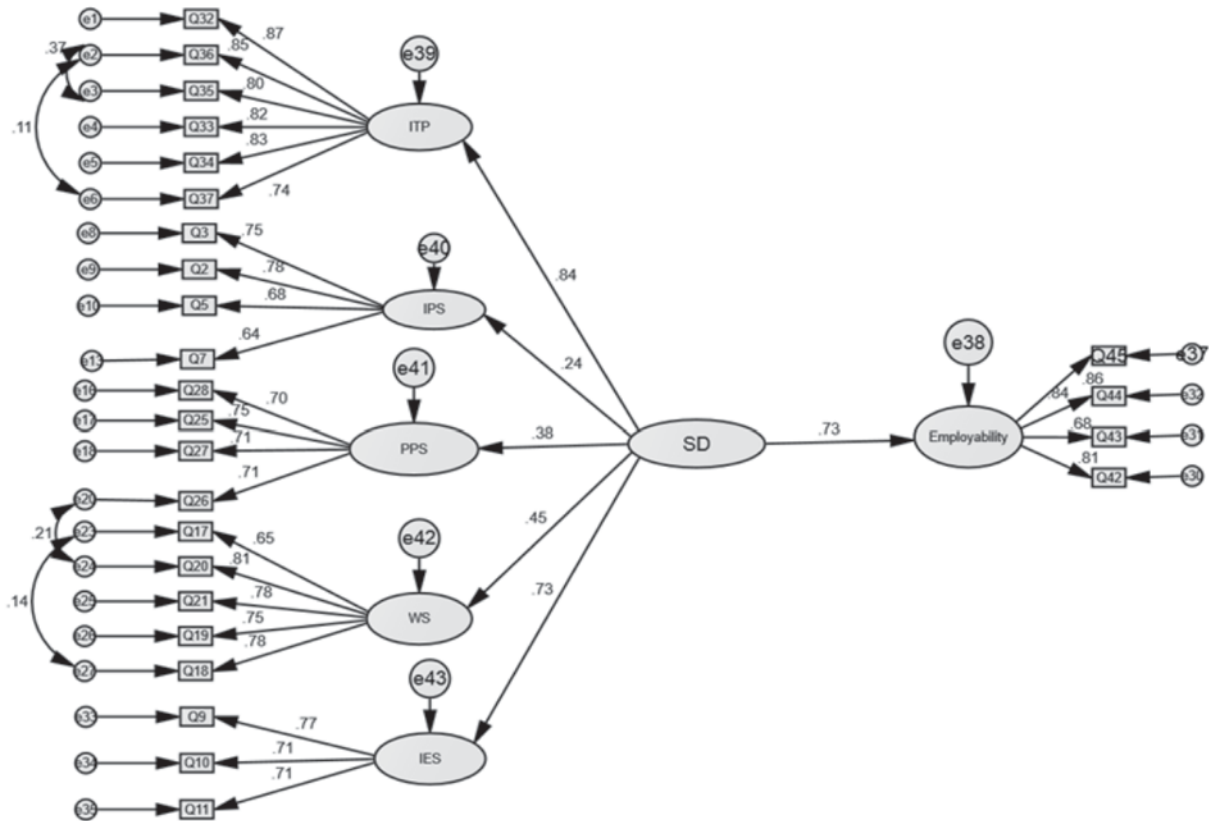|	Path	Components	Estimate	S.E.	C.R.	P	Results
Skill Development	→	ITP		1.000 Reference Point			
Skill Development	→	IPS	0.196	0.048	4.066	***	Significant
Skill Development	→	PPS	0.364	0.060	6.080	***	Significant
Skill Development	→	WS	0.306	0.044	6.994	***	Significant
Skill Development	→	IES	0.830	0.81	10.237	***	Significant

Figure 3: Output of Initial SEM Model

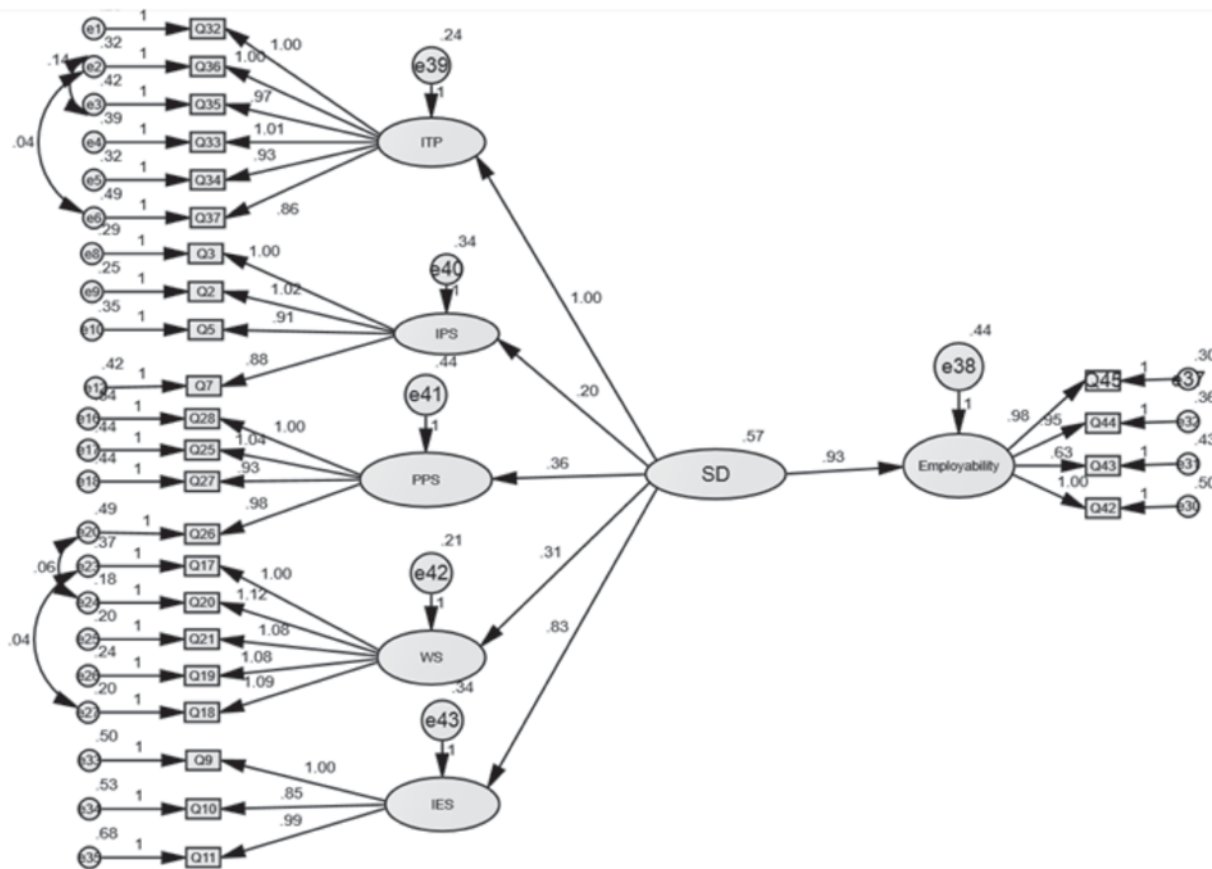Figure 4: Revised (Standardized Regression Coefficients) Structural Model

Figure 5: Unstandardized Structural Equation Model

Test of Direct Relationships

T – Statistics and path coefficients to test the impact of skill development on employability (figure 5) are significant in nature. Standardized regression coefficient is β = .726 with T statistics and significance value is t = 10.736, p < .001 for the same. Thus, skill development of workforce positively impacts employability skills which indicates that when skill development goes up by 1 standard deviation, employability goes up by 0.726 standard deviations. Thus, there exists a positive relationship between skill development and employability skills for employed workforce.

Discussion and Conclusion

Studies have shown that the benefits of VET programmes are manifold some of them being enhancing employment opportunities, aiding self-employment, imparting skills for required occupation to partake in the employment markets for school drops outs and to combat child labour and equip kids with marketable skills (Aggarwal & Aggarwal 2017). It is considered pertinent for increasing productivity and employability of the workforce in unorganized sector. (King 2012). The studies undertaken by Kumar et.al (2019) identified that having formal VET in India increase the salaries by 4.7% in the overall economy in comparison with a person without any formal VET. Studies conducted in India by Aggarwal& Aggarwal (2017) suggest higher returns to VET in comparison to general education. Further, Banerjee (2016) opined that VET increases overall wages and manufacturing

sector participation across all social groups. Similar studies conducted by Kahyarara& Teal (2008) in Tanzania, by El-Hamidi (2006) in Egpyt, and by Moenjak and Worswick (2003) in Thailand also revealed higher returns of VET when compared to general education.

National Youth Policy was introduced by Government of India in 2014 aimed at providing holistic vision for the country's youth to empower and achieve their potential. The Ministry of Skill Development and Entrepreneurship (MSDE) in 2019 also emphasized on Convergence, Increased Scale, Meeting Aspirations, and Improved Quality. The MSDE has launched 'Aatamanirbhar Skilled Employee Employer Mapping (ASEEM)' portal to help skilled people find sustainable livelihood opportunities. The other governmental initiatives of "Make in India", Vocal for local, promotion of Micro of Small and Medium Enterprises (MSME) and Self-Help Groups (SHG) also aim at providing employment opportunities. Hence, the objective for enhancing the employability through skill delivery is being successfully achieved through these initiatives.

As per Bloomberg News Analysis 2017 it was predicted that India would have a billion people in the 15-64 years category which would be largest workforce in world by 2027. The current pandemic has also contributed to increase in unemployment rates. In the future too possession of appropriate skills would always enhance the chances of

getting employed and receive wages accordingly. Hence skill development through VET would be a panacea for all job-related problems. Studies have also identified that VET training is also quite helpful from the earnings point of view as it is observed that average daily wages of the formal trainees was found to be higher in comparison to non-formal trainees. This paper confirms that all constructs - Interpersonal Skills (IPS), Professional Practice and Standards (PPS), Initiative and Enterprise Skills (IES), Integration Theory and Practice (ITP), Workplace Skills (WS) are significant for Skill Development. It also identified a positive relationship between skill development and employability skills for employed workforce. The study reiterates that skill development through VET will generate higher employability. Arriagada and Ziderman (1992) also derived that students completing their vocational training receive higher earnings as compared to regular academic streams in Brazil emphasizing that the relation between skill development and employability is significant. According to Eichhorst et al. (2015) in the industrialized economies the government expands the job prospects of youth who lack in skills required by the labour markets and do not possess the ability, funding, or motivation to pursue higher education through VET to enhance the job

opportunities. Further studies by Arum and Shavit (1995) also reiterate that in US, VET increased the probability of employment for secondary graduates and helped them in becoming skilled workers. Kumar et.al (2019) observed that several research work both in developing and developed countries depicted that VET enhanced participation, chance of employment, employability, and salaries of the employees.

Hence in the current context it is further reiterated that possession of right skills through VET enhances the chances of employability for all.   The requirements of trained manpower can be fulfilled when the VET is provided in the right earnest. Accurate skill development will lead to a win-win situation for all the stake holders-employee, employer, and the government. The National Education Policy 2020 also focusses on imparting skill-based learning right from the school levels.

The current study aims to provide an insight to the policy makers about the role of skill development and employability for employed workforce. Study enables them to understand the role of specific hard & soft skills and the other interventions required for employment. This will also help them in meeting the labour market demands effectively.

	REFERENCES
I.	Skilling India's Youth, shaping India's Future, Annual Report 2019-2020, National skill Development Corporation, Government of India.
II.	National Education Policy, Government of India, Ministry of Human Resource Development. 2020 Retrieved from https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
III.	IBEF report in Indian retail industry (April 2019), Retrieved from https://www.ibef.org/download/retail-jan-2019.pdf
IV.	MSDE Annual report 2019-20 (https://www.msde.gov.in/sites/default/files/2020-12/Annual%20Report%202019-20%20English.pdf
V.	(2010). UK Commission for Employment and Skills annual report 2009 to 2010. UK Commission for Employment and Skills.
VI.	Vocational Education First, State of the Education Report of India 2020 Technical and Vovational Education and Training, UNESCO.
VII.	Aggarwal, S. (2016). Central Pillar of Employability/: Skill Development. Imperial Journal of Interdisciplinary Research, 2(3).
VIII.	Agrawal, T., & Agrawal, A. (2017). Vocational education and training in India: a labour market perspective. Journal of Vocational Education and Training, 69(2). https://doi.org/10.1080/13636820.2017.1303785
IX.	Ahmed, T. (2016). Labour market outcome for formal vocational education and training in India: Safety net and beyond. *IIMB Management Review*, *28*(2), 98–110. https://doi.org/10.1016/j.iimb.2016.05.002
X.	Ali, E., Rus, R. C., Haron, M. A., & Hussain, M. A. M. (2018). Employability of Technical and Vocational Education Graduates/: An Analysis. Sains Humanika, 10(3).
XI.	Anderson, J. C., &Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. Psychological bulletin, 103(3), 411.
XII.	Arriagada, A. M., Ziderman, A., & Mundial, B. (1992). Vocational secondary schooling, occupational choice, and earnings in Brazil (Vol. 1037). Washington, DC: Population and Human Resources Department, World Bank.
XIII.	Arum, R., & Shavit, Y. (1995). Secondary vocational education and the transition from school to work. Sociology of Education, 187-204.
XIV.	Bagozzi, R. P., &Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of marketing science*, *16*(1), 74-94.
XV.	Banerjee, T. (2016). Impacts of vocational education and training on employment and wages in Indian manufacturing industries: variation across social groups—empirical evidences from the 68th round NSSO data. The Indian Journal of Labour Economics, 59(4), 489-509.
XVI.	Bennett, R. (2002). Employers' demands for personal transferable skills in graduates: A content analysis of 1000 job advertisements and an associated empirical study. Journal of Vocational Education and Training, 54(4), 457-475.
XVII.	Bentler, P. M., &Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological bulletin*, *88*(3), 588.
XVIII.	Blades, R., Fauth, B., & Gibb, J. (2012). Measuring employability skills. A rapid review to inform development of tools for project evaluation. London National Children's Bureau, 1-39.
XIX.	Bollen, K. A. (1990). Overall fit in covariance structure models: Two types of sample size effects. *Psychological bulletin*, *107*(2), 256.
XX.	Eichhorst, W., Rodríguez-Planas, N., Schmidl, R., & Zimmermann, K. F. (2015). A road map to vocational education and training in industrialized countries. Ilr Review, 68(2), 314-337.
XXI.	El-Hamidi, F. (2006). General or vocational schooling? Evidence on school choice, returns, and'sheepskin'effects from Egypt 1998. Journal of Economic Policy Reform, 9(2), 157-176.
XXII.	Fornell, C., &Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics.
XXIII.	Grubb, W. N., & Ryan, P. (1999). *The roles of evaluation for vocational education and training: Plain talk on the field of dreams*. International Labour Organization.

XXIV.	Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. "Multivariate Data Analysis: A Global Perspectives." *Upper Saddle River, NJ: Prentice Hall. (2015)*
XXV.	Hartl, M. (2009). Technical and vocational education and training (TVET) and skills development for poverty reduction–do rural women benefit. *Retrieved October, 4,* 2011.
XXVI.	Harvey, L. (2001). Defining and measuring employability. Quality in higher education, 7(2), 97-109.
XXVII.	Harvey, L., Moon, S., Geall, V., & Bower, R. (1997). Graduates' work: organisational change and students' attributes. Birmingham: Centre for Research into Quality, University of Central England.
XXVIII.	Idris, A., &Rajuddin, M. R. (2012). The influence of teaching approaches among technical and vocational education teachers towards acquisition of technical skills in Kano State-Nigeria. Journal of education and practice, 3(16), 160-165.
XXIX.	Jackson, D. (2010). An international profile of industry-relevant competencies and skill gaps in modern graduates. International Journal of Management Education, 8(3), 29-58.
XXX.	Kahyarara, G., & Teal, F. (2008). The returns to vocational training and academic education: Evidence from Tanzania. World Development, 36(11), 2223-2242.
XXXI.	Karmel, T., & Fieger, P. (2012). The value of completing a VET qualification.
XXXII.	King, K. (2012). The geopolitics and meanings of India's massive skills development ambitions. International Journal of Educational Development, 32(5), 665-673.
XXXIII.	Kumar, R., Mandava, S., & Gopanapalli, V. S. (2019). Vocational training in India: determinants of participation and effect on wages. *Empirical Research in Vocational Education and Training, 11*(1). https://doi.org/10.1186/s40461-019-0078-y
XXXIV.	Law, W., & Watts, A. (1977). Schools, Careers and Community. London: Church Information Ofce.
XXXV.	McLeish, A. (2002). Employability skills for Australian small and medium sized enterprises: report of the interviews and focus groups with small and medium enterprises. Canberra, Australian Capital Territory: Department of Education, Science and Training.
XXXVI.	Melo, Y., & Das, A. K. (2020). The Extent of Participation in Skill Development Trainings and Its Impact on Employment: Https://Doi.Org/10.1177/0973703020945262, 14(2), 290–303. https://doi.org/10.1177/0973703020945262
XXXVII.	Moenjak, T., &Worswick, C. (2003). Vocational education in Thailand: a study of choice and returns. Economics of Education Review, 22(1), 99-107.
XXXVIII.	Moon, J. (2004). Reection and Employability. York: The higher Education Academy.
XXXIX.	Olayinka, O., &Oyenuga, A. (2010). Integration of Automobile Technological Developments Into Nigeria Technical College Motor Vehicle Mechanics Work Curriculum. *Academic Leadership: The Online Journal, 8*(2), 26.
XL.	Ornellas, A., Falkner, K., & Edman Stålbrandt, E. (2019). Enhancing graduates' employability skills through authentic learning approaches. Higher Education, Skills and Work-Based Learning, 9(1), 107–120. https://doi.org/10.1108/HESWBL-04-2018-0049
XLI.	Pool, L. D., & Sewell, P. (2007). The Key to Employability: Developing a Practical Model of Graduate Employability. Education + Training, 49(4), 277-289.
XLII.	Raimi, L., & Akhuemonkhan, I. A. (2014). Has Technical Vocational Education and Training (TVET) impacted on Employability and National Development? The Macrotheme Review, 3(2).
XLIII.	Scharnhorst, U., & Kammermann, M. (2020). Who is included in VET, who not? *Education and Training, 62*(6), 645–658. https://doi.org/10.1108/ET-11-2019-0248
XLIV.	Scholten, M., & Tieben, N. (2017). Vocational qualification as safety-net? Education-to-work transitions of higher education dropouts in Germany. *Empirical Research in Vocational Education and Training, 9*(1), 7. https://doi.org/10.1186/s40461-017-0050-7
XLV.	Smith, C., Ferns, S., & Russell, L. (2014). Conceptualising and Measuring 'Employability'- Lessons from a National OLT Project. Work Integrated Learning: Building Capacity. Springvale South VIC Australia: Australian Collaborative Education Network (ACEN) Limited
XLVI.	Tiwari, P., & Malati, N. (2020). Employability skill evaluation among vocational education students in india. Journal of Technical Education and Training, 12(1 Special Issue), 218–228. https://doi.org/10.30880/jtet.2020.12.01.023
XLVII.	Wye, C. K., & Lim, Y. M. (2009). Perception Differential between Employers and Undergraduates on the Importance of Employability Skills. *International education studies, 2*(1), 95-105.
XLVIII.	Yasin, R. M., Nur, Y. F. A., Ridzwan, C. R., Ashikin, H. T., &Bekri, R. M. (2013). Current trends in technical and vocational education research: A meta-analysis. *Asian Social Science, 9*(13), 243.

Why are Storage REITS Outperforming Other REITS?

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Recent developments in the REIT stocks have seen a critical divergence. Most REITs have outperformed S&P 500 index over the sample period that covers about twenty years. However, within different sectors of this industry, storage REITs are the outperformers. In this paper, we examine different forces that are impacting Storage REITs. Also, there are some structural trends that are having a significant effect on this sector of real estate. Using structural breakpoint methodology, we can identify changes that are occurring in this industry, in particular storage REITs and identify factors that affect the performance of this real estate sector.

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INTRODUCTION

One of the important sectors of the economy relates to the importance of real estate industry and its compounding effect on the national or the global economy. Both residential and commercial real estate is a useful barometer to estimate future economic conditions. For example, Benjamin et al. (2004) found a positive relationship between US economy and the real estate prices. However, as pointed out by Chan et al. (1990) real estate market goes through booms and busts thus creating significant risks that are unique to this industry. Due to extensive use of leverage in this industry, REITs (Real Estate Investment Trusts) are directly and indirectly affected by changes in the interest rates.

As suggested by various authors, equity REITs tend to have stronger relationship with small stocks but have a weaker correlation with the bond market. Furthermore, there are specific factors not reflected in the equity and the bond markets, that have a significant effect on this sector. For instance, real estate investment can also be local in nature where local factors may dominate this industry. Since we cannot move the real estate property to another location or another geographical area if a particular city witnesses decline, this sector's performance needs to be investigated keeping in mind both the broader economic factors as well as the local conditions.

Nevertheless, real estate investment is sensitive to many factors that merits careful study. Within the different sectors of the real estate investment trusts (REITs) self-storage facility became a very useful and lucrative investment from being an unattractive proposition with location that prohibited customers from being able to use the facility due to safety concerns. In addition, there was a possibility of spoilage of the storage as these facilities were not climate controlled. But, with the demographic changes, more individuals are storing their goods due to downsizing or other reasons, these self-storage facilities are climate controlled and has desirable locations.

To study the performance of these self-storage REITs we employ a multiple structural break methodology to gain insight into changing risk-return attributes of REITs. In this methodology, a trimming value is used which enables endogenous breakpoint estimation. It is important to note that the time-period for the data should be long enough for infrequent structural breaks to occur.

The remainder of the paper is organized as follows. The next section presents a review of the relevant literature. This is followed by sections that describe the methodology and results. The final section concludes the paper.

ITERATURE REVIEW

There are many research papers that have examined relationship between equity returns and economic/financial variables. For example, Chen, Roll, and Ross (1986) followed by Fama and French (1989) and Campbell and Diebold (2009) find that factors such as market premium, size premium and value premium are closely linked equity returns. Furthermore, these factors namely, size, value and momentum can also be related to short-term rates, default spreads, term spreads and dividend yields.

Hoskins et al. (2004) point-out that the relationship between real estate and economic variables is constantly changing. Hence, understanding of this time variability of real estate returns can be useful in decision making by investors for portfolio formation and diversification. Also, the debt structure of REITs plays a role in terms of its performance. Increases in leverage or debt are negatively associated with REIT returns. Lee (2010) finds that REITs provides diversification benefits until 1999 but in the post 1999 period REITs become return enhancers. Thus, any study of long-term performance of REITs must incorporate structural changes in the industry in relation to the underlying characteristics of the sectors and sub-sectors of REITs as the responses of these assets vary.

ATA AND METHODOLOGY

Monthly data for storage REITs spanning from January 1995 to April 2020 aggregating 304 months are downloaded from National Association of Real Estate Investment Trusts (NAREIT) website and represent the FTSE, NAREIT real-estate index series. Economic data for term premium (ten-year Treasury Bonds minus three months Treasury Bills), default premium (Moody's Baa Bonds minus Treasury Bonds), monetary policy variable (change in Federal Funds rate), unexpected inflation (percentage inflation minus lagged three-month treasury bill) is downloaded from Federal Reserve Bank, St. Louis website. The data for Fama-French (FF) and Carhart four factor model that includes momentum are downloaded from Ken French's website. All data are monthly and cover the identical timespan.

It is well known in both economic and financial time series analysis and forecasting that data may be non-stationary implying non-constancy of parameters such as mean and variance over time. This non-stationarity of data may cause random walk behavior by the time series. Consequently, the application of linear models such as regression analysis may lead to spurious results. Furthermore, as pointed out by Nelsen and Plosser (1982), random walk behavior could be caused by changes in the trend arising from a random shock to the time series followed by another disturbance. Initially, it was assumed that the time series would revert over a business cycle and become stationary. However, in several instances this mean-reversion need not occur

Detection of multiple structural breaks when the break-date is unknown (or it is endogenous), Bai and Perron (1998, 2003) develop a sequential structural break method where the sample is divided around each break-date and parameters are estimated using ordinary least squares and the sum of squared errors are calculated and stored. The correct break-date is identified as the date when the residual variances are minimized.

$$Y_t = x_t\beta + z_t\lambda_j + \varepsilon_t \text{ Where } t = T_{J-1} + 1,\ldots\ldots\ldots\ldots, t_j$$

and j=1,…..,m+1. y_t or REITs returns (excess returns) is the dependent variable at time t, x_t and z_t are vectors of covariates

and β and λ_j (j=1,....,m+1) are vectors of coefficients, ε_t is the error term at time t. Furthermore, the indices $(T_1,......,T_m)$ are the unknown breakpoints. The method of estimation is based on the least square principle and for each m-divisions with break-dates $(T_1,.....,T_m)$, corresponding least square estimates of β and λ_j are computed by minimizing the sum of squared residuals.

EMPIRICAL RESULTS

Table 1 outlines the preliminary statistics for monthly storage REIT returns. The median values for storage REITs are higher than the mean, indicating a negatively skewed distribution that may signify frequent small gains followed by infrequent large losses. In turn, this indicates that negatively skewed distributions have a much smaller maximum and a much larger minimum value. The sizable negative or positive skewness in conjunction with high excess kurtosis may also reflect nonlinearities in REIT returns. When these nonlinearities become more extreme, there are catastrophic gains and losses.

The highest mean returns are found for storage REITs, which stood at 1.298 percent per month well above the mid-capitalization, small and S&P 500 average returns of 0.751, 0.704 and 0.608 percent respectively with similar standard deviation or risk for the full sample. Furthermore, Storage REITs have a much higher monthly Sharpe- Ratio (SR) of 0.196 when compared against Sharpe-Ratio of 0.109 for Mid-Cap stocks followed by 0.096 for S&P 500 index. Hence, even after adjustment for risk, storage REITs have a much better performance than other major equity indices over the sample period.

Table 1. Descriptive Statistics for REITs, Economic and Financial Variables

SR	Mean	Median	Max.	Min.	St.Dev.	Skew	Kurt	Jarque-Bera
Storage	1.298	1.597	21.928	-22.244	5.656	-0.36	4.70	
					43.37***		0.196	
Mid	0.751	1.176	16.03	-28.72	5.44	-1.19	7.51	331.7***
		0.109						
Small	0.704	1.282	17.36	-33.07	5.88	-1.25	7.73	364.7***
		0.092						
SPY	0.608	1.037	13.60	-18.14	4.54	-0.92	5.07	98.20***
		0.096						

Note: Monthly time series for Storage REITs covers about twenty five years period from January 1995 to April 2020. SR is the Sharpe Ratio and *, **, *** represent significance at 10%, 5%, and 1% levels, respectively. All REITs and financial returns are calculated by $\ln(p_t/p_{t-1})$ where p is the stock index.

Figure 1a. Plot of the index for REITs, S&P 500 and Small Capitalization Stocks from January 1995 to April 2020.
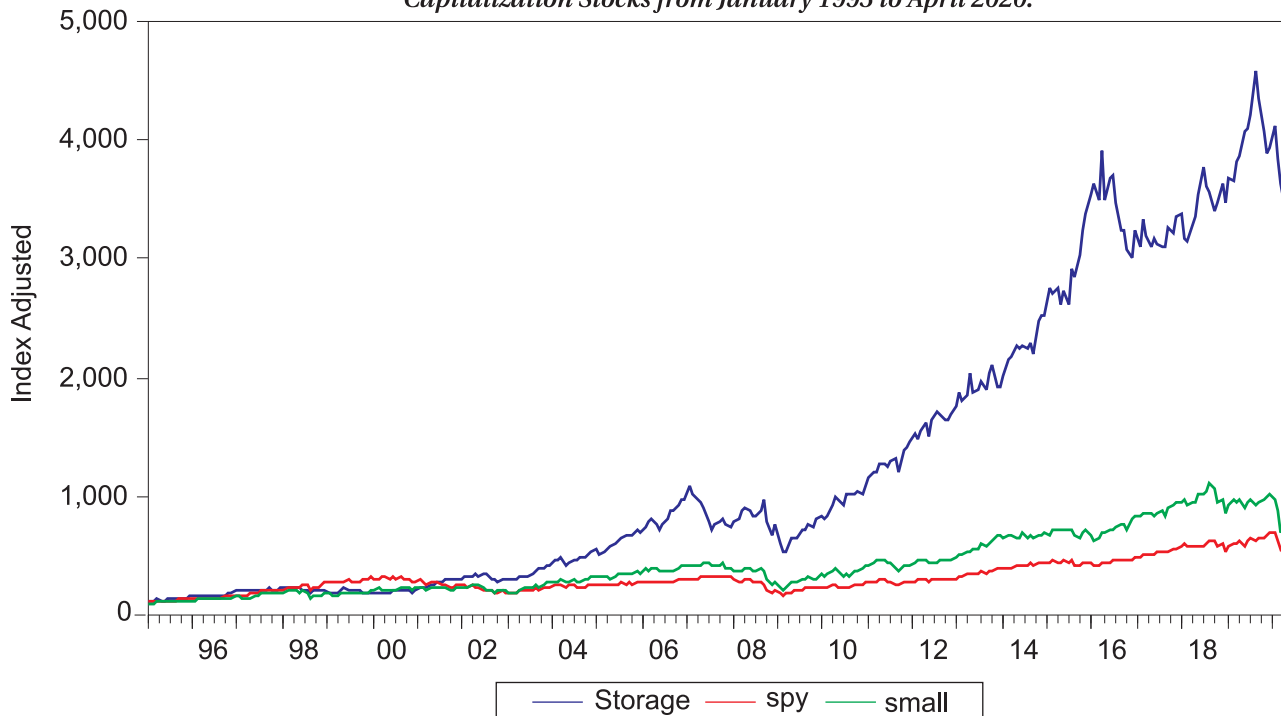
As Figure 1a reflects, storage REITs outperformed both the S&P 500 and small stocks but with higher volatility. There are several periods when storage REITs generated outsized returns followed by large losses signifying potential profit opportunities contingent upon the correct identification of sensitivities to changing market conditions.

A standard multi-factor pricing model in which typical macro-economic variables are included to explain real estate return predictability. Additionally, dynamic evolution of these economic risk factors is considered as storage REIT exposure to risk variables changes over time due to business cycle expansion or contraction. Thus, the following equation

was a structural break point around M7 of 2001 implying that the storage real estate market was less important before this period. Only in the recent time-period after the financial crisis that these real estate companies returns went up significantly above small, mid-cap and large company stocks. As pointed out by Correll (2003), Americans are purchasing and consuming goods far more than most countries and that has created a substantial demand for self-storage facilities. Further, the storage REITs have withstood the changes in economic cycles better than the other REIT investments.

Since REITs enjoy both stock and bond like features these real estate companies may be impacted by stock market factors

Table 2. Storage REITs returns against Economic Variables Using Sequential Structural Break Analysis

	c	Term	DefaultGDP	c	Fed	UINF	GDP
2 vs 3	3.26	13.02	18.93				
Storage REITs: 1995M(01)−2001(M06)		Break Date 1995M01−2009(M03)			Break_____Date		
7.446***	1.399	0.509*	-0.483 1.786***		3.946**	-2.141	2.579-
	(0.87)	(1.86)	(-0.66) (5.13)	(3.24)	(-0.75)	(0.84)	(-2.73)
				Break Date 2001M(07)−2020(M04)			
2.564***				1.085***		1.746	-0.599
				(2.54)	(0.66)	(-0.45)	(2.59)
Adj. R²		0.021		**Adj. R²**			0.034
F	3.14**			**F**	2.53**		

Trimming=0.15	F	Scaled F	Critical Values (5%)
0 vs 1	4.06	16.24	16.19
1 vs 2	1.85	7.40	18.11

represents the time series behavior of cross-sectional storage REIT returns against standard economic variables:

$$R_t = \beta_0 + \beta_{1t}Term_t + \beta_{2t}Default_t + \beta_{3t}GDP_t + \varepsilon_t \quad (3)$$

Where the dependent variable, R_t represents storage REIT returns. The first independent variable in the model, term spread, the second variable in the model, default or credit spread and the third variable, is directly related to real estate values as higher GDP is associated with lower vacancy rates and increased rental income.

Notes: Method is from Bai and Perron (1997) where tests of L+1 vs L sequentially determined breaks are tested for multiple breakpoints. The economic variables are term spread (10-year Treasury Bonds minus 3-month Treasury Bills), default or credit spread (Moddy's Baa minus Treasury Bond), Gross Domestic Product (GDP), unanticipated inflation UINF (CPI minus Risk Free), change in federal funds rate (monetary policy variable). The trimming value is defined as the shortest time that a break needs to be eligible to be included as structural. *, **, *** represent significance at 10%, 5%, and 1% levels, respectively. Critical values are from Bai and Perron.

From this table it is evident that the storage REITs had minimal structural changes against economic variables. Both term spread and GDP had a significant effect on the return characteristics of these real estate companies returns. However, when other economic variables are included, there

while retaining distinct features embedded in idiosyncratic risk.

The regression equation for the Fama-French and Carhart four-factor model with momentum is:

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + \omega_i SMB_t + \theta_i HML_t + \lambda_i PRIYR_t + \varepsilon_{it} \quad (5)$$

where $r_{it} - r_f$ is the excess return for different REITs, r_{ft} is the risk-free rate, r_{mt} is the return on value weighted market portfolio, SMB_t is the return on diversified portfolios of small stocks minus large stocks, HML_t is the difference between diversified portfolio of high and low Book/Market-Value stocks and $PRIYR_t$ are the returns on value weighted zero investment factor showing similarity with the portfolio for size, book to market equity and one-year momentum in stock returns and ε_{it} is a zero-mean residual.

The regression result for the above model is provided in Table 3 given below. From the structural break point model, it can be observed that the storage REITs have at least one break point around M(07) of 2012. That implies, the economic crisis did not have a significant effect on these companies confirming the results from the previous table. The date of M(07) 2012 is meaningful in the sense that the significant change in the modernization of the storage facilities occurred after this time-period. Also, digitization and other technological changes made a big impact in the use of storage facilities by the

Table 3 Regression Results for Excess Returns of Storage REITs
Sectors Carhart-Fama-French Four Factor Model with Momentum

REITs Sub-Sector	4-Factors α	Mkt	SMB	HML	Mom
	1995(M01) − 2004(M03)				
	1995(M01) − 2012(M06)				
Storage	0.959***	0.506***	0.746***	0.490***	-0.066
	(2.83)	(6.57)	(6.88)	(4.94)	(-1.04)
	2012(M07) − 2020(M04)				
	0.502	0.301**	0.149	-0.008	0.578***
	(0.95)	(2.05)	(0.70)	(-0.04)	(3.04)
Adj R²		0.282			
F		14.24***			
Break Test:	F Scaled F	Critical Values (5%) Trimming=0.15			
0 vs 1	10.18	50.89	18.23		
1 vs 2	2.24	11.21	19.91		

Regression equation for Carhart four factor model with momentum is $r_{it} − r_{ft} = \alpha_i + \beta_i (r_{mt} − r_{ft}) + \omega_i SMB_t + \theta_i HML_t + \lambda_i PRIYR_t + \varepsilon_{it}$ where $r_{it} − r_f$ is the excess return for the hedge fund index, r_{ft} is the risk-free rate, r_{mt} is the return on value weighted market portfolio, SMB_t is the return on a diversified portfolios of small stocks minus large stocks, HML_t is the difference between diversified portfolio of high and low Book/Market-Value stocks, $PRIYR_t$ or are returns on value weighted zero investment factor showing similarity with portfolio for size, book to market equity and one year momentum in stock returns and ε_{it} is a zero-mean residual. Fama-French factors and momentum data are downloaded from French's website, t-values are in parentheses and *, **, *** represent significance at 10%, 5%, and 1% levels, respectively.

As expected, the adjusted R-square of 0.282 is quite significant when using Fama-French model. Also, the F-statistics are significant at one percentage implying that this model has a good fit. Furthermore, for the second breakpoint, the momentum effect is significant displaying that both market and momentum is playing a significant role in the storage REIT returns. On the other hand, size and the growth which is significant in the first period does not play a major role for the second period.

CONCLUSIONS

In this study we examine the impact of variability in economic and financial variables on storage REIT returns with the goal of understanding how these relationships have changed over time. The empirical results generated have important implications for portfolio managers who are interested in portfolio diversification or exploiting investment opportunities and regulators concerned with stability in the real estate markets. A multi-factor methodology is applied to various fundamental economic variables against storage REITs to better understand their changing risk-return attributes.

Consistent with several studies, standard multi-factor models in which typical economic variables are included to explain return predictability are analyzed. Furthermore, dynamic evolution of these changing economic factor is considered using endogenous breakpoint methodology.

To gain additional insights into performance characteristics of REITs, the Fama-French-Carhart four factor regression model is employed to decompose and capture risk-adjusted performance attributes such as 'alpha' and factor exposure components to obtain corresponding risk-premium variability over time and detected breakpoints. For the second breakpoint, the momentum effect is significant displaying that both market and momentum is playing a significant role in the storage REIT returns. On the other hand, size and the growth which is significant in the first period does not play a major role for the second period.

REFERENCES

I.   Benjamin, J.D., P. Chinloy and G.D. Jud. 2004. "Real Estate Versus Financial Wealth in Consumption," *Journal of Real Estate Finance and Economics*, 29, 341-354.

ii.   Bai, J. and P. Perron. 1998. "Estimating and Testing Linear Models with Multiple Structural Changes," *Econometrica*, 66, 47-78.

iii.   Bai, J. and P. Perron. 2003. "Computation and Analysis of Multiple Structural Change Models," *Journal of Applied Econometrics*, 18, 1-22.

iv.   Campbell, S.D. and F.X. Diebold. 2009. "Stock Returns and Expected Business Conditions," *Journal of Business and Economic Statistics*, 27, 266-278.

v.   Carhart, M.M. 1997. "On Persistence in Mutual Fund Performance," *Journal of Finance*, 52(1), 57-82.

vi.   Chan, K.C., P.H. Hendershott and A.B. Sanders. 1990. "Risk and Return on Real Estate: Evidence from Equity REITs," *AREUEA Journal*, 18(4), 431-52.

vii.   Chen, N.F., R. Roll and S.A. Ross. 1986. "Economic Forces and Stock Markets," *Journal of Business*, 59, 383-404.

viii.   Correll, Richard R. 2003. "Market Analysis of self-Storage Facilities, Fall 2003, *Appraisal Institute Journal*.

ix.   Fama, E.F. and K.R. French. 1989. "Business Conditions and Expected returns on stocks and Bonds," *Journal of Financial Economics*, 25, 23-49.

x.   Hoskins, N., D. Higgins and R. Cardew. 2004. "Macroeconomic Variables and Real Estate returns: An International Comparison," *The Appraisal Journal*.

xi.   Lee, S.C. 2010. "The Changing Benefits of REITs to the Mixed-Asset Portfolio," *Journal of Real Estate Portfolio Management*, 16(3), 201-216.

xii.   Nelsen, C.R. and C.I. Plosser. 1982. "Trends and Random Walk in Macroeconomic Time series," *Journal of Monetary Economics*, 10(2), 139-62.

CORRIGENDUM

The readers are hereby informed that the Doctoral Abstract 'A Study of Engagement, Protean Career Orientation and turnover Intentions of Faculty Teaching in Professional and Technical Institutions' submitted by Dr. Khushboo Raina should be read as-

Doctoral Abstract "A Study of Engagement, Protean Career Orientation and Turnover Intentions of Faculty Teaching in Professional and Technical Institutions" published in 33rd Issue of DTR (Vol. 17 No.1) has been submitted by Dr. Khushboo Raina for the award of Ph. D. degree from GGSIP University Delhi. The supervisor was Prof. Puja Khatri, Professor, University School of Management studies, Guru Gobind Singh Indraprashta University, Delhi, India. The university awarded the Doctorate to the research scholar in 2019

IMPACT OF COMPETENCY DEVELOPMENT AND TALENT MANAGEMENT PRACTICES ON EMPLOYEE ENGAGEMENT IN INDIAN HOTEL INDUSTRY

Dr. Nitya Khurana
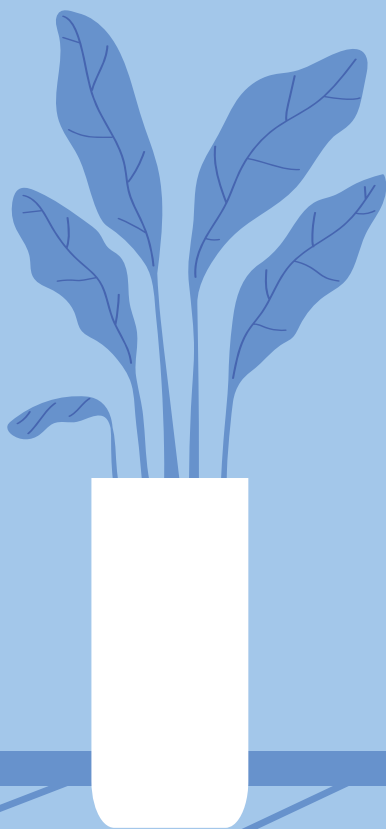
The Abstract of the Thesis "Impact Of Competency Development And Talent Management Practices On Employee Engagement In Indian Hotel Industry" submitted by Dr. Nitya Khurana for the award of Ph.D. degree from GGSIP university, Delhi, India. The supervisor was Dr. Shilpa Jain, Assistant Professor, University School of Management Studies, Guru Gobind Singh Indraprastha University, Delhi, India. The University awarded the Doctorate to the research scholar in 2022.

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INTRODUCTION

Organizations have increased their budget allocations for business travel as a result of the world's growing economy. Leisure or recreational travel, on the other hand, is gaining traction as a result of people's increased disposable discretionary income and the importance associated with leisure time pursuits. These are the two factors that are driving up demand in the hospitality and tourism industries. As a result, this industry is booming, accounting for one-third of the service market worldwide. (ILO, 2010).

Globally, the hospitality sector has seen a growth in sophisticated guests with higher expectations, a more diverse workforce, technology advancements to stay up with the company, and pressure to cut costs in the face of increasing competition. As a result, hotel management has become more intricate and dynamic. In the service-driven, knowledge-intensive, and information-based economy, hospitality organizations must keep up with the fast changes and bottlenecks of operation. These issues have put pressure on the hotel sector to radically modify its strategic orientation, as well as on executives and managers to take on new roles and demonstrate professionalism. As a result, it's critical to choose and develop leaders and managers with skills that match the job's specific requirements.

The hotel sector, in particular, has distinct characteristics that place harsh demands on its employees, particularly managers. The hotel sector is made up of a diverse workforce because it is a labor-intensive industry that operates 24 hours a day, seven days a week (Blayney, 2009). The hotel's senior management plays an important role in keeping things running smoothly. They are the ones who cultivate a service excellence culture, shape the service delivery system, and drive overall service quality to improve client experiences (Walsh and Koenigsfeld, 2015).

The memorable experience offered by hotels to its customers is an intangible asset that a hotel possesses. In the hotel sector, rivals can imitate the tangible assets and products given by another hotel, but intangible assets are the only thing that gives one hotel an advantage over the other. Employee knowledge, skills, experience, competencies, commitment, and engagement are examples of intangible assets. As a result, there is a fierce competition among hotels to engage their talent pool (Bharwani, 2014).

The tourism and hospitality industry in India is a vital part of the country's economy. It contributes significantly to the development of Brand India and employs approximately 12.4% of the Indian workforce. After fuel, chemicals, food, and automotive products, the tourism industry ranks fifth in terms of global exports. A big number of hotel brands have laid out their expansion plans in India, indicating that this industry is very optimistic. Many organisations have invested in the tourism and hospitality business as a result of the rise in global tourists and recognition of India's potential.

The hospitality industry is confronting numerous Human Resource (HR) concerns, including labour shortages, training and development, employee retention issues, and leadership development. The worldwide hospitality business has long had a major problem of employee turnover. One of the primary issues in the hotel industry is employee turnover. However, there is an issue of employee attrition in the sector, and HR managers are experiencing a severe scarcity of qualified employees.

Employees, generally, prefer to work in an environment where they are respected and treated fairly in the administration of organisational activities (Burke & Ng, 2006). As the new Gen Y workers invade the workplace, the traditional legitimate and hierarchical patterns associated to power behaviours are challenged (Beck, 2003; Burke & Ng, 2006; Pink, 2001). In order to apply contemporary strategies for developing, promoting, motivating, and retaining employees, take into consideration the diverse and complicated business environment. It is evident that when employees are psychologically and emotionally healthy in the organisation, they drive it to unimaginable heights. As a result, firms must not only invest in the development of competencies among their personnel and nurture their potential, but also involve them in order to achieve unrivalled success.

Organizations have faced numerous obstacles as a result of globalisation, which they must overcome in order to survive. Talented employees are seen as a vital source of differentiation as business models and workforce demographics change. Organizations are increasingly identifying and advancing in the development of fresh talent by focusing on employee competency development.

As organizations are continually pushed into a transition phase in this dynamic business environment. These changes have altered people's perceptions of work and have contributed to the development of modern career management frameworks (Arthur, Inkson& Pringle, 1999). Employees nowadays are concentrating on their long-term employability in order to achieve career success. This means that employees should think about learning new abilities, maintaining and expanding their potential, and creating new opportunities through the best use of their skills.

The goal of competence development is to develop the entire work community as well as the organisation. Strategic operational planning has identified competency development as one of the most critical areas on which to focus. Top management has recognised the importance of competence development for changes in job descriptions and responsibilities, as well as for the renewal of information and work techniques and the creation of an information-based society. Employee achievement is the fundamental goal of competency development.

By aligning and supporting employee goals and performance, managers that use competency development as a strategic tool are better equipped to develop, engage, and retain talent.

RATIONALE OF THE STUDY

The hotel industry is a global industry with a highly competitive market and low profitability. As a result, if the organization wants to develop in this competitive market, it must improve its service quality. Continuously improving the quality of employee service is one of the best way, because they are the employees are the ones who directly deals with the guests and

have an impact on them (Kusluvan, 2003). This industry has the most client interaction, with practically all hotel departments.

Talent management is becoming increasingly important around the world. It is commonly acknowledged that acquiring a competitive advantage over competitors is critical to an organization's success. Organizations place a premium on employees' vital talents, which allow them to gain a competitive advantage. This can only be accomplished with the help of talented employees. As a result, the emphasis has switched to keeping important talent, which includes innate abilities, acquired knowledge, capabilities, and skills. Companies all over the world are employing various people management strategies in response to the changing business environment.

Competency development is becoming ever more of a focus for organizations. The concept that human resources are the most important resource that gives a business a competitive advantage has been embraced by top management. The basic goal of competency development is to increase employees' success by constantly improving their ability to execute difficult tasks and take on more responsibility. As a result, organizations are focusing not just on acquiring exceptional talent, but also on nurturing, promoting, motivating, and retaining essential talent, which encompasses all innate abilities, acquired knowledge, capacities, and skills. Employee retention is critical for businesses since employees' contributions to the organization will be inconsistent if they leave frequently. To overcome this problem, organisations must employ a variety of talent management practices. Organizations are continuously working to improve not only their ability to attract and retain key talent, but also their level of employee engagement (Hughes & Rog, 2008). Morton (2005) correctly stressed the importance of talent management in engaging employees in the organisation.

The hotel industry, which has a turnover rate of more than 50%, requires special attention because it is developing at a rapid pace while its employees are disengaged. The current study examines the various competency development and talent management practises used by various hotels to keep their employees engaged.

ITERATURE REVIEW

Globalization and increased worldwide demands appear to be pressurizing organisations to ensure that their managers have crucial competences that enable them to perform successfully and efficiently in diverse cultures. According to many research studies, the International Hospitality Industry faces a critical HR in the development of managerial competences. (Velo and Mittaz, 2006; D'Annunzio-Green, 2004; Kriegl, 2000; D'Annunzio-Green et al., 2000).

Tesone and Ricci (2008) contemplated that the hospitality program's curriculum should be organised in such a way that persons entering the profession are prepared with the necessary knowledge, skills, and attitude to perform effective and efficient management functions. They emphasized on having desired competencies required by hospitality and tourism practitioners.

Employees are considered as the most valuable assets that organizations can have today. They are the business environment. As a result, businesses are forced to focus on the critical problem of employee engagement. Engaging people with the necessary knowledge, skills, and proficiency is critical for organizational success and growth. (Kirke, 2012).

The hospitality sector has long suffered with high employee turnover rates and has encountered numerous obstacles in attracting and engaging personnel resources with the right skill set and experience. The main reasons for this are a lack of work-life balance and changing client needs. Organizations in this industry can use talent management to attract, manage, retain, and engage their employees. (Hughes and Rog, 2008).

One of the most pressing issues faced by hospitality industry is attracting and retaining talented employees (Barron, 2008). Institutions and educators who provide hospitality education to future talent must be absolutely apprehensive about the ramifications of consciously reducing the practical and vocational nature of programmes, as well as making changes to programme management and administration, in order for students to complete programmes.

According to Ramdhony and Annunzio-Green (2018), an efficient talent management approach uses talent's hospitability in a commercial setting without reducing the hospitality and tourism industry's noble core of magnanimity and philanthropy. They defined hospitableness as an employee's moral obligation and unconditional willingness to take care of guests. They presented a conceptual framework for talent management to be viewed as a dialogic process in which hospitability, altruism, and noble fundamental values may be preserved, allowing them to be effectively leveraged as a unique talented resource in a commercial setting.

In the hospitality business, according to Reilly (2018), talent management strategy aids in the growth of customer centricity. The research was carried out in the hospitality industry, and data was gathered from HR practitioners via in-depth interviews in order to better understand the various facets of talent management. It was discovered that customer needs are evolving, necessitating the hiring of professional workers with interpersonal abilities. The necessity for firms to change their recruiting, development, and retention of people was stressed.

To address this issue Pandita and Ray (2018) studied the relationship of talent management and employee engagement. They construed that organisations are concentrating on talent management activities to reduce their costs related to recruitment, training and development, opportunity cost of attrition etc. As a result, when an organisation invests in growth and development of its employees, they feel appreciated. Employees are more engaged with their company as a result of this.

In the last ten years, the concepts of talent management (TM) and employee engagement (EE) have been intensively researched in management literature (Lewis & Heckman,

2006; Scullion, Collings & Caligiuri, 2010, Saks &Gruman, 2014). Both the concepts have piqued the curiosity of practitioners as well as academic researchers. As a result, investigations on the relationship and influence of talent management strategies on employee engagement and its antecedents have been done independently for each notion.

RESEARCH GAPS IDENTIFIED FROM LITERATURE REVIEW

· Studies related to competency development in hospitality industry are limited to competency mapping, competency models and identification of competencies which are essential for managers working at different levels in the hospitality industry

- Very few studies in Indian context pertaining to both competency development and talent management in relationship with employee engagement.

- No literature is available on the Competency development and employee engagement in hospitality Industry.

- Only two studies are available, with respect to competency development practices, which shows a linkage of Training with employee engagement in banking (Arunmozhi, 2015) and mentoring with employee engagement in IT (Naim and Lenka, 2017)in Indian context.

- No studies are available which shows a linkage between Competency Analysis and Competency based assets with employee engagement or its antecedents.

- The empirical studies related to impact of leadership development on employee engagement are limited to only leadership styles.

- Only conceptual studies are available that shows the relationship of performance management and employee engagement.

- In Indian context, only two studies showed the relationship of talent management and employee engagement (Bhatnagar, 2007; Kumar and Arora, 2012) but in BPO/ITES industry.

- There are more than 30 thesis during the year 2013-2018 are available on talent management but none of them have conducted their research in hospitality industry. Also only two theses were available which showed the impact of talent management on employee engagement (Pandita, 2017; Chhanniwal, 2017) but both relates to IT industry. (As per InfiLib database)

- More than 20 theses during the year 2013-2018 are available on Competency mapping and Competency gaps but none of them focuses on competency development. Also no study relating to competency development is available in context of hospitality industry. (As per InfiLib database)

RESEARCH METHODOLOGY

The goal of this study is to determine the level of competency development and talent management practices employed by various hotels, as well as their impact on employee engagement. A 2 X 2 X 5 factorial design with equal numbers was implemented to draw successful conclusions from this study, which involves two types of hotel chains, namely Indian and Foreign hotel chains. In addition, the sample was taken from two types of hotels: luxury and budget. Finally, respondents from several hotel departments were surveyed, including Food and Beverage (F&B) Production, Food and Beverage (F&B) Service, Front Office, Housekeeping, and Ancillary departments (Finance, Human Resource, Sales & Marketing, Security and Engineering).

Research Objectives

1. To understand the Competency Development practices in Hotel Chains of Indian and foreign origin having luxury and budget brands.

2. To understand the Talent Management practices in Hotel Chains of Indian and foreign origin having luxury and budget brands.

3. To study the effect of Competency Development practices on Employee Engagement of Hotel Chains of Indian and foreign origin having luxury and budget brands.

Table 1: Indian and Foreign hotel chains with their Luxury and Budget brand hotels

	Hotel Chain	Luxury Brand	Budget Brand
Indian Hotel Chain	Indian Hotels Company Limited	Taj Palaces and Resorts	Ginger Hotels
	ITC Hotels Limited	ITC- Luxury Collection	ITC Welcome
	Lemon Tree Hotels Limited	Lemon Tree Premier	Red Fox Hotels
Foreign Hotel Chain	Accor Global Hospitality Private Limited	Sofitel; Pullman	IBIS Hotels
	Inter-Continental Hotel Group (India) Private Limited	InterContinental; Crowne Plaza	Holiday Inn Express
	Hyatt Hotels Corporation	Grand Hyatt; Park Hyatt; Andaz	Hyatt Place
	Starwood Hotels India Private Limited	St. Regis; W; Le Meridien; Westin	Aloft
	Marriott Hotels India Private Limited	JW Marriott; Marriott; Ritz Carlton	FairField
	Radisson Hotel Group	Radisson; Radisson Blu	Park Plaza

4. To study the effect of Talent Management practices on Employee Engagement of Hotel Chains of Indian and foreign origin having luxury and budget brands.

Population

The study's population include hotel chains of Indian and foreign origin that operate in India and offer both luxury and budget brand of hotels. A hotel chain, as defined by the Ministry of Tourism's Hotels and Restaurants Approval and Classification Committee (HRACC), is a collection of hotels that are owned or operated by the same entity and may hold several brands. The sampling frame includes both Indian and foreign hotel chains with operations in India.

Out of the seven foreign hotel chains only three were considered for the study. These were Intercontinental hotel group, Hyatt hotel Corporation and Radisson Hotel group. Accor Global hospitality and Hilton were not taken into

luxury and two budget hotels from each hotel chain were picked at random using the fish bowl technique. The data was then gathered from four core departments and ancillary departments that were combined together. Every third manager from each department was chosen to fill out the questionnaire based on a list of employees provided by the human resource department. A total of 624 questionnaires were distributed to respondents one at a time. There were numerous totally and partially patterned responses among the 624 completed questionnaires, and some were partially filled, thus those questionnaires were excluded from the study. Finally, only 453 useable questionnaires were used to conduct analysis and draw conclusions.

Testing Tools Used

• To measure **Competency Development Practices**, A questionnaire was constructed and validated based on the six practices identified and drawn from literature on

Table 2: Sampling Frame of the study

	Hotel Chain	Luxury Brand	No. of Hotels in 7 cities	Budget Brands	No. of Hotels in 7 cities
Foreign Hotel Chain	Indian Hotels Company Limited	Taj Palaces and Resorts	6	Ginger Hotels	16
	ITC Hotels Limited	ITC- Luxury Collection	10	ITC Welcome	3
	Lemon Tree Hotels limited	Lemon Tree Premier	5	Red Fox Hotels	4
Foreign Hotel Chain	Inter-Continental Hotel Group (India) Private Limited	InterContinental; Crowne Plaza	9	Holiday Inn Express	3
	Hyatt Hotels Corporation	Grand Hyatt; Park Hyatt; Andaz	5	Hyatt Place	4
	Radisson Hotel Group	Radisson; Radisson Blu	12	Park Plaza	4

consideration because they did not have enough hotels in Luxury hotels to randomly select for the study. It is only in September 2016 that Star wood was acquired by Marriot hotels private limited making it the world's largest hotel chain. Both these hotel chains were excluded from the study because these hotels were in transition phase.

Sampling Frame

Three Indian and three foreign hotel chains with luxury and budget brands were included in the study's sampling frame. The sampling frame was confined to only 7 cities in India, which the Federation of Hotels and Restaurants Association of India designated as the important cities in the Indian hotel industry (FHRAI). Bengaluru, Chennai, Goa, Kolkata, Mumbai, New Delhi, and Pune are among them. All of the Indian and foreign hotel chains that were chosen for the study were present in these cities. The study's sampling frame is shown below in Table 2.

Sample

The study's sample size was set at 500 respondents. To ensure representativeness, a stratified sampling technique was employed to identify hotels and departments within them. Data was collected from managers working in various departments of the hotels chosen using systematic sampling. Following the division of the industry into strata of Indian and foreign hotel chains with luxury and budget brands, two

the hotel industry data. The questionnaire was validated through five experts in the area of study to establish face validity. Pilot testing of the questionnaire was then conducted on a sample of 250 respondents. As each practice here is a distinct construct, exploratory factor analysis was undertaken on each practice independently on a sample of 250 hotel industry respondents. The questionnaire was subsequently given to 453 managers from various levels in various departments of various types of hotels who were chosen for the study. The data was then evaluated using confirmatory factor analysis to verify the factors and determine the questionnaire's validity and reliability. Table 3 shows the fit indices, as well as the reliability and validity scores. For the purpose of categorising these activities on the level of maturity on Very High, High, Medium, Low, and Very Low, norms for the questionnaire were developed based on standard scores and criterion reference.

• To measure Talent Management Practices, A questionnaire was constructed and validated based on seven practices identified and drawn from literature on the hotel industry data. The questionnaire was validated through five experts in the area of study to establish face validity. Pilot testing of the questionnaire was then conducted on a sample of 250 respondents. As each practice here is a distinct construct, exploratory factor analysis was undertaken on each practice

Table 3 Fit indices and reliability and validity score of Competency Development Practices

Talent Management Practices	No. of Items	CMIN/ DF< 5 (Wheaton et al, 1977)	GFI ≥ 0.90 (Stevens, 1996)	AGFI ≥ 0.90 (Hair et. al, 1998)	NFI ≥ 0.90 (Hair.et. al,1998)	CFI ≥ 0.90 (Stevens , 1996)	SRMR ≤ 0.08 (Byrne, 2013; Hu & Bentler, 1999)	RMSEA ≤ 0.08 (Mac Callum. et. al, 1996)	PClose ≥ 0.05 (Mac Callum. et. al, 1996)	Cronbach Alpha ≥ 0.70 (Hair et al., 2006)	AVE ≥ 0.50 (Keshar-wani, Sreeram & Desai, 2017)
Training and Development	7	2.214	0.986	0.961	0.991	0.995	0.013	0.052	0.415	0.932	0.709
Competency Analysis	6	3.224	0.988	0.951	0.990	0.993	0.015	0.07	0.161	0.911	0.624
Mentoring	5	2.4	0.992	0.969	0.992	0.995	0.013	0.061	0.352	0.892	0.663
Competency Based Assets	10	2.674	0.968	0.938	0.978	0.986	0.022	0.061	0.132	0.943	0.663
Capability Development	7	3.302	0.982	0.943	0.985	0.989	0.020	0.071	0.095	0.915	0.681
Continuous Capability Development	11	2.735	0.966	0.929	0.979	0.984	0.021	0.062	0.097	0.944	0.653

independently on a sample of 250 hotel industry respondents. The questionnaire was subsequently given to 453 managers from various levels in various departments of various types of hotels who were chosen for the study. The data was then evaluated using confirmatory factor analysis to verify the factors and determine the questionnaire's validity and reliability. Table 3 shows the fit indices, as well as the reliability and validity scores. For the purpose of categorising these activities on the level of maturity on Very High, High, Medium, Low, and Very Low, norms for the questionnaire were developed based on standard scores and criterion reference.

• To measure Employee Engagement, a scale developed by Lather & Jain (2014) was used. On a sample of 453 managers working in various departments of various types of hotels, the reliability and validity of the Employee Engagement scale was established. The reliability and validity scores of dimensions of Employee Engagement are shown in Table 5.

Table 4 Fit indices and reliability and validity score of Talent Management Practices

Talent Management Practices	No. of Items	CMIN/ DF< 5 (Wheaton et al, 1977)	GFI ≥ 0.90 (Stevens, 1996)	AGFI ≥ 0.90 (Hair et. al, 1998)	NFI ≥ 0.90 (Hair.et. al,1998)	CFI ≥ 0.90 (Stevens , 1996)	SRMR ≤ 0.08 (Byrne, 2013; Hu & Bentler, 1999)	RMSEA ≤ 0.08 (Mac Callum. et. al, 1996)	PClose ≥ 0.05 (Mac Callum. et. al, 1996)	Cronbach Alpha ≥ 0.70 (Hair et al., 2006)	AVE ≥ 0.50 (Keshar-wani, Sreeram & Desai, 2017)
Recruitment & Selection	9	3.067	0.966	0.934	0.981	0.987	0.022	0.068	0.051	0.949	0.751
Performance Management	13	2.688	0.950	0.921	0.965	0.977	0.024	0.061	0.055	0.952	0.626
Compensation Management	10	2.564	0.967	0.942	0.978	0.986	0.020	0.059	0.170	0.947	0.665
Learning and Development	16	2.210	0.955	0.921	0.972	0.985	0.025	0.050	0.497	0.959	0.653
Career Development	11	2.610	0.957	0.932	0.971	0.982	0.023	0.060	0.115	0.948	0.632
Succession Management	17	2.446	0.939	0.911	0.959	0.975	0.025	0.057	0.106	0.963	0.628
Leadership Development	11	2.214	0.956	0.927	0.970	0.981	0.025	0.063	0.055	0.946	0.634

Table 5 Reliability and Validity of Employee Engagement Scale

	Construct Reliability (Cronbach alpha $\geq$ 0.70)	Composite Reliability $\geq$ 0.70	Standardized Factor Loadings $\geq$ 0.50	Average Variance Extracted $\geq$ 0.50
Job Satisfaction	0.940	0.940	0.832	0.692
Organizational Commitment	0.906	0.906	0.812	0.660
Advocacy	0.856	0.856	0.815	0.664
Pride	0.898	0.899	0.865	0.748
Intention to Stay	0.902	0.902	0.805	0.649
Emotional Connect	0.844	0.844	0.802	0.643

STATISTICAL TESTS APPLIED

The following statistical tests were used for analyzing the data:

● For understanding the Competency Development and Talent Management practices in Hotel Chains of Indian and foreign origin having luxury and budget brands, mean scores were calculated used to draw comparison with norms developed. Also, Multivariate Analysis of variance (MANOVA) was applied. MANOVA helped in identifying whether or not the means of different types of hotel and different departments of hotels are all equal statistically.

● For studying the impact of competency development practices and talent management practices on employee engagement, correlation and step-wise regression analysis was used. Correlation helped to identify statistical significant relationship between competency development practices with employee engagement and talent management practices with employee engagement. Then, regression analysis helped in establishing the impact of competency development practices on employee engagement and the impact of talent management practices on employee engagement.

FINDINGS AND CONCLUSION

Impact of Competency Development Practices on Employee Engagement

● All competency development practices, including as training and development, competency analysis, competency-based assets, capability development, mentoring, and continuous capability development, have a high positive correlation with employee engagement. As a result, hotels that adhere to these competency development principles religiously are better equipped to engage their employees.

● **In Indian luxury hotels, training and development and Continuous Capability Development practises have a significant positive impact on employee engagement.** Employees at Indian luxury hotels are motivated if their level of engagement in the hotel increases as a result of the hotel's policies and procedures, which invest in the individual development of employees while reaping overall growth in comparison to their industry competitors.

● **In Indian budget hotels, training and development, competency-based analysis, and continuous capability development all have a significant positive impact on employee engagement.** Employees in Indian Budget hotels will feel more engaged if their skills are integrated into organisational procedures as assets. It should be emphasised that their level of engagement in the hotel improves if the hotel's policies and procedures are such that they invest in the individual development of its employees, giving them a competitive advantage over their industry competitors.

● **In foreign luxury hotels, training and development, competency analysis, and capability development have a significant positive impact on employee engagement.** Employees at Foreign Luxury hotels will feel more involved if their knowledge, skills, and process abilities are analysed to determine their best competencies and work is assigned to them in their area of expertise. Additionally, their level of engagement in the hotel increases if the hotel's policies and procedures include investing in strengthening employees' competencies when gaps are detected, as well as providing appropriate training and development programmes for individual employee development.

● **In foreign budget hotels, competency analysis, capability development, and continuous capability development have a significant positive impact on employee engagement.** Employees at Foreign Budget hotels are more motivated if their knowledge, skills, and process abilities are analysed to determine their best competencies and work is assigned to them in their area of expertise. Additionally, their level of engagement in the hotel increases if the hotel's policies and practises include efforts to develop employees' competencies and empower them to continuously identify their knowledge, skills, and process abilities, as well as assess the gaps from benchmarks to set their own improvement objectives and work toward achieving them. This contributes to the employee's and organization's growth and development.

- The prominent competency development strategies used by hotels to engage their employees are training and development, competency analysis, capability development, and continuous capability development. To keep their employees engaged, hotels must channelize their resources in such a way that these practices are followed rigorously at all levels.

Impact of Talent Management Practices on Employee Engagement

- All Talent Management activities, including Recruitment and Selection, Performance Management, Compensation Management, Learning and Development, Career Development, Succession Management, and Leadership Development, have a significant positive correlation with Employee Engagement. This means that hotels that adhere to these talent management procedures rigorously are better equipped to engage their employees.

- In Indian luxury hotels, compensation management and leadership development have a significant positive impact on employee engagement. This means that employees in Foreign Luxury hotels are encouraged to perform more efficiently when they are paid fairly for the task they do, in line with industry norms, and at par with others in the hotel doing the same job at the same level. Practices and procedures that assist employees build leadership skills and advance in their careers also aid Indian luxury hotels in effectively engaging their workforce.

- In Indian Budget Hotels, recruitment and selection, as well as career development, have a significant positive impact on employee engagement. This means that choosing the best candidate for a specific job helps to keep employees engaged in their work. When the hotel invests in the employee's career development wherever it is needed for their advancement, their level of engagement rises.

- In Foreign Luxury Hotels, recruitment and selection, succession management, and leadership development have a significant positive impact on employee engagement. This means that employees in Foreign Luxury hotels feel motivated to work more efficiently when the nature of job is such that they are best suited for it. Furthermore, methods and policies that enable employees build leadership capacities and take on higher roles, as well as specifics explicitly stated in succession rules, assist Foreign Luxury hotels in effectively engaging their staff.

- In Foreign Budget Hotels, recruitment and selection, succession management, and leadership development have a significant positive impact on employee engagement. This means that employees in Foreign Budget hotels feel motivated to work more efficiently when the nature of job is such that they are best suited for it. Furthermore, methods and policies to build leadership qualities of employees in order for them to take on higher and more crucial positions, as stipulated in succession policies, assist Foreign Budget hotels in effectively engaging their employees.

- The prominent talent management practises employed by hotels to engage their employees are recruitment and selection, compensation management, career development, succession management, and leadership development. To keep their employees engaged, hotels must channel their resources in such a way that these practices are followed rigorously at all levels.

Overall Employee Engagement in Indian Hotel Industry

- There is a significant difference in the overall level of employee engagement in various types of hotels under study

- Foreign Budget hotels are better able to engage their employee the overall mean score of employee engagement is highest amongst the various types of hotels under study. This means that Foreign Budget hotels implement both Competency Development and Talent Management procedures effectively and religiously in order to establish a psychological disposition among employees for their firm that keeps them engaged.

- Foreign Luxury and Indian Luxury hotels have an average employee engagement score. This indicates that, while Indian and foreign luxury hotels adhere to all competency development and talent management practices, they do so inconsistently at all levels and in all departments, resulting in an average level of employee engagement. As a result, these hotels should place a heavy emphasis on these procedures in order to fully utilise their outstanding human resources.

- Indian Budget hotels on the other hand are not able to engage their employees much. As a result of the low to medium concentration on competency development and Talent Management practises in Indian budget hotels, these hotels have lower levels of employee engagement than other hotels. As a result, these hotels should place a heavy emphasis on these practices in order to engage their employees.

HYPOTHESES OF THE STUDY

H1 Training and Development, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Luxury Hotels is **Supported**.

H2 Training and Development, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Budget Hotels is **Supported**.

H3 Training and Development, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Supported**.

H4   Training and Development, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H5   Competency Analysis, as a Competency Development practices, has no effect on employee engagement in Indian Luxury Hotels is **Supported**.

H6   Competency Analysis, as a Competency Development practices, has no effect on employee engagement in Indian Budget Hotels is Supported.

H7   Competency Analysis, as a Competency Development practices, has no effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H08   Competency Analysis, as a Competency Development practices, has no effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H09   Competency Based Assets, as a Competency Development practices, has no effect on employee engagement in Indian Luxury Hotels is **Supported**.

H10   Competency Based Assets, as a Competency Development practices, has no effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H11   Competency Based Assets, as a Competency Development practices, has no effect on employee engagement in Foreign Luxury Hotels is **Supported**.

H12   Competency Based Assets, as a Competency Development practices, has no effect on employee engagement in Foreign Budget Hotels is **Supported**.

H13   Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H14   Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H15   Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Supported**.

H16   Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Budget Hotels is **Supported**.

H17   Mentoring, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H18   Mentoring, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H19   Mentoring, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H20   Mentoring, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H21   Continuous Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Luxury Hotels is **Supported**.

H22   Continuous Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Indian Budget Hotels is **Supported**.

H23   Continuous Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H24   Continuous Capability Development, as a Competency Development practices, has a significant positive effect on employee engagement in Foreign Budget Hotels is **Supported**.

H25   Recruitment and Selection, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H26   Recruitment and Selection, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Supported**.

H27   Recruitment and Selection, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Supported**.

H28   Recruitment and Selection, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Supported**.

H29   Performance Management, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H30   Performance Management, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H31   Performance Management, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H32   Performance Management, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H33   Compensation Management, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Supported**.

H34 Compensation Management, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H35 Compensation Management, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H36 Compensation Management, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H37 Career Development, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H38 Career Development, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Supported**.

H39 Career Development, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H40 Career Development, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H41 Learning and Development, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H42 Learning and Development, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H43 Learning and Development, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Not Supported**.

H44 Learning and Development, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Not Supported**.

H45 Succession Management, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Not Supported**.

H46 Succession Management, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H47 Succession Management, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Supported**.

H48 Succession Management, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Supported**.

H49 Leadership Development, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Luxury Hotels is **Supported**.

H50 Leadership Development, as a Talent Management Practice has a significant positive effect on employee engagement in Indian Budget Hotels is **Not Supported**.

H51 Leadership Development, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Luxury Hotels is **Supported**.

H52 Leadership Development, as a Talent Management Practice has a significant positive effect on employee engagement in Foreign Budget Hotels is **Supported**.

IMPLICATIONS

In this complex and volatile business environment, many hotels are facing the issues associated with talent. Hotels are rapidly afflicted with the contentions relating to the dearth of talent. The managers and the administrators of the hotels have now realised that having capable employees is a competitive advantage. Competent and talented employees are considered as the greatest asset of any organization and by fully utilizing this asset organizational can enhance their performance (Sweem, 2009). To attain a competitive edge, hotels need to have more proficient employees particularly in know-how, innovation and experience (Fegley, 2006). Hotels have recognized that best in class service and a memorable experience to its customers can only be reaped through talented employees. Productive and efficient employees facilitate the organization to not only sustain, but also to succeed. To cater to the issues pertaining to the dearth of talent organizational focus has increasingly shifted to retaining the critical talent, which demonstrate acquired knowledge, skills, inherent abilities and capabilities (Brewster et al., 2005). Hotels must efficiently implement competency development practices to upskill the employees in providing best in class service to the guests. Also, the management should invest in attracting, nurturing and retaining talented employees in all the departments of the hotels, as it has a maximum interface with the clients. Through competency development and talent management practices the hotels can engage their employees and attain higher productivity and profitability.

FUTURE SCOPE OF RESEARCH

Future researchers can replicate similar research state-wise taking into consideration all the different types of hotels for broader understanding of the relationships between variables. Comparisons can be drawn with respect to level of employee engagement in luxury, upscale and budget hotels. Also, individual variables like personality, self esteem, self efficacy, locus of control etc. can also be studied as these variables also drive employee engagement in the hotel industry.

REFERENCES

I.	Arthur, M. B., Inkson, K., and Pringle, J. K. (1999). The new careers: Individual action and economic change. Sage, London.
ii.	Arunmozhi, T. (2015). A Study on Employee Engagement and Involvement Practices in ICICI Bank Ltd., Chennai.
iii.	Barron, P. (2008). Education and Talent Management: Implications for the hospitality Industry. International Journal of Contemporary Hospitality Management, 20(7), 730-742.
iv.	Beck, J. (2003). Independent workforce theory: Implications for HRD. Human ResourceDevelopment International, 6(1), 21-41.
v.	Bharwani, S. (2014). Hospitality innovations in the emerging experience economy: a case study of the Oberoi Resorts in Goyal, A. (Ed.) Innovations in Services Marketing and Management: Strategies for Emerging Economies, IGI Global, Hershey, PA, 307-328.
vi.	Bhatnagar, J. (2004). New dimensions of strategic HRM: HRIS managed talent management and application of HR Six Sigma, in Padaki, R., Agrawal, N.M., Balaji, C. and Mahapatra, G. (Eds), Emerging Asia: An HR Agenda, Tata McGraw-Hill, New Delhi.
vii.	Bhatnagar, J. (2007). Predictors of organizational commitment in India: strategic HR roles, organizational learning capability and psychological empowerment, International Journal of Human Resource Management.
viii.	Bhatnagar, J. (2007). Talent management strategy of employee engagement in Indian ITES employees: key to retention. Employee relations, 29(6), 640-663.
ix.	Blayney, C. (2009). Management Competencies: Are They Related to Hotel Performance? International Journal of Management and Marketing Research, 2 (1), pp. 59-71, 2009. Retrieved from https://ssrn.com/abstract=1555218
x.	Brewster, C., Sparrow, P. and Harris, H. (2005). "Towards a new model of globalizing HRM", International Journal of Human Resource Management, 16, pp. 949-70.
xi.	Burke, R., and Ng, E. (2006). The changing nature of work and organizations: Implications for human resource management. Human Resource Management Review, 16, 86-94.
xii.	Byrne, B. M. (2013). Structural equation modeling with AMOS: Basic concepts, applications, and programming. Routledge.
xiii.	Chhaniwal, P. V. (2017). Impact of Talent Management Practices on Employee Engagement with Special Focus on Generation Y. Ganpat University. Shodhganga
xiv.	Curtis, B., Hefley, W. E., and Miller, S. A. (2002). The people capability maturity model: Guidelines for improving the workforce. Addison-Wesley.
xv.	Curtis, B., Hefley, B., and Miller, S. (2009). People capability maturity model (P-CMM) version 2.0 (No. CMU/SEI-2009-TR-003). Carnegie-Mellon University Pittsburgh PA Software Engineering Institute.
xvi.	Curtis, B., Hefley, W. E., and Miller, S. (1995). Overview of the People Capability Maturity Model (No. CMU/SEI-95-MM-01). Carnegie-Mellon University Pittsburgh PA Software Engineering Institute.
xvii.	D'Annunzio-Green, N. (2002). An examination of the organizational and cross-cultural challenges facing international hotel managers in Russia, International Journal of Contemporary Hospitality Management, 14(6), pp. 266-73.
xviii.	D'Annunzio-Green, N. (2008). Managing the talent management pipeline: towards a greater understanding of senior managers' perspectives in the hospitality and tourism sector, International Journal of Contemporary Hospitality Management, 20(7), pp. 807-819.
xix.	D'Annunzio-Green, N. (2004). The hotel expatriate in Russia: competencies for cross-cultural adjustment, in D'Annunzio-Green, N., Maxwell, G.A. and Watson, S. (Eds), Human Resource Management: International Perspectives in Hospitality and Tourism, Thomson, London, pp. 74-89.
xx.	D'Annunzio-Green, N., Maxwell, G.A. and Watson, S. (2000). Human resource issues in international hospitality, travel and tourism: a snapshot, International Journal of Contemporary Hospitality Management, 12(3), pp. 215-6.
xxi.	Fegley, S. (2006). "Talent Management Survey Report", SHRM Research, Alexandria, VA.
xxii.	Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., and Tatham, R. L. (2006). Multivariate data analysis Ed. 6. Upper Saddle River, NJ: Pearson Prentice Hall.
xxiii.	Hughes, J.C. and Rog, E. (2008). Talent management: a strategy for improving employee recruitment, retention and engagement within hospitality organisations, International Journal of Contemporary Hospitality Management, 20(7), pp. 743-757.
xxiv.	Kesharwani, A., Sreeram, A., Desai, S. (2017) Factors affecting satisfaction and loyalty in online grocery shopping: an integrated model, Journal of Indian Business Research, 9(2), doi: 10.1108/JIBR-01-2016-0001.
xxv.	Kirke, D. (2012). Employee Engagement: Impact of Learning and Development.
xxvi.	Kriegl, U. (2000). International hospitality management: identifying important skills and effective training, Cornell Hotel and Restaurant Administration Quarterly, 41(2), pp. 64-71.
xxvii.	Kumar, R., and Arora, R. (2012). Determinants of Talent Retention in BPO Industry. The Indian Journal of Industrial Relation, 48(2).
xxviii.	Kusluvan, S. (2003). Employee attitudes and behaviors and their roles for tourism and hospitality businesses. Managing Employee Attitudes and Behaviours in the Tourism and Hospitality Industry, pp. 25-50. Retrieved from https: //www.researchgate.net/publication/281905065_Employee_attitudesand behaviors_and_their_roles_for_tourism_and_hospitality_businesses
xxix.	Lather, A. S. and Jain, V.K. (2014). Developing a Scale to Measure Employee Engagement. DIAS Technological Review.
xxx.	Lewis, R., and Heckman, R. (2006). Talent Management: A critical Review. Human Resource Management Review, 16(2), 139-154.

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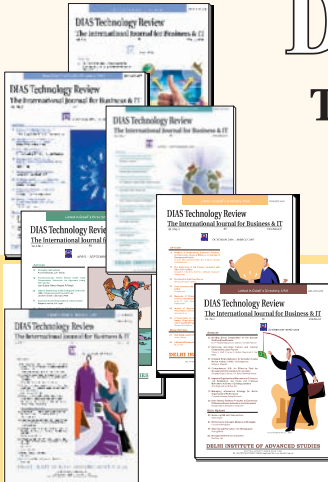**… Phone: … … … … … … … … … …**

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