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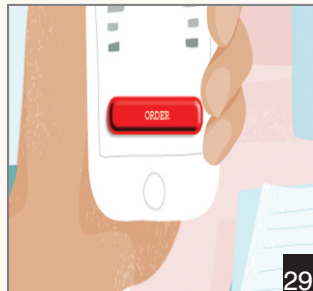
The authors have discussed various data privacy threats that persist for the people on social media platforms. They have also proposed a technique to avoid the possibility of attack on privacy.



29 Service Quality and Behavioral Intention: The Mediating Effect of Satisfaction in Online Food Ordering Services

Dr. Divya Mohan, Dr. Nishant Kumar

The paper primarily studies the interrelationship among perceived Service Quality components like satisfaction and behavioral Intention of online food ordering service providers.



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Dr. Sonali Yadav

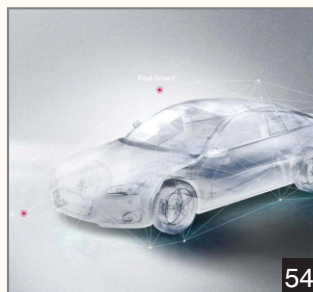
The author through this paper has investigated the evolving weak form market efficiency in the Indian Stock Market to predict future price behaviour.



54 A Study of Business Networks in Pune Auto – Component Cluster of India

Mr. Dinesh Rawat, Dr. R. K. Mittal, Dr. Vijita Singh Aggarwal

The authors in this paper have focused on identification of different types of Business Networks between firms and the participants



From The Editor's Desk

It is our immense pleasure to present to our readers the 30th issue of DIAS Technology Review. A skilled and productive human resource is pre-requisite to economic growth and a quality education system is the back bone of nation building process. It is essential for the students to be equipped with pragmatic knowledge and adequate skill-set to grab better employment opportunities in today's competitive world. The biggest challenge faced by Indian education system today is a skill gap in context of academic, technical and employability skills of the students. In the research article **Employability Skill Factors in Retail Vocational Education: An Empirical Analysis**, authors have cross-examined certain non-technical skills which can be transferred into different fields of work. These are pre-requisite for either entering the working world or to remain in a job. They have found that Interpersonal skills, Integrating Theory & Practice and Learning Skills are the major factors that affect employability of students.

Dispersion of technical knowledge has influenced our professional as well as personal life to a great extent. Information sharing and communication on Social Networking sites is in vogue for its ease and promptness, but to keep personal information private and protected has become a big challenge due to cyber-attacks taking place every other day. The authors in their study, **Privacy Threats and Techniques to Secure Personal data on Social Networks** have discussed various data privacy threats occurring on social media platforms, certain prevention techniques and some fool-proof methods to thwart such attacks on privacy of the users of social networking sites. Similarly, On-line marketing also affects customers' behavioural intentions and consumerism. The research paper **Service Quality and Behavioral Intention: The Mediating Effect of Satisfaction in Online Food Ordering Services** explores the interrelationships among perceived 'Service Quality' components like Website design, reliability, responsiveness, trust & personalization etc. and the 'Satisfaction' resulting in behavioral intention to revisit and recommend, for online food ordering service providers. The authors have explored that perceived service quality is a predecessor of customer satisfaction and satisfaction performs a mediating role between service quality and behavioral intention.

Presence or absence of random walk has always caught attention of academicians, stockbrokers, individuals, institutional investors, financial institutions and regulators in the area behavioral finance. In case of 'weak form efficient' markets, technical analysis fails to make any comments on future price behavior. In the research paper **Test of Random Walk Hypothesis: A Study in Context of Indian Stock Market**, the author has investigated the weak-form market efficiency in Indian Stock market, by testing daily data of Bombay Stock Exchange (BSE) 200 index-based companies over the period of 1 January 1991 to 31 December 2016. By employing Runs Test, Augmented Dickey-Fuller Test, Phillips Perron Test, Normality Test and Variance Ratio Test, the author has resolved that Indian stock market is not 'weak form efficient' but has a pattern and so prices do not follow a random walk.

Business networks formed by the firms are always an area of concern for policy makers. These patterns provide a deeper understanding of how firms connect with its buyers, suppliers, government agencies, research and educational institutes operating in cluster and other stakeholders. In the research study, **A Study of Business Networks in Pune Auto-Component Cluster of India**, the authors have investigated that the network with supplementary stakeholders like financial institutes and competitors, especially in Auto-Component Cluster of Pune remains unfilled, which indicates missed opportunities for growth in this sector.

Standardization and quality control are the buzz words for all the organizations and the ISO 9001 certification process provides companies scope to improve operations. In research paper **An Examination of ISO 9001 Certifications in the BRIC Countries**, authors have tried to scrutinize the impact of globalization on the number of ISO 9001 certifications issued in Brazil, Russia, India and China (BRIC countries). The analysis reveals that the change in FDI per capita and the lagged change in FDI per capita are positively associated with the number of ISO 9001 certificates and the conditions in Brazil and Russia are statistically associated with the number of organizations obtaining ISO 9001 certificates. In our attempt of enlightening our treasured readers with up to date knowledge, we are confident that this new edition of DIAS Technology Review will, as usual, prove captivating and informative.



Regards,

Dr. Anju Batra

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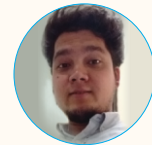
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Dr. Terrence J. Moran

Employability Skill Factors in Retail Vocational Education: An Empirical Analysis

**Dr. Pratiksha Tiwari, **Dr. N. Malati*

ABSTRACT

Skills and knowledge are the driving force for economic growth and social development of any country. The economy becomes productive, innovative and competitive through the existence of a skilled human potential. The biggest challenge Indian education currently faces, is that of a skill gap in the context of academic, technical, and employability skills of the students. Employability skills consist of non-technical skills that can be transferred into different fields of work which are required for entering the working world or to remain in the job, as well as developing a career in the workplace, or for career development at a new place of work. This research is aimed to validate the student perspective for employability skills in vocational education in the retail sector through confirmatory factor analysis (CFA) technique. The retail vocational education students were surveyed to validate the CFA model through a structured questionnaire. The CFA model enables us to identify the various factors responsible for enhancing employability skills

of the retail vocational education students. The final model identified three major factors, Interpersonal skills (IPS), Integrating Theory & Practice (ITP) and Learning Skills (LS) that affect employability.

Keywords: Employability, Retail Sector, Interpersonal skills, Learning skills, Integrating Theory & Practice.





INTRODUCTION

“The skills, knowledge and competency enhances a worker's ability to secure and retain a job, progress at work and cope with change, also secure another job if he/she so wishes or has been laid off and enter more

easily into the labor market at different periods of the life cycle”



INTERNATIONAL LABOR ORGANIZATIONS (2013)

Education and its role in enabling the economic and social progress of the country has long been recognized. Education advances functional and analytical abilities. It

provides openings for both; individuals and groups to achieve heights. Education isn't just an instrument of improving effectiveness, but also a model for updating the general nature of individual and societal life.

Since the 1970s, the International Standard Classification of Education (ISCED) differentiated three types of education: formal, non-formal and informal. Formal education comprised “regular school and university education”; non-formal education (NFE) comprised “out-of-school and continuing education, on the job training, etc.”; and informal education comprised “family and socially directed learning”. A fourth category, experiential learning, was added to embrace “learning by doing, self-directed learning, etc.” (UNESCO 1991:17-18).

In the current context education for employment is gaining popularity and vocational education fulfils that gap. Vocational education is general and includes every form of education that aims to the acquirement of qualifications related to a certain profession, art or employment or that provides the necessary training and the appropriate skills as well as technical knowledge, so that students are able to exercise a profession, art or activity, independently of their age and their training level, even if the training program contains also elements of general education (Kotsikis, 2007).

Vocational Education is also looked as a rule that incorporates every type of instruction, that expects to get capabilities identified with a specific activity, craftsmanship, business or that gives the essential preparation, required aptitude and specialized information, so that an intern can practice a skill or workmanship freely as per their age, preparation level regardless of whether the preparation program additionally contains components of general training. (Kotsikis, 2007)

GOVERNMENTAL INITIATIVES FOR SKILL DEVELOPMENT

According to The National Policy for Skill Development and Entrepreneurship 2015, India is one of the top-ranking countries in the globe in terms of population, with over 54% of the population under the age of 25 years and yet the country faces a scarcity of skilled workforce. A skill gap study was undertaken by National Skill Development Corporation in 2015. The study projected that India requires an additional 109.73 million skilled manpower by 2022 in twenty four key

sectors. This challenge becomes tougher as just 4.69% of the aggregate workforce in India has the requisite expertise in contrast to 68%, 75%, 52%, 80% and 96% in UK, Germany, USA, Japan and South Korea respectively.

The central government in order to deal with this issue has launched various skill development programs across 20 Ministries/ Departments, with the Ministry of Human Resource Development (MHRD), Ministry of Skill Development and Entrepreneurship (MSDE) and Ministry of Labor and Employment (MoLE) being the important ones. In addition, the Eleventh Five Year Plan (2007-12), also established a major 'Skill Development Mission' with an outlay of Rs. 228 billion which was launched by the Government of India in 2008. Further, in the year 2009, under the aegis of the Department of Skill Development and Entrepreneurship, the National Skill Development policy was formulated. Later in the year 2013 it was accorded the Ministerial status. The National Policy for Skill Development and Entrepreneurship 2015 superseded the policy of 2009.

The National Policy for Skill Development and Entrepreneurship 2015 provides an umbrella system for all Skilling activities undertaken in the nation. The aggregate workforce in India is evaluated to be 487 million, of which 57% is in the non-cultivate segment. Out of these 487 million, 241.86 million are either unskilled or skilled through non-formal channels, with 170 million in the age group of 15-45 years, making it imperative to focus on vocational education and training (VET) programs.

The major objective of skill development is to act as a tool that ensures both vertical and horizontal pathways to a skilled workforce resulting in improved employability and livelihood for individuals. Skill development also aims to translate into enhanced efficiency across primary, secondary and tertiary sectors. As per the National Policy for Skill Development and Entrepreneurship 2015 to map this workforce, their prevailing skills need to be recognized followed by essential skilling which can be imparted through VET.

AIM OF VOCATIONAL EDUCATION AND TRAINING

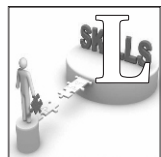
According to Efstratoglou & Nikolopoulou, (2011) the aim of initial vocational training is to connect the given offer and demand of specialties with the structural characteristics of each county's economy. The major objective of vocational education and training is to prepare youth for the world of work. The aim is to impart training in specific areas to make them employable or create opportunities for self-employment. (Statement 2.9, NSS Report No 566: Status of Education and Vocational Training in India 2011-12)

The training programmes are offered at the school level in classes 11 and 12 alongside the formal tutoring cycle offered principally through open Industrial Training Institutes (ITIs), private Industrial Training Centers (ITCs) and polytechnics (both open and private). According to Biswas(2008) different institutions which provide vocation training can be classified into five categories : (i) Government, (ii) Local body, (iii) Private helped, (iv) Private unaided, and (v) not known.

According to MSDE Annual report 2016-2017, Retail sector will

have 10.7 % incremental human resource requirement by 2022. It is rising to be one of the biggest segments in the economy. The aggregate market measure was assessed around US\$ 672 billion in 2016 and will increase to US\$ 1.3 trillion by 2020 as per the *BCG Retail 2020*, *Ernst and Young*, *Deloitte*, *indiaretailing.com*, *Economist Intelligence Unit*, *Euro monitor*. Organized Retail Penetration (ORP) in India is low in contrast to different nations. This demonstrates the huge development potential for organized retail in India. Growing skill gaps in the retail sector have been observed with estimated 107 lakhs trained manpower requirement by 2022 ranked second after construction sector thereby increasing the need for vocational education. As per the MSDE Annual report 2016-17, training was imparted to only 4,63,221 people, which is 18.52% of the accepted targets by the Ministry/ Department.

It is observed that rigorous efforts are needed by the government to promote employability skills amongst students. The sole objective of vocational education is to assure student employability rather than providing them employment. It becomes imperative that a student understands the factors affecting their employability and focuses on enhancing the required skill set. It has also been observed that there has been a paucity of literature in the Indian context in the skill development especially in the retail sector. This paper aims to examine factors assisting in the employability of students in retail vocational education.



LITERATURE REVIEW

The call for developing skills is currently high (Hogstedt, et al., 2007; Maclean and Lai, 2011). During the recent years, proficiency and diagnostics in Technical and Vocational Education (TVE) have made great progress in

providing an empirical foundation for occupation- related competence models and their assessment.

TVE can be utilized to develop and arrange skilled labor. Apprenticeship, Evaluation, and Use of Information & Communication Technology in TVE surfaced as major methods in Technical and Vocational Education. TVE should work in tandem with agencies and try to encourage more studies at the grass root level to identify and meet current and future demands. Ruhizan & Yasin (2013) and Grubb (2006) also raise the issue that TVE teaching takes place in a variety of settings from specialized workshops to classrooms. The degree to which TVE preparation is "hands-on" changes as deciphered distinctively by mentors. As far as worldwide settings are concerned TVE's fill in as one of the significant preparing segments giving skilled labor to horticulture, modern and business development. Although the research on social skills in TVE has expanded extensively in the previous decade, a comprehensive knowledge with regards to, basic aptitude is yet to be found (Monnier 2015).

VET is designed to prepare individuals for a vocation or a specialized occupation and so is directly linked with nation's productivity and competitiveness. From a theoretical perspective, VET can be divided into four categories (Grubb

and Ryan, 1999): Pre-Employment VET, Upgraded Training, Retraining and Remedial VET.

The notion that employability should be an explicit outcome of vocational education and training is gaining attention everywhere. Hartl, (2009) found that better training produces higher income which improves quality of life, occupational safety, diversity and the livelihood of individuals. Employability abilities are the aptitude, information, understanding and individual qualities that empower a man to acquire work, and be fruitful and fulfil their identified vocations (Lorraine & Sewell, 2007).

Employability aptitude are those essential abilities important for getting, keeping and doing great on the job and they can be put into three categories: Basic Academic Skills, Higher-Order Thinking Skills and Personal Qualities (Robinson, 2000). Barnett (2006) clarifies that employability aptitude empowers individuals to acquire reasonable work and in the meantime, build up their vocations amid social and innovative changes. Employability abilities in college include data proficiency, working with innovative, composed and verbal correspondence, working in groups and numeracy (Bennett, 2002). The significance of preparing and furnishing people with individual abilities and characteristics with the end goal of the work cannot be overemphasized as this requires cooperative endeavors from all partners (Wye and Lim, 2009). Smith et al. (2014), conceptualized and measured employability in higher education amongst students in Australia through CFA and identified six dimensions of employability which are: lifelong learning; professional practices and standards; integration of knowledge/theory and practice; informed decision-making (applied information literacy); commencement readiness; and collaboration.

In the global Skilling ecosystem, India occupies a unique and special place today on account of being a developing economy with a population of 1.2 billion. To add to that, it is evaluated that by 2022, India will have the greatest number of working age populace (between the ages 15 to 59) on the planet who could add to the growth of the country, emphasizing the significant requirement for Skilling India's youth . The need further arises due to the diverse demographic disparity in the country. Different states in India face diverse scenarios in relation to demographics and skill development. There needs to be a shared sense of urgency to address these challenges. National Capital Region attracts people from varied socio-economic strata with increasing demand for such offering.

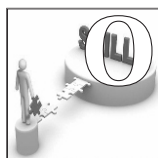
The administration alongside different organizations is also attempting to increase the number of interns for providing advanced education and professional preparation with widening interest for talented work force (XII Plan Document Volume III, Planning Commission, 2012-2017). Hence the current study aims at understanding the student perspective with respect to the factors which would help them enhance their employability.

The broad Literature Review exploring Vocational Education and Training (VET) for the identification of factors of Employability administered in the study is as follows:

TABLE 1

Articles	Variables
McLeish(2002), Jackson(2010), Idris et al.(2012), Smith et al. (2014)	Q1: Speaking clearly and directly
	Q2: Learn from and collaborate with people representing diverse backgrounds or view points.
	Q3: Give clear instructions or advice to colleagues to achieve an outcome.
	Q4: Ability to share information using various communication technologies, like voice mail, e-mail and computers.
McLeish(2002), Harvey et al. (1997)	Q5: Use information to come to reasonable decisions and then act on these.
	Q6: Appraise the quality of information obtained e.g. from the web, from books or from other people.
	Q7: Understand the key drivers for success in this enterprise / profession.
	Q8: Collect, analyze and organize information.
Pool & Sewell (2007), Idris et al. (2012)	Q9: Seek clarification when I do not understand an instruction.
	Q10: Person who likes to take responsibility
	Q11: Be prepared to invest time and effort in learning new skills.
	Q12: Recognize ethical practice in the workplace.
McLeish(2002), Moon (2004)	Q13: Learn from mistakes and can accept feedback.
	Q14: Ready to commence work in your field or discipline
	Q15: Acknowledge and praise another person's work
	Q16: Present myself effectively in selection interviews and processes.
Harvey et al. (1997), Smith et al. (2014)	Q17: The kind of person who has the energy to get the work done.
	Q18: Respect the thoughts, opinions and contributions of others.
	Q19: Can adapt to new circumstances or information.
	Q20: Apply knowledge and skills gained in my studies in the workplace.
	Q21: Link together different theoretical perspectives when working in a workplace or professional task or problem
	Q22: Recognize and value the role of theoretical ideas in work or professional contexts.
	Q23: Understand the theories and principles in my discipline
	Q24: Understand the practices and methods used in my discipline
	Q25: Set goals, plan and manage my time, money and other resources to achieve my goals.

It has been observed that there is a paucity of Indian literature in regard to the studies pertaining to student perspective for employability. The current paper intends to contribute to the existing body of literature.



OBJECTIVES OF THE STUDY

The study has following objectives:

1. To identify preliminary factors for employability with respect to student's perspective in retail vocational education.
2. To identify the relation amongst the identified factors



RESEARCH METHODOLOGY

The nature of the study is exploratory in nature as it tries to examine the factors responsible for employability of students in retail vocational education courses. The present study is based both on primary and secondary data. The secondary data was acquired through periodicals, journals, newspapers, industry publications, research reports

and the primary data was collected through a scheduled format of structured questionnaire containing bilingual questions present in both Hindi and English (attached as Appendix) for better understanding of the respondents. The population of the study consists of students opting for retail vocational education courses in the National Capital Region. Retail vocational education institutes / centres were identified from the website of Retail Skill Council of India. After preparing the list of institutes /centres providing vocational education in retail sector, the institutes were divided in to strata's on the basis of location of institutes. The data from students at these selected institutes was collected through convenience sampling. A sample of around 211 respondents was collected from Delhi and NCR. After data cleaning 172 responses were found to be suitable for further analysis of the data. Exploratory factor analysis, Confirmatory factor analysis and descriptive techniques were used to analyse the data.

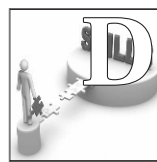
DEMOGRAPHIC PROFILE

The gender of the respondents revealed that 17.44%(30) are female and 82.55%(142) are male. In the age category the sample distribution has been 4%(7) in 15-17 years category, 20%(34) in the 18-20 years category, 75%(129) in the 21-23 years category, 1.16%(2) in more than 23 years category. Thus most people pursuing retail vocational education courses may not be pursuing their vocational education immediately after their higher/senior secondary school as 75% belong to the age group 21-23 years. Family income of 19.18 %(33) ranges between Rs.5001-10000, 41.27%(71) between Rs.10001-15000, 28%(48) earn Rs.15000-20000 and 11.6%(20) earn more than Rs.20000 income per month. Thus 60.5%(19.18+41.27) of the respondents pursuing retail vocational education belong to families earning less than 15000 per month

STATISTICAL TOOLS

The Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are considered as the two major modules of factor analysis. In EFA, the number or nature of the variables is not known and it provides an opportunity to explore the dimensions to create a theory, or model from a large set of latent constructs. Exploratory factor examination (EFA) could be depicted as methodical rearrangements of interrelated measures. EFA, customarily, has been utilized to investigate the conceivable hidden factor structure of an arrangement of watching factors without forcing a biased structure of the result (Child, 1990). By performing EFA, the

basic factor structure is distinguished. Principal component analysis was used with varimax rotation. The correlations between factors and the different items expressed by means of the factorial loads were significant. In CFA, testing an anticipated theory or model is permissible. CFA also has assumptions and expectations based on priori theory regarding the number of factors that offer best model fit.



ATA ANALYSIS

Exploratory factor analysis was applied to develop a tool for measuring the perception of students corresponding to the factors affecting their employability using SPSS V 22. 25 items (given in table 1) were subjected to exploratory factor analysis. The data on these items was collected on a 5 point Likert scale. Exploratory factor analysis reduced variables to sixteen and four factors were identified. The Kaiser- Meyer-Olkin measure of sampling adequacy came out to be 0.720 which is above 0.65 (the acceptance level) as shown in Table 2. This shows that the items selected for the questionnaire were appropriate. The chi- square value of Bartlett's Test of Sphericity was found to be significant (chi sq. = 1758.523, p=. 000), which means the factor analysis is acceptable. The factor analysis generated four components with eigenvalues above 1 with total variance explained 68.575%. The varimax rotation clubbed the items on four components as shown in Table 3. Cronbach alpha corresponding to each identified factor was found to be high as shown in Table 3.

Table 2: KMO and Bartlett's test of Sphericity

Kaiser- Meyer- Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	1758.523
	Df.	120
	Sign.	.000

Table 3: Rotated Component Matrix and Cronbach Alpha

Identified Factors	variable	Components	Cronbach alpha
Adaptive Skills (AS)	Q5 uses information to come to reasonable decisions and then act on these.	0.790	0.862
	Q13 learn from mistakes and can accept feedback.	0.757	
	Q4 able to share information using various communication technologies, like voice mail, e-mail and computers.	0.755	
	Q8 collect, analyze and organize information.	0.733	
	Q9 seek clarification when I do not understand an instruction.	0.667	
	Q21 link together different theoretical perspectives when working in a workplace or professional task or problem.	0.639	
	Q19 can adapt to new circumstances or information.	0.548	
Professional Excellence (PE)	Q16 present myself effectively in selection interviews and processes.	0.919	0.858
	Q23 understand the theories and principles in my discipline	0.901	
	Q17 the kind of person who has the energy to get the work done.	0.676	

Integrating Theory & Practices (ITP)	Q14 ready to commence work in your field or discipline	0.798	0.725
	Q20 apply knowledge and skills gained in my studies in the workplace.	0.791	
	Q24 understand the practices and methods used in my discipline	0.795	
Learning Skills (LS)	Q10 person who likes to take responsibility	0.778	0.658
	Q11 be prepared to invest time and effort in learning new skills.	0.744	
	Q12 recognize ethical practice in the workplace.	0.625	

On the basis of exploratory factor analysis, a diagram depicting the preliminary measurement model (Figure 1) was designed. The model displayed sixteen measured indicator variables and four latent variables which were subjected to CFA with AMOS V21. The latent variables were identified as an Adaptive Skill (AS), Professional Excellence (PE), Integrating Theory & Practices (ITP) and Learning Skills (LS) comprising items mentioned in Table 3.

Table 4: Validity and Reliability of Preliminary Model

	CR	AVE	MSV	MaxR (H)	ITP	AS	PE	LS
ITP	0.753	0.508	0.042	0.781	0.713			
AS	0.852	0.456	0.764	0.910	-0.051	0.675		
PE	0.799	0.579	0.247	0.948	0.204	0.497	0.761	
LS	0.613	0.390	0.764	0.961	0.023	0.874	0.358	0.625

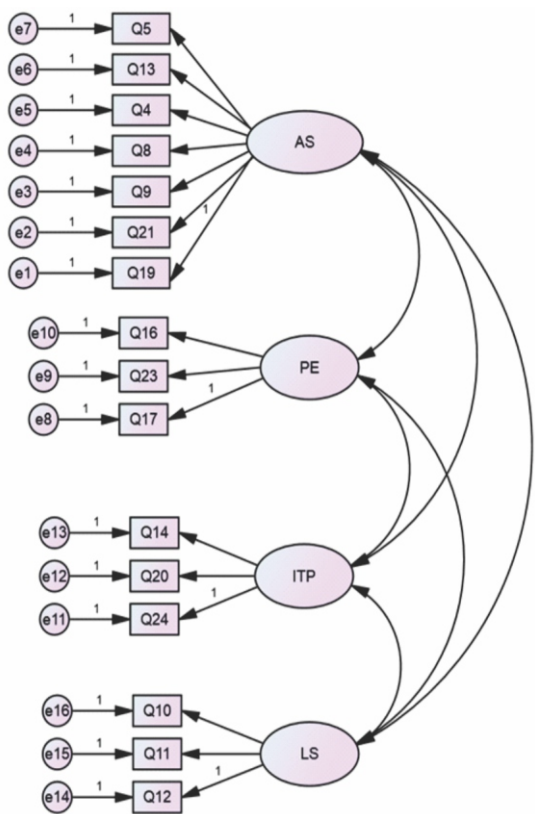


Figure 1: Preliminary Model

The output of the preliminary model (Figure 2) shows that the discriminant and convergent validity of AS and LS does not exist as the square root of the average variance extracted (AVE) of both the items are less than absolute values of the correlation with the other factors and AVE of both factors is less than 0.5. The construct reliability (CR) of LS was less than 0.7 and is not reliable as given in Table 4 (Hair et al., 2017). Preliminary model does not provide a good fit with the value of CMIN/ DF= 5.315, AGFI= 0.682, CFI 0.717 (Chi square value 520.843, p value=0.00), RMSEA=0.147.

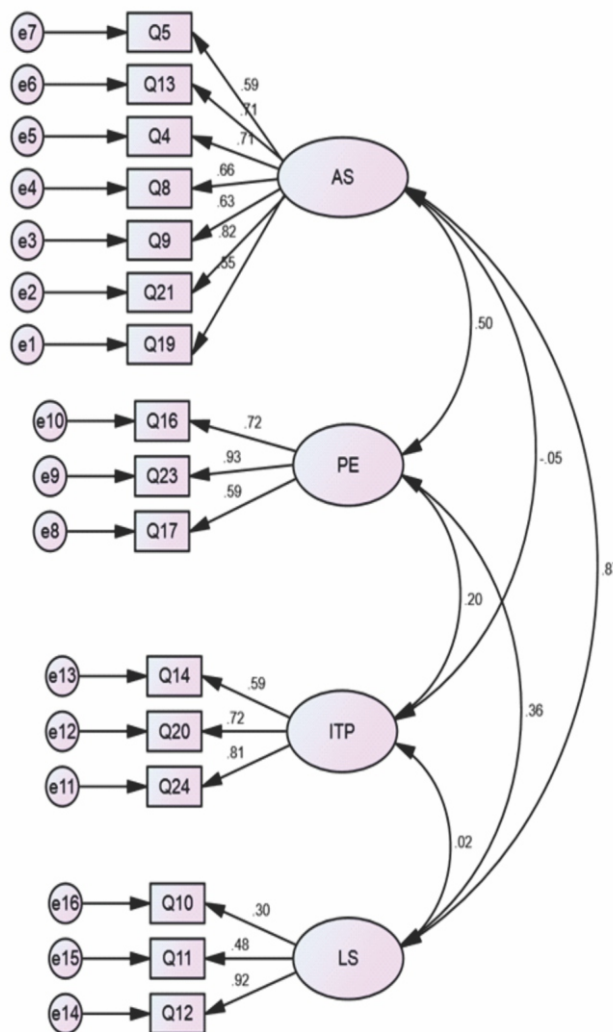


Figure 2: Output Preliminary Model

Hence it was amended to establish validity, reliability and improve the model fit. Modification indices and standardized residuals calculated through AMOS V 21 were used to modify the model resulting in the final model (Figure 3). Table 5 shows the reliability and validity of the model as the final model was significantly better fit in comparison to the preliminary model with Chi Square value = 109.364, p=0.000. The CFI for the final model was 0.918, indicating that the model provided a good fit. Other indices also indicated a good fit (CMIN=2.734, RMR=0.074, AGFI=0.873, RMSEA=0.093). All the factor loadings (standardized coefficients in figure 4) ranging from 0.59 for Q17 to 0.99 for AS and PE were highly significant and exceeded the 0.5 level which is meaningful in factor analysis approach. It was observed that both Adaptive Skills (AS) and Professional Excellence (PE) are equally important for Inter Personal Skills (IPS). The R² Statistic for Q21 (link together different theoretical perspectives when working in a workplace or professional task or problem) was found to be highest (0.8281) for Adaptive Skills (AS), R² Statistic for Q12 (recognize ethical practice in the workplace) was found to be highest (0.7056) for Professional Excellence (PE), R² Statistic for Q23 (understand the theories and principles in my discipline) was found to be highest (0.8464) for Integrating theory and Practice (ITP), and R² Statistic for Q24 (understand the practices and methods used in my discipline) was found to be highest (0.64) for Learning skills (LS).

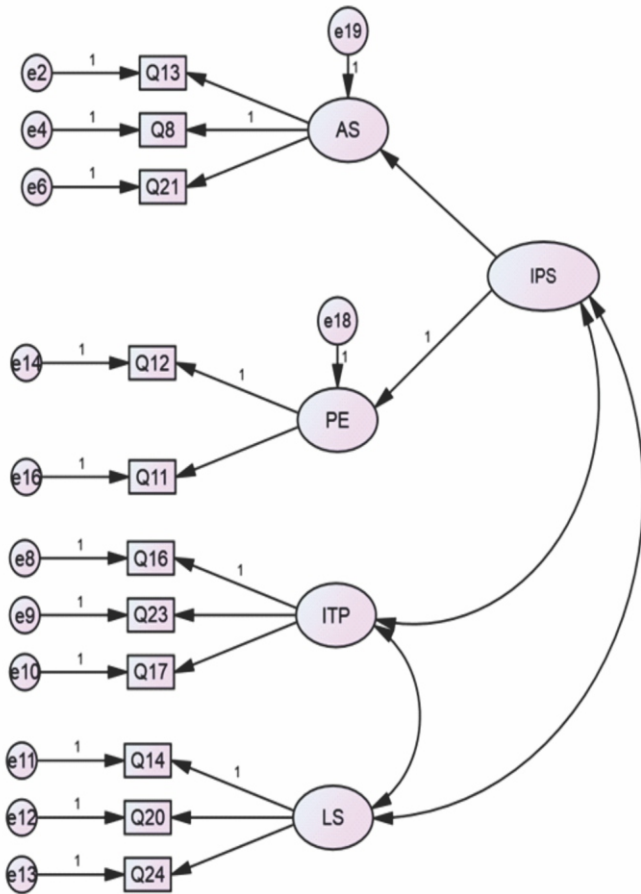


Figure 3: Final Model

Table 5: Reliability and validity of Final Model

	CR	AVE	MSV	MaxR(H)	LS	ITP	IPS
LS	0.754	0.509	0.041	0.775	0.713		
ITP	0.799	0.578	0.174	0.917	0.202	0.761	
IPS	0.990	0.981	0.174	0.992	-0.028	0.417	0.991

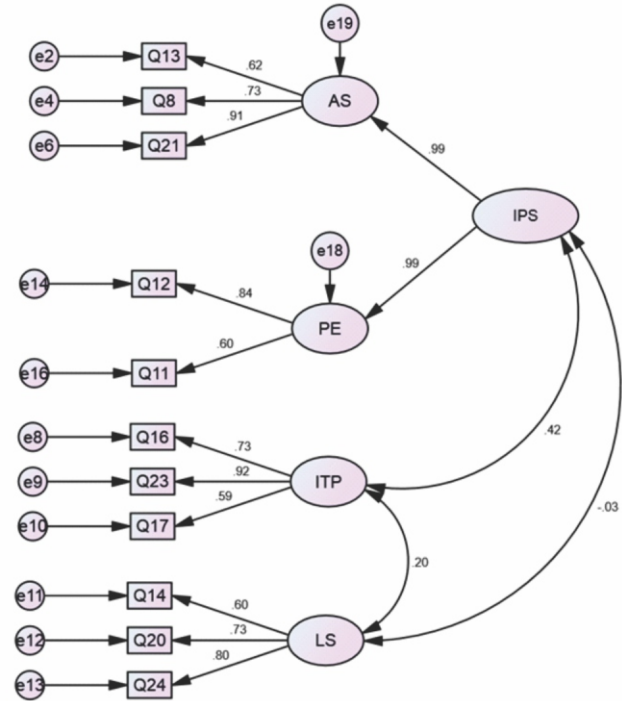
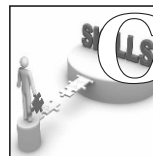


Figure 4: Output Final Model

The study revealed that the students perceive Interpersonal skills (IPS), Integrating Theory & Practice (ITP) and Learning Skills (LS) to be important in their employability.



CONCLUSION

The study has reiterated that skills are an important component for seeking employment. The skills identified in the study include Inter Personal Skills (IPS), Integrating Theory & Practice (ITP) and Learning Skills (LS). Enhancing these skills can only be achieved by training. Further, it also helps us understand the areas of focus for skill development as perceived by the students.

In current times the population of the country is over 1.2 billion and less than 35 age group's population is two third of the total population. A recent *Bloomberg News Analysis* also identified that by 2027, India would have a billion people in the 15 to 64 years category, the largest workforce in the world. The government has a bigger responsibility to provide them with adequate employment opportunities. Further, to be successfully employed students should be qualified and

trained in the requisite areas. The National Youth Policy was launched in 2014 for providing a holistic vision for the country's youth to empower them to achieve their potential. The National Policy on Skill Development and Entrepreneurship, 2015, also aims at providing a framework for the skilled activities carried in the country and links skills with demand centers. The establishment of the National Skills Council and other allied agencies are also some of the positive steps taken by the government in this direction. To augment the prospects of employment, the focus should be on enhancing interpersonal skills, integrating theory and practices and learning skills. The studies taken by the Employment skills and VET Policy, Australia also suggests the importance of organizational and training skills. Banerjee (2016) also opines that vocational education and training play a pertinent role in developing skilled manpower in the country. India has also been emphasizing on offering convenient access to technical and vocational education along with general education for meeting the demand for skilled employees (Goel, n.d).

Hence, the role of all stakeholders- government, employees, both current and prospective is to constantly enhance/update skill sets for being relevant in their respective areas. Further, the training programs should also be designed after undertaking a thorough need based analysis. The government should continuously monitor and elicit feedback from parties involved in providing training to understand the effectiveness

of existing policy and plan for future policy initiatives. The country is poised at a stage where new employability models need to be generated to achieve the mission of 'Skilling India'.

FUTURE RESEARCH

The current research was limited to comprehending the factors responsible for enhancing employability skills of the retail vocational education students like Interpersonal skills (IPS), Integrating Theory & Practice (ITP) and Learning Skills (LS). Further research can be extended to other regions of the country and other sectors to identify additional factors affecting employability.

Moreover, studies can also evaluate the perspective of managers/employers in assessing the factors responsible for enhancing employability skills. This will be useful in recruiting, training and retaining personnel in the organizations. The research can also be extended to students pursuing technical education and the impact of social factors on employability can also be assessed.

ACKNOWLEDGEMENT

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APPENDIX

Dear Participants

The purpose of this study is to examine employment skills of vocational education students in retail sector. The data would be collected from the students pursuing retail vocational education. This questionnaire collects information regarding the perception of students on various factors of skill development. All the responses provided by the respondent will be confidential and used only for educational purposes, for the project titled “A Study of Skill Development Situation and Model Development Relating to Employability for Vocational Education in National Capital Region, India” sponsored by ICSSR.

Name:				
Gender:				
Institute:				
Age:	15-17 years,	18-20 years,	21-23 years,	more than 24 years
Education:	10th	12th	others	
Family Income (per month):	Less than Rs 5000,	5001- 10000,	10001- 15000,	15001- 20000,
	More than 20000			

EMPLOYABILITY SKILL FACTORS IN RETAIL VOCATIONAL EDUCATION: AN EMPIRICAL ANALYSIS

20	Apply knowledge and skills gained in my studies in the workplace.					
21	Link together different theoretical perspectives when working in a workplace or professional task or problem.					
22	Recognize and value the role of theoretical ideas in work or professional contexts.					
23	Understand the theories and principles in my discipline.					
24	Understand the practices and methods used in my discipline.					
25	Set goals, plan and manage my time, money and other resources to achieve my goals.					

Privacy Threats and Techniques to Secure Personal Data on Social Networks

**Dr. Barkha Bahl, **Mr. Rahul Aggarwal*



Abstract

Social Networking sites have become the most efficient and effective means of communication and information sharing. Social networks provide an online space for people to share their personal information. As a result of such increased usage and sharing of information through these sites, negative entities such as hackers have found an easy way to steal the users' personal information and exploit them. To keep personal information private is the challenge and has been a matter of concern for every user. The reason behind this is the increased number of attacks

and difficulties faced while protecting the personal data against attacks and threats. This paper aims to discuss various data privacy threats which persist for the people on social media platforms, various prevention techniques and also to discuss the proposed technique to avoid and possibly prevent such attacks on privacy.

Keywords: Social Networking, Privacy, Threats, Risk factors

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INTRODUCTION

In the modern society, internet is the hub of information, social networks being at the heart of it. Social media provides a common platform for like-minded people and friends form a group, discuss ideas, share a mutual interest and also exchange information through various services with like-minded people.

There are various Social networking sites that are popular based on geographic location. Orkut is popular in Brazil, V Kontakte in Russia and Mixi in Japan. Facebook and Twitter have maximum usage worldwide. A Business-Oriented focus is provided through LinkedIn and Xing to enable sharing of business contacts and job offerings among the people who are using it.

The main purpose of such platforms is to communicate with others and provide different criteria for searching friends based on local areas, company name or based on common interest. Some search engines like yasni or 123people will search the keywords in multiple networks and return all possible results centrally. With the growth of the enterprises it has become more popular. It has been observed in a survey conducted by Symantec that 95% of the companies who were enquired do not block access to social network sites as they use social media for marketing purpose and also to keep their employees happy. 32% of people surveyed would not want to work for a company that prevents them from accessing a social network at work. On the other hand, the main worry of IT department which includes 84% of CIOs and 77% of system administrators, is security of personal data on social networks at work place. It is very difficult for administrators to prevent users from visiting social networks from work laptops while at home or when using company smart phones.

Social networking sites are used by millions of people to communicate, share their posts and login to access other services of different websites. To secure the personal data, awareness about its security, privacy and defending techniques against attacks are important for the users to understand. Social networking privacy issues have risen among users. The challenge today for every user is to keep computers and social networking more secure and more private. This is primarily due to the number of attacks and difficulties faced in defending against these attacks and threats (Kumar A., et. al. 2013). Next section will discuss data privacy threats, problems, risks and existing applications & widgets to secure the personal data on social networks.



LITERATURE REVIEW

As highlighted in the above section, social networks have become incredible tool in all age groups of the people especially among the youth and has become widely popular worldwide. It is mainly used for communication, self-expression, and for sharing information such as likes, dislikes, photos, interests, job details, relationship status, political views, current town details, religious views etc. Unfortunately, most of the users are not aware of the privacy risks associated with their shared sensitive information on the

internet. The privacy concern is raised among the users of social network when the personal information has been accessed by other users on the network. B2B International together with Kaspersky conducted a survey in 2015, which shows that although social networking is being used worldwide, but there are very few users who understand the risks of using social networking especially when using mobile device to access the sites. According to study (Gangopadhyay, S., et. al., 2014) 78% of the users are not concerned about the cyber-crime or cyber-attacks associated with their information.

The literature (Go-Gulf., 2014) shows some principle privacy problems in social networks. In Facebook, the real information of the user is used to create an account profile for the rest of Facebook users. The default privacy settings provided in Facebook are not enough, consequently the users are exposed to too much information of other users. The online social network default privacy settings are not changed by the users and sometime it is unavailable to adjust the privacy setting which are offered by Facebook such as the users can see the whole his or her shared information whenever users add his or her to be in friend list.

Literature (Kumar, A.et. al., 2013) reveals that the dissemination of private content on social networking platforms has increased the risk of identity crime and it also promotes establishment of a separate industry based on the trade of personal identification information. Another mode by which some of the attackers steal information is by requesting permission to access personal information through falsely projected pages. When the targeted user grants the permission, the attackers can easily access information and can misuse the same without the knowledge or permission of the users. Research conducted at Carnegie Melon University suggests that biggest bunch of social networking users who are victimized by identity criminals are between the age group of 15 to 25 years. It can also be looked up in the literature that young users are unaware but are still not bothered about the privacy settings offered by the social networking sites. Posting updates is the favorite pastime for the youngsters. It has been found by Staista, 2014 that the account of the users can be hacked and someone else can post updates on their behalf which can be different and peculiar, leading to problems for the users.

Protecting the personal content from malicious attacks is one of the major challenges being faced by the developers of website, especially social network providers. Social Network Privacy issue has been discussed by Several researchers (Gangopadhyay, S. et. al.,2014). According to researchers, in the year 2009, the information given by a user became 'more and more' public by default. This has happened not only because of information or updates given, but also providing the access to one's profiles like seeing photos as well as the list of friends which one might wish to keep private. These changes have made the personal data public for others without the knowledge of the users. In 2011, facebook has introduced some more setting changes, which even allowed the users, who are not even in the friends list to access the personal information.

According to Jo Pierson and Rob Heyman, 2011, the Internet

Cookie is considered to be the most powerful tool for collecting personal identifiable information. In 1994 Cookies were basically developed to give websites a memory or state, a configuration last used by a user and is known as First party http cookie. It is automatically sent to the user's browser, when the user interacts with the website. Another type of cookie is placed through advertisements, images or scripts hosted on a first party website by a third party server and are known as third party cookies.

Social media, needs third party cookies to get state information through different websites so as to ensure an optimal working service. Facebook, Google Buzz plugin and Twitter's tweet button gather's user's data in this way and hence can track the users. This is problematic as users have not accepted to be tracked via the plugins, which are not even used by them.

United Virtualities have implemented "Zombie Cookies" as 30 percent of the internet user's were deleting http cookies. These cookies are tagged to the user's browser. These can not be deleted by any commercially available adware, spyware or malware removal program.

The challenges of user's disempowerment and online privacy can be dealt at user level, technology level and on policy level. At the user level, the communication between the consumers and consumer groups has to be controlled and this is to be supported at technological level by introducing new techniques for tracking and exposing online consumer behavior. To control the misuse of the personal data, policy needs to be enforced to address transparency and awareness, by which users can know about the exchange taking place, which is further required to be addressed by the researchers. E.g with the social network site Buzz by Google. At the launch on 9 February 2010 Google Buzz automatically, without asking, published openly all personal networks of users based on the people they interact with via Gmail. However, e-mail contact lists can hold very private information, like names of personal physicians, romantic relationships or the identities of anti-government activists. They wrongfully assumed that information in one context (of e-mail correspondence like Gmail) could be disclosed without any problem in another setting (of social network relationships like Buzz).

In order to achieve a high level of privacy, literature discusses online privacy setting techniques to prevent the identity crime. The users should be authorized to govern their privacy settings whenever they receive or requests a service related to their personal details. Online privacy protection settings, that allow the user to control the profile view and distribution of personal data, vary across social networking websites, and there is no privacy standard for controlling the user's personal information settings. Although privacy settings should be chosen carefully, most online social network providers have complex privacy settings. These complex privacy settings may cause confusion among users. There is the 'Help' option too that provide help to the users to clarify their concerns (Gangopadhyay, S. et. al., 2014), but it was found that very less number of people use it. As a result, the major problems being faced by the young users of social networking site are identifying theft, hacking and commenting on controversies. Young users between the age group of 15 to 25 years are usually

unaware about the privacy Settings offered by the social networking sites. Also, they do not hesitate in sharing their personal details and photographs and they believe that their close friends are the only one who are sharing their updates and as a result their accounts can be hacked and they may receive disgraceful posts.

To avoid the hacking of personal data and its misuse. It suggests that the users should be more careful about adding friends while using social networking sites. Further, the public access to the private information should be restrained, also frequent changing of passwords is advisable to keep the accounts safe One potential way to mitigate privacy risk is to use different settings with targeted disclosure - that is, using different privacy settings for different posts. For example, It has been observed by Fiesler, C. . et. al., 2017, that the users were controlling the use of emotional or self expressive content Ad-hoc strategies are also adopted by the Facebook to prevent privacy threats. Overall, on social networking, privacy management are complex and encompassing a range of strategies.

In addition to above following data protection techniques are also suggested by researchers:

1. Stronger authentication methods: Server side authentication should always be adopted so that the server should know the identity of the user. Client side authentication is to be performed so that the request for the information can be processed by the server being requested. Usually, authentication by a server entails the use of a user name and password. Other ways to authenticate can be through cards, retina scans, voice recognition, and fingerprints. Client side authentication usually involves the server giving a certificate to the client in which a trusted third party, that the server belongs to the entity that the client expects it to connect can be verified. Social networking accounts should be protected with the usage of strong password and using different passwords on different social networking sites.
2. Usage of HTTPS to secure the user's connection to the site is recommended as it introduces encryption to provide security.
3. One should be Cautious while replying to emails sent through social networking sites to avoid spoofed attacks sent by cyber criminals.
4. Suspected Malicious Links/scams should not be clicked to avoid any attempt to infect the system. Apps like games should not be installed as these apps may have full access to the user's account and their private information.

Limitations of using social networking sites as revealed in literature talks about data privacy threats and other threats being encountered by the users of social networking sites. These are decreased productivity, more resource utilization, Viruses and Malware attacks, Access to personal web log or different social networking website account by Cyber criminals. The productivity of employees in an organization has been affected as they will be involved in changing their profile information or accessing the sites throughout the day. The users will be accessing the video links which will increase the price of web browsing. Attackers use social networks as a channel to spread viruses and malware. Since the associated

risks as discussed above are more corresponding to profile data hacking, therefore, the motivation of the research is to secure private data of the social networking users. Next section will explain the data privacy attacks caused due to limitations of existing applications and widgets in social networking site.

LIMITATIONS OF EXISTING APPLICATIONS & WIDGETS IN SOCIAL NETWORKS

Some social networks allow active content to be embedded in the form of applications or widgets. These applications can then interact with the user and his group of friends. A simple example would be a daily joke application, which posts a new humorous joke to the user's profile site every day for the user and the user's friend's amusement. More complex applications are also possible, like multiplayer games or photo rotation albums.

Wuest, C., Symantec found that each social network has its own way of implementing applications and embedding active content. Some allow remote code to be included in their application, which poses a great risk as it is hard to control the data which will be loaded on the site. Larger networks have created their own APIs, which allows developers to access specific information from the user's accounts. Unfortunately, that sometimes allows them to covertly access some information or even attack users or other applications.

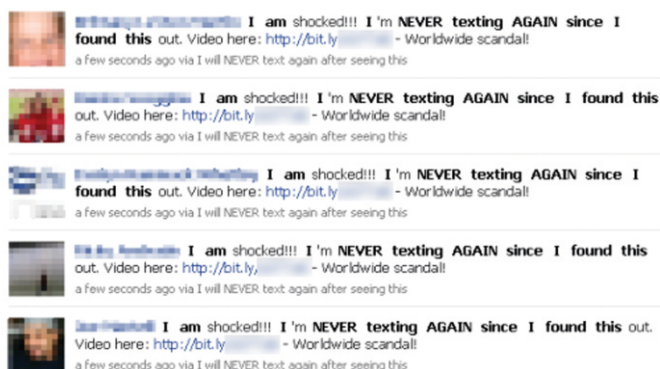
The following section shows some examples of attacks. In first example, researchers observed that how a video shared by Facebook user's messages through malware (Wuest, C., Symantec) and in second example, we found that how other websites take user's information without any permission.

Personal Data Attacks Due to Sharing of Video on Social Network

In July 2010 around 300,000 people fell for a shady application in Facebook. Suddenly more and more personal profiles started showing a message with the following text:

I am shocked!!! I'm NEVER texting AGAIN since I found this out. Video here: [http://bit.ly/\[REMOVED\]](http://bit.ly/[REMOVED]) - Worldwide scandal!

Social engineering posts on Facebook



Analyzing the click statistics for this specific short URL revealed nearly 300,000 clicks. If an inquisitive user clicks on

the shortened link he or she is redirected to a Facebook application. The names and URLs of the application vary. For example:

<http://apps.facebook.com/wonttextagain/>

<http://apps.facebook.com/nevertxttingagain/>

The list of application names grows and grows. This is because Facebook bans such applications as soon as they are discovered, but the malware author re-registers them under a new name in order to keep the attack working(Wuest, C., Symantec). The Malicious Facebook application's Installation page is shown in Figure 1 below:

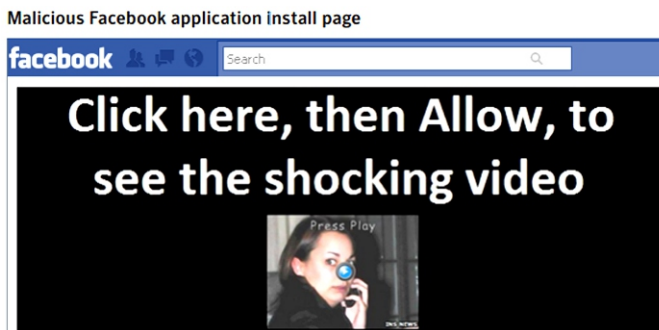


Figure 1: Malicious Facebook Application's Installation Page

Clicking on the Facebook application starts the application installation process. In order to fulfill its shady business the application requests some elevated privileges from the user, as seen in Figure 2:

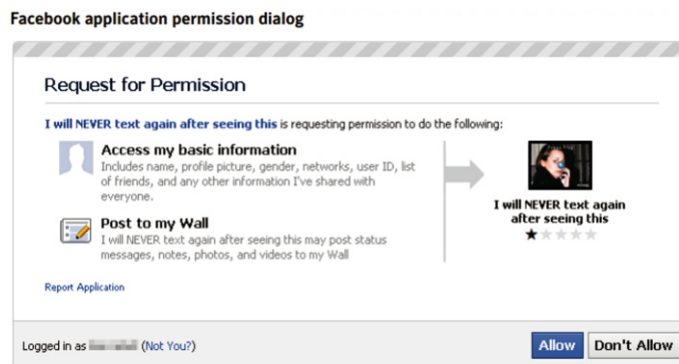


Figure 2: Facebook Applications's Permission Dialog Box

Personal Data Attacks Due to Usage of Music Application Ganna.com

While visiting some websites, we observed that there is only server side authentication through Facebook or google and mostly users easily ignore this and share their information for using website services.

Figure 3 below shows India's most famous music app gaana.com, which plays song online for users, but If user login through Facebook, it will ask for sharing information for using the services of the application.



Figure 3: Gaana.com

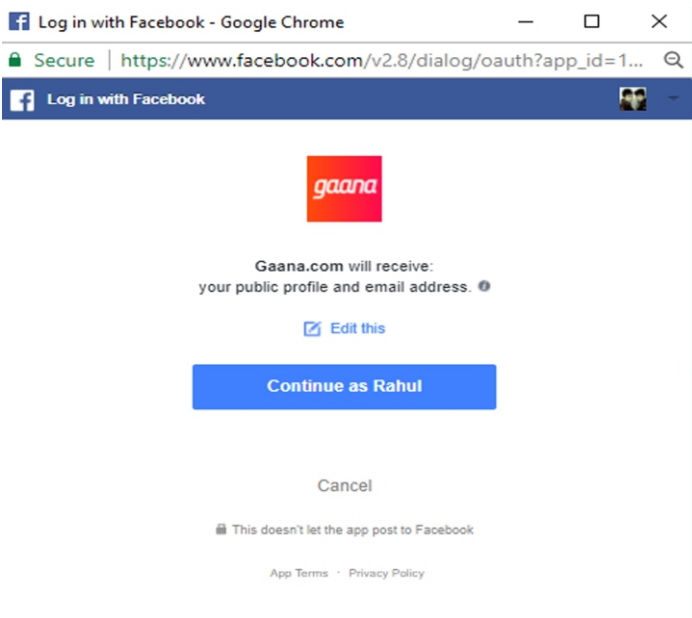


Figure 3: Ganna.com asks for sharing information

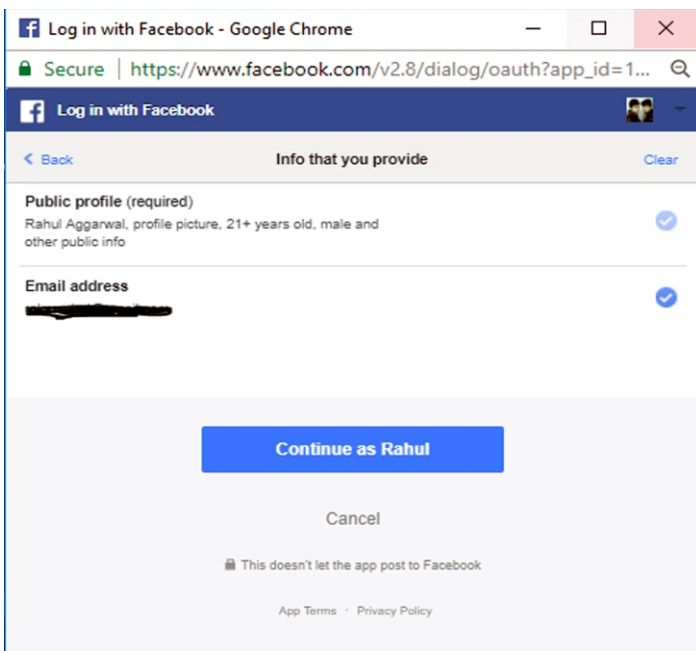


Figure 4: Editing page for sharing information

In Figure 3, Gaana.com asks for sharing user's public profile. If user clicks on “Edit this”, another dialog box will open (Figure 4 : right side figure) which will show what information the user is going to share. With one click, the whole user's datasets will be shared. These datasets may be in the form of API's which carry every user's information which is submitted by the user at the time of signup. Working of these applications has been explained below:

Working of Existing Applications

Most social networks allow applications to have a wide variety of access to user's data through different interfaces. Some provide documented Application Programming Interfaces(APIs) that allow specific access to pieces of information. Depending on its type, the application can be anchored deep within the social network and melded within the user interface. Alternatively, it could just interact on a loose level, displaying some partial information on a different website(Go-Gulf., 2014)

As an example, Facebook has two basic application types. First, there are social plugins, which allow the integration of basic Facebook features onto any website. Canvas applications, which do interact with the profile, can send update messages or open a new page, which in turn can contain nearly anything. Since 2010, Facebook requires any new developer to confirm their identity either by the help of a working mobile phone number or a credit card number.

This is done in order to combat anonymous developers registering dummy accounts for malicious applications.Unfortunately, this does not make it impossible to registeranonymous accounts with anonymous phone numbers which are still available in some countries. It has been suggested by the researchers (Wuest C., Symantec) that following list of some of the information an application can get permission for:

- Access the public information— this includes the user's name, profile picture, list of friends, and all other public parts of the profile.
- Access the profile information— this includes any additional information, such as birthday, favorite movies and books, etc.
- Send email— this means sending direct emails to the registered email address.
- Access posts in the News feed— this allows the application to read the posted messages.
- Access family and relationships information
- Access photos and videos
- Access friends' information— this includes their details, birthdays, etc.
- Access the data at any time— this means the application can access the data even if the user is logged out and not using the application at that moment.
- Post to the wall— add new message posts on the user's behalf.

There is server side authentication through Facebook which take these permissions from user for sharing information. If User allows these permissions whole API will be shared to that unsecure page and that page can save the data into database. This data can be shared to big companies for promotion and other purposes.

Research Gaps in the Existing Applications

Above reviews state that an application could get access to nearly all information that a user has entered in their profile, given that the user grants the permission to do so. Since the applications are allowed to load remote scripts, it is not possible to conclusively say what does happen to the user information and how it is processed. An application could easily store all the accessible information on an offsite database and use it later.

There is no client side authentication to stop sharing of the user information to the other users of the application. The users should be made aware of the data, which will be shared to other users through the warning box. In the current research the client side authentication technique has been proposed and is being explained in the next section.



RESEARCH METHODOLOGY

As a research methodology, a comprehensive approach has been followed which in turn is a two-fold process. During first process, research gaps have been identified based on the existing literature resulting to which,

Privacy Ensurer Extension has been designed by dint of top-down approach. Adhering to the procedure of top-down approach, firstly problem is being identified and then solution is find out by splitting up the problem under study at various levels. According to literature survey as explained above, it has been realized that there is a requisite to develop a technique which is proficient of warning the users whenever malicious attack occurs during web browsing. As a solution to this problem, we proposed a Google Chrome extension which is developed and added. Subsequently, as a part of second process of our research methodology, the proposed technique is tested against the third party-attacks during web browsing. For this, data survey was conducted by eighty trained users for analyzing the successful and satisfactory execution of the extension on various social networks. The below mentioned section explains the proposed personal data privacy technique, its design and, algorithm.

PROPOSED PERSONAL DATA PRIVACY TECHNIQUE

Privacy Ensurer, a browser extension application has been proposed to provide client side authentication. The application will work when user clicks on link of unauthorized page on Facebook or on other social networking sites. This extension application works through OAUTH keyword in the URL which is used to provide the authentication of transferring the user data like name, profile picture, gender, friend's information to other pages. If user wants to continue for redirection, then he can click on -Ok button on alert box. If not, then he can click on cancel button. Details of the Privacy Ensurer, its design and implementation has been explained below:

DESIGN METHODOLOGY OF PRIVACY ENSURER (Extension for browser)

A Browser Extension is a plug-in that extends or adds to the functionality of a web browser. Also web technologies like HTML, Javascript, CSS are used to develop web extensions. Others are developed using machine code and application programming interfaces (APIs) provided by web browsers, such as Netscape Plugin Application Programming Interface (NPAPI) and PPAPI. Browser extensions can even make changes in the user created interface.

Privacy Ensurer is a browser extension which is used to warn user whenever his personal information transfers from social network to other web pages.

The word “oauth” is very common in URLs where authentication is required, as shown by a study of URLs of various networking sites.

OAuth 2 is a framework for authorization, in which the applications are enabled to access to user accounts on an HTTP service, such as GitHub, Facebook, LinkedIn and DigitalOcean. The working of OAuth 2 is based on delegation of user authentication to the service that hosts the user account, and third-party applications are authorized to access the user account. OAuth 2 provides authorization flows not only for desktop and web applications but also for mobile devices. When there is call for users datasets or API's then Oauth token is sent to servers for giving permission for sharing the information in the form of API's to other sites. OAuth2 works through passing access and refresh tokens between the apps. OAuth defines four roles:

- Resource Owner
- Client
- Resource Server
- Authorization Server

Whenever this “oauth” word is encountered while using these applications, privacy ensurer will warn the user with an alert box as shown in Figure 5.



Figure 5: Privacy Ensurer Alert Box

Design of Privacy Ensurer Algorithm: The proposed algorithm to implement a privacy ensurer browser extension has been designed using top down approach. Once the user has logged in and tries to click the unsecure page link, it will confirm from the owner's page whether the data can be shared or not.

Once found ok it will continue otherwise the message will be redirected to the Facebook page of user.

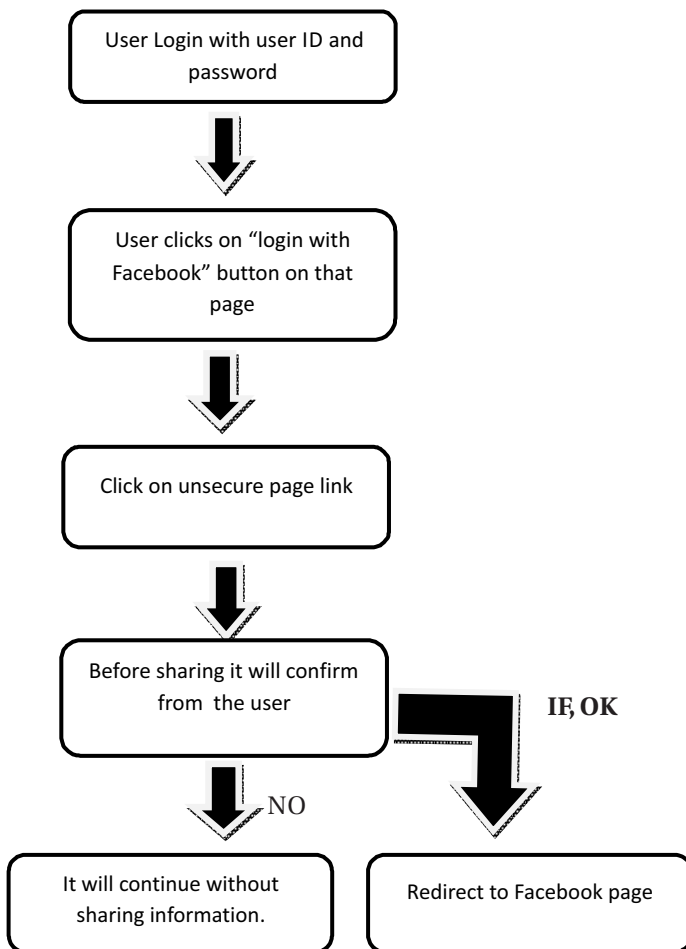


Figure 6: Flow Chart- Showing Steps for Privacy Ensurer

Implementation of Algorithm

We have developed a packed extension and then loaded it into Chrome browser.

The program has been developed using JavaScript and JSON. Back.js implements backend JavaScript code. It will search "OAUTH" keyword from URL and confirm user with a warning box.

Back.js

```

var page_url = location.href; // variable 'page_url' is used to store page url

if (page_url.search("oauth") >= 0) {
//page_url.search function is used to check oauth

```

Keyword in the page url

```

if(confirm("This page is not secure.continue?") != true)
//Confirm function is used to confirm from the user to continue further or not after displaying the message that "this page is not secure"

{

        window.location.replace("http://facebook.com");
//redirect back to facebook

}

}

```

Every extension has a JSON-formatted manifest file, named manifest.json that provides important information. This manifest file describes all important information about our extension.

Manifest.json

```

{

"manifest_version": 2, //The version of the manifest file format is specified, that our extension package requires.

"name": "Privacy Ensurer", //The name manifest properties are short, plain text used to identify the name of extension.

"version": "0.1", //One to four dot-separated integers are used to identify the version of the extension.

"default_locale": "en", //Specifies the subdirectory of _locales that contains the default language for this extension.

"description": "For securing your data from social network sites", //A plain text that describes the extension. It specifies task performed by extension.

"browser_action": {

"default_icon": "icon.png"

}, //set icon. png as default icon and put in the main google Chrome toolbar, to the right of the address bar.

"content_security_policy": "defined", //To mitigate a large class of potential cross-site scripting issues, Chrome's extension system is working on the general concept of content security policy.

"devtools_page": "devtools.html", //A DevTools file extension adds functionality to the Chrome DevTools for the extension.

"permissions": ["tabs"], //To use most chrome APIs, this extension must declare its intent in the "permissions" field of the manifest. It gives permission to access any tab.

"content_scripts": [

{

```

```

"matches":[
  "<all_urls>" //here it is used to apply script on all urls
],
"js":["back.js"]
}
] //This property has JavaScript files that run in the context
of all the web pages. By using the standard Document object
model (DOM), we can easily read details of the web pages the
browser visits, or working on it accordingly.
}
    
```

Steps for adding Privacy Ensurer Extension in Google Chrome-

Privacy Ensurer extension can be added by following the steps mentioned below :

- Google Chrome is to be opened
- Three dots on the upper left corner to be clicked
- Settings option to be chosen
- Extension Option to be selected

Figure 7 shows the illustrative representation of all the steps to be followed to add Privacy Ensurer Extension in Google Chrome.

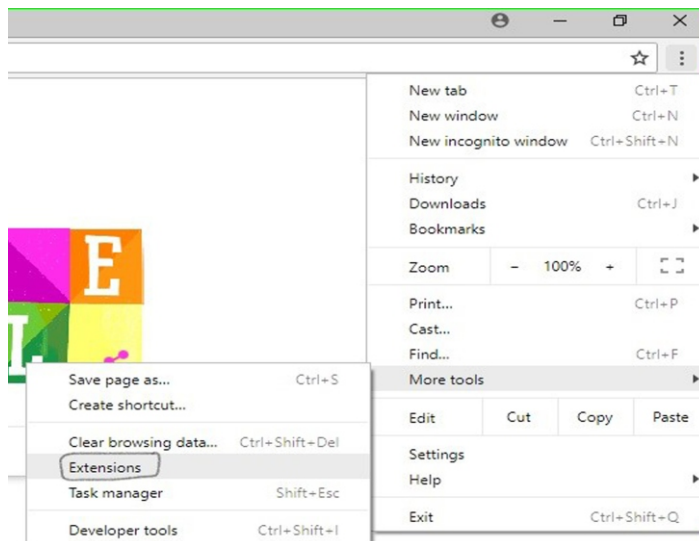


Figure 7: Adding Privacy Ensurer to Google Chrome
 Once the pack extension is loaded, extension icon will be visible with other extensions as shown in Figure 8. After activating the extension icon, users will receive the warning alert whenever there are malicious web-browsing attacks.

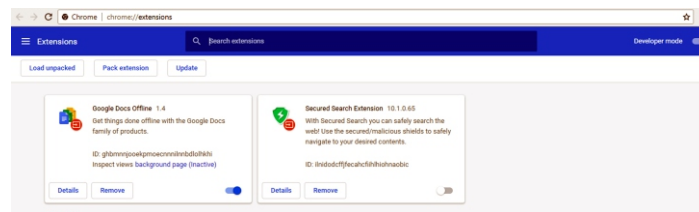


Figure 8: Extension ICON

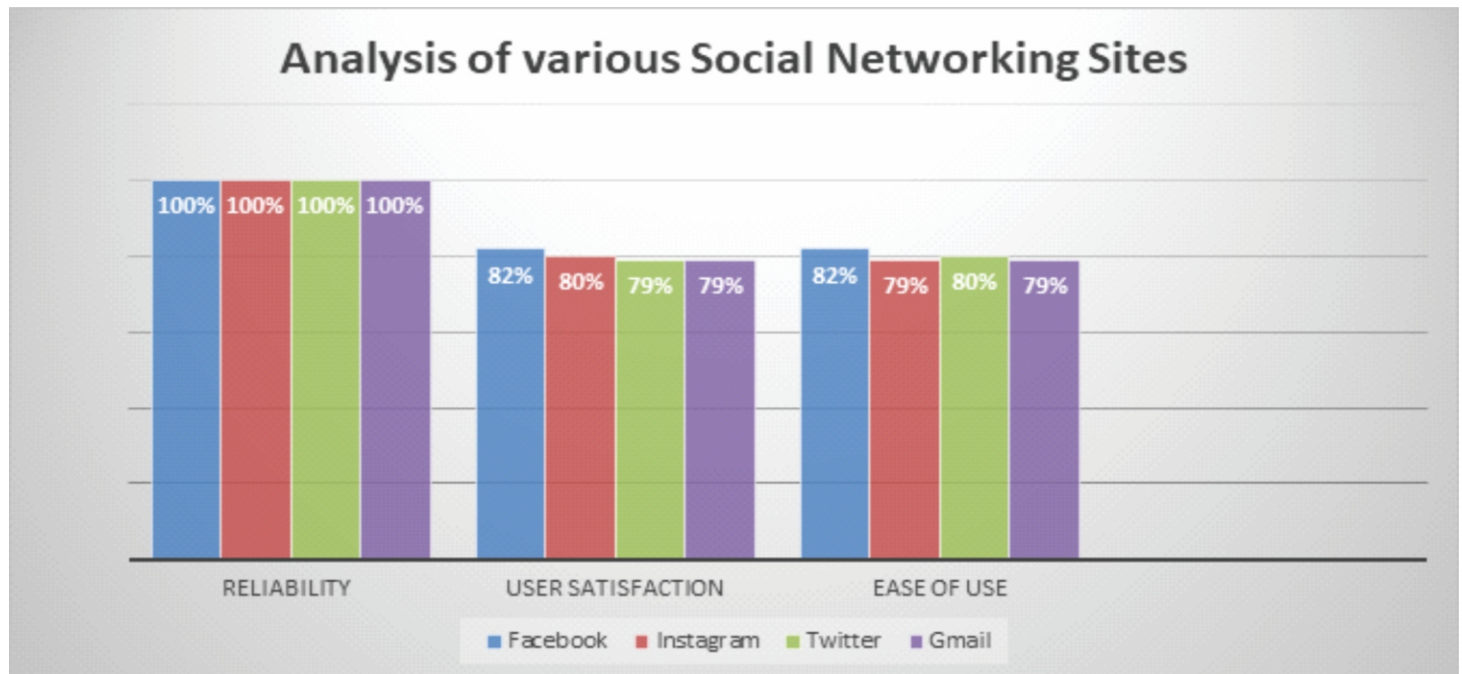
Data Survey on Various Social Networks

As conferred earlier in research methodology, survey has been conducted on 80 trained users. By trained users, here we meant that users have been given the prior knowledge of installing and activating the Privacy Ensurer extension in their respective web browsers. Succeeding to this, proposed extension has been analysed based on the four parameters Reliability of the Extension, User Satisfaction for the raised

Alert box and Ease of access for the user on various Social Networking sites i.e Facebook, Instagram, Twitter and Gmail. Statistics of the same has been shown below in Table 1. An average of 100%, 80% and 80% has been achieved against reliability, user satisfaction and ease of use corresponding to the four social networking sites under survey.

Table 1 : Analysis of the Data Survey on Various Social Networks

Parameters	Facebook	Instagram	Twitter	Gmail	Average
Reliability	100 %	100 %	100 %	100 %	100 %
User satisfaction	82%	80%	79%	79%	80%
Ease of use	82%	79%	80%	79%	80%



Graph 1: Parameter wise analysis of various Social Networking Sites

The statistics show that 100 percentage of the users are getting access to the extension, 80 percent users are satisfied for the alert being sent as warning and 80 percent user's can easily access the extension.

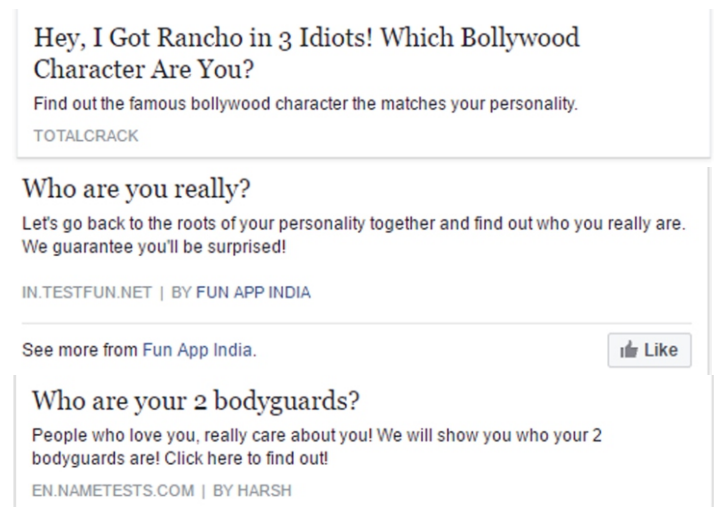
IMPLICATIONS FOR SOCIAL NETWORK USERS

Our paper has practical implications for the social network users. By installing the extension on Google Chrome personal data security has been provided to the users by sending an alert to the users seeking his permission to made the data available for other users or not. The existing privacy extensions on the Google Chrome uses Virtual Private Network and are encrypting the data so that third party can not steal the data. But in literature, there have been several attacks recorded against Virtual Private Nertwork secured traffic through Cookie Synchronization being used widely by third parties for advertisement and tracking purposes. Therefore, as per the statistical analysis, since 80 or 100 percentage of the users are satisfied on the individual parameters the extension developed can be adopted for the social network users.

TESTING AND RESULT OBTAINED

The proposed algorithm was implemented and tested on a extension application as discussed above. The extension was primarily developed using JavaScript and supported by multiple users. While testing, the extension was installed using Chrome browser. Around eighty users have executed the application and clicks are performed on many links and it has been observed that on every click, a notification pop up is shown on web browser asking for permissions for sharing data of social network sites. Example below shows how clicking on some links will lead to data leakage for the attackers and the same can be avoided by asking for the permission to share the data and continue through Alert Box as shown in Figure 10.

Some links are given below that are examples of applications through which user's personal data can be accessed. Clicking on these links will take the user to a new and attractive page as shown in Figure 9.



Pages that look fun actually take the user's information. After clicking on the above link it will redirect the page that looks like following:



Figure 9: Unauthorized page

Whenever the word “oauth” is encountered in the URL an alert box will pop up as shown in Figure 8. Alert box will ask for the users interest to continue with the personal information being shared to other webpage as shown in Figure 8 or to go back to the home page.



Figure 10: Asking for Permission for Sharing the Personal Data



CONCLUSION

Technology and social networks have made interaction and communication much easier than in the early decade. As social networking has become too popular, people are more concerned about their data privacy issues. In

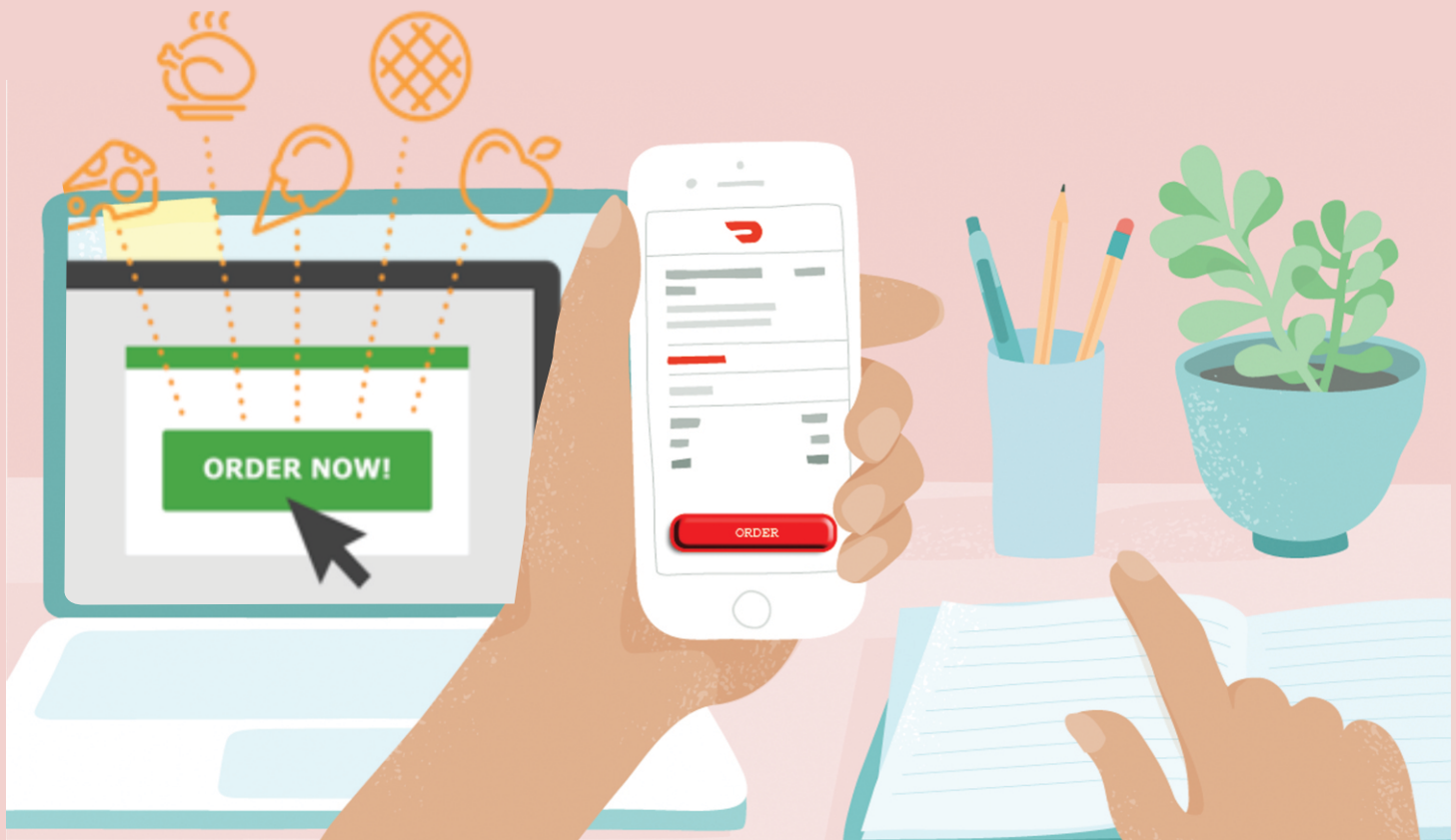
this paper, we have briefly explained the privacy threats, limitations of the existing social network techniques and the associated data privacy risks. It has been observed that personal data is not safe on social networks, as almost everything being posted or shared on social media platforms can be accessed by others, even those who are not in the friend list of the user. We have proposed a technique to avoid data privacy threats to the user through privacy insurer, an extension of browser. Privacy Insurer is a client side awareness that can be downloaded as a plug in to warn the users every time about the information leakage threat. The adoption of the privacy insurer extension by the social networking sites will be beneficial for the users to provide data privacy on social networks.

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Service Quality and Behavioral Intention: The Mediating Effect of Satisfaction in Online Food Ordering Services

**Dr. Divya Mohan **Dr. Nishant Kumar*



ABSTRACT

Perceived Service Quality, Customer Satisfaction and Behavioral Intention have always been of great interest for marketers. Present study explores the interrelationships among Perceived Service Quality component (i.e. Website design, Reliability, Responsiveness, Trust & Personalization), Satisfaction and Behavioral Intention (i.e. Intention to revisit and recommend) for online food ordering service providers. Cross sectional survey design followed with convenience sampling was used to draw a sample of 371 respondents. The hypothesized relationships were

tested with the help of Multiple Regression and the mediating effect was analyzed through Hierarchical Regression. Findings of the study propose that perceived service quality is a predecessor of customer satisfaction and satisfaction performs a mediating role between service quality and behavioral intention. Further, perceived service quality directly affects behavioral intention, inferring that the impact of service quality on behavioral intention is as essential as that of satisfaction.

Keywords: Perceived Service Quality component, Satisfaction and Behavioral Intention.

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INTRODUCTION

With the technology evolving day by day, online food ordering system has become a key part of the present food industry to endure the market competition and to serve the customers in a better way while improving the quality of services provided. Online food marketing enables fast and quick order processing service also providing the Global Positioning System assistance with regard to the food delivery system enhancing the customer gratification adding to customer devotion. Online food marketing system has immensely worked on the quality of food services being provided in the form of mobility, offers, deals, quick and easy order cancellation plans (in case of change in plans or better deals). Online services also let us compare the restaurants in regard to various parameters that would provide the customer with maximum satisfaction. The all-time availability features are an add on to the increased and repetitive sales from customers.

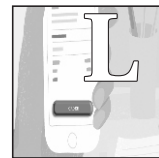
The online shopping is expanding in India and has a bright scope in future. The socio-cultural and economic changes are converting the eating habits of local consumers which also is accredited to the online ordering system. Consequently there is a rise in the occurrence of Indians dining by ordering food online. Due to increased product knowledge, fierce competition and changes in local eating habits have forced online ordering system to improve their connectivity and level of services. Therefore, it is considered important to explore this industry in terms of service delivery and behavioral intentions.

SERVQUAL Model was developed and implemented by the American marketing gurus Valerie Zeithaml, A. Parasuraman and Leonard Berry in 1988. Over the time, it became necessary to enhance the service standard to improve service quality in order to provide competitive edge. Service has become a necessity and as a result, the SERVQUAL Model had a significant impact. Satisfaction survey provides the transactions between provider and client, the ascertained quality is measured through generic, environmental factors. To look at the service quality and views of shoppers the importance is given to the event of quality systems within the arena of product price.

Service quality is considered as a major success factor for making new customers and retaining the old ones. It is also necessary for increasing satisfaction of shareholders, successfully implementing business strategies and increasing profitability of the company, in the world of globalization (Buttler, 1995; Ali, et.al., 2016; Brady and Cronin, 2010; Hussain et.al., 2015; Fotaki, 2015). Research on service quality has given importance in different types of industries such as banking (Felix, 2017; Sadaf, 2017), supply chain and logistics (Baloch and Jamshed, 2017; Yaprakli and Tuzemen, 2017), higher education (Meštrović, 2017), hospitality (Liat et al., 2017; Widarsyah et al., 2017) and health (Aliman and Mohamad, 2016; Lu and Wu, 2016).

There is difference between e-commerce and physical marketplace service so researchers need to be focused on evaluation of e-services, because of the difference of service

quality methods between e-business and physical marketplace (Parasuraman and Grewal, 2000). The SERVQUAL scale items need to be edited in the online shopping context to make it more meaningful Van Riel et al. (2001). The main focus of the study is to identify the influence of service quality using latest version of SERVQUAL model. The influence of e-services on perceived service quality, customer satisfaction and behavioural intentions is studied in the research paper (Parasuraman and Grewal, 2000; Jeong et al., 2003). The online managers need to understand the determinants of service quality, customer satisfaction and purchase intentions for online shopping. Furthermore, earlier studies have identified that service quality in online environments is an important factor for the effectiveness of online shopping (Yang, 2001; Janda et al., 2002). The research work of relation among dimensions of e-service quality in predicting overall service quality, customer satisfaction and purchase intention is limited for online shopping. To identify the key service quality dimension that affect customer satisfaction and behavioral intention in online food ordering system is being examined in this report.



LITERATURE REVIEW

Service Quality applied in several industries has always been an area of research in dynamic world. What's best today may not be even relevant tomorrow, hence it becomes very important for researchers to carry on

studies regularly to better understand the dynamics and highlight the gaps for the betterment of the industry. Over the years, numerous studies were done to highlight the gap between Service Quality and Customer Satisfaction and suggested ways to understand and bridge them together. Online food ordering is essentially a self-service approach, hence reading some of the studies that have been conducted on consumer's behavior of self-service approaches become mandatory.

Service Quality

Service quality is defined as the overall evaluation of a service by the customer (Eshghi et al., 2008). The intangibility, heterogeneity and inseparability helps to understand service quality much better (Parasuraman et al., 1985). "Excellent service quality will result in a high level of customer's satisfaction." (Naeem & Saif, 2009). "Customer's satisfaction can be built through the quality of service" Kotler and Keller (2006). "In case of services consumers look in for quality at the priority" Negi (2009). "Service quality in the management and marketing literature is the extent to which customers' perceptions of service meet or exceed their expectations" Bowen and David (2005). Thus, service quality can intend to be the way in which customers are served in an organization which could be good or poor.

Service quality has appeared as an important concept in marketing of services from past few years. Parasuraman et al. (1988) developed a model of SERVQUAL that has five influential elements: Tangibility, Reliability, Responsiveness, Assurance and Empathy (Parasuraman et.al., 1988; Zeithaml, et.al, 1990). It has been proved that Reliability, Responsiveness, Assurance, Empathy and Tangible had met the standard of validity and reliability analyses and have been

important predictors of customer satisfaction (Berry, et.al, 1985; Parasuraman et.al., 1988; Zeithaml, et.al, 1990).

Customer's Satisfaction and Behavioral Intentions

It is necessary that food ordering platform should understand their weaknesses and design policies to enhance customer satisfaction (Hsiao et al., 2016). Repeat purchase behavior is predominantly affected by customer satisfaction (He and Song, 2009). Loyal customer and the major predictors of customer satisfaction are loyal customers and new customers (Barber et al., 2011; Tuu and Olsen, 2009) and they are the major revenue source for the company (Brunner et al., 2008).

The customer satisfaction is of much importance in service marketing and has linked purchase/consumption to post-purchase phenomena such as changes in attitude of the customer, repeat purchase behavior and spreading positive word of mouth which enhances customer loyalty (Oliver, 1994; Fornell et al., 1996; Oliver, 1997). There have been various definitions of customer's satisfaction based on different aspects; Kotler and Keller (2009) directly defined satisfaction can also be a person's feelings of pleasure or disappointment that results from comparing a product's perceived performance or outcome with their expectations. Sureshchander et al. (2002) expressed that consumer's experience with the supplier at a particular point of contact judges his level of satisfaction.

So, it can be clearly stated that the concept of customer's satisfaction is the difference between pre-purchase and post-purchase satisfaction levels or the gap between previous performance and current one. "The terms customer's satisfaction and perception of quality are labels we use to summarize a set of observable actions related to the product or service" (Hayes, 2008, p.33). Customer Satisfaction has been an important topic in the marketing literature from decades and has gained importance as compared to most of other studies (Oh and Kim, 2017).

Behavioral intentions are an individual's likelihood that he or she will involve in a certain activity (Ajzen and Fishbein, 1980). For Ali et al. (2013), the positive word of mouth, high spending, paying extra price and being loyal to a service provider indicates the favorable behavioral intentions whereas negative word of mouth and reducing spending with a service provider implicit unfavorable behavioral intentions where customer plans to switch the service provider Jani and Han (2011). Therefore, the experience of a consumer with a product or service forms his attitude towards a service provider and is further reflected in his intention to repurchase and spreading positive word of mouth. (Han and Kim, 2009) In their study reported behavioral intention is talked in the form of repeat visits and positive recommendations. Behavioral intentions are one of the important goals in the service marketing community as it is a key component for an organization's long-term viability or sustainability. According to Zeithaml et al. (1996), favorable behavioral intentions are associated with a service provider's ability to get its customers to say positive things about them, recommend them to other customers, remain loyal to them, spend more with the company and pay price premiums. Previous studies have used one or more of these five proposed constructs to examine the outcomes of

quality (Oh, 1999; Baker & Crompton, 2000; Kim et al., 2008; Han et al., 2009) and satisfaction (Spreng & Mackoy, 1996).

There have been numerous studies on the relationship of service quality and satisfaction (Parasuraman et al., 1988; Cronin & Taylor, 1992) and further the satisfaction and intentions of customers (McDougall & Levesque, 2000). The attitude and buying intention relationship are controlled by customer satisfaction (Taylor & Baker, 1994; Mattila, 2000), but at the same time satisfaction and perceived service quality are two separate theories.

Factors Influencing Online Food Services

A well-designed and user friendly self-service ordering system gives customers substantial control over the pace of their transaction and allows them to limit the amount of personal interaction they experience. This increased level of control over the system has led to higher customer satisfaction and greater intent to use or recommend the service to others. (Collier and Sherrell, 2010) reported perceived convenience of a self-service system also leads to an increase in both adoption and overall customer satisfaction. Guo, Ling, and Liu (2012) developed a model of factors influencing online shopping satisfaction in China. They discovered eight critical factors on customer satisfaction; interactive website, data security, information quality, payment methods, e-service quality, product quality & variety, and efficient delivery service. Their study highlights that each of these factors are positively related to consumer satisfaction.

SERVQUAL is used for measuring customer's perception of service quality using a multi-scale model (Parasuraman et. al 1988). These scales were tangible dimensions of the physical facilities, reliability dimension on the type and kind of services provided, the responsiveness dimension relates to the willingness to help customers and provide prompt service; the assurance dimension means the employee knowledge base which could earn customer trust and confidence; and finally, the empathy dimension which is about caring and individualized attention provided to customers.

For online businesses the challenge is in measuring web-based service quality as the traditional SERVQUAL may not fit. Parasuraman and Grewal(2000) suggested that revision of the classical SERVQUAL dimensions are necessary for measuring web-based service quality. In online services customers interact with technology rather than the traditional service personnel.

Parasuraman, Zeithaml & Malhotra (2000, 2002) developed an e-SERVQUAL to measure electronic service quality and to study how customers judge e-service quality. They identified five scales – web site design, reliability, responsiveness, trust, and personalization to measure the customer's perception of the service quality of online retailers (Janda et al., 2002; Yang and Jun, 2002; Santos, 2003). It is often argued that better service quality can create better customer satisfaction (Zeithmal et.al. 1996).

Website Design: The quality of Web site design is crucial for online stores (Than and Grandon, 2002). It describes the application of user interface design that it presents to customers (Kim and Lee, 2002). There has been extensive

study of influence of website design on e-service performance. An empirical study has been conducted, by Cho and Park (2001) in which samples of 435 internet users were evaluated to observe the e-commerce user-consumer satisfaction index (ECUSI) for internet shopping. It has been observed that the customer satisfaction is judged using the quality of web site design. According to research studies it can be clearly stated that web site design factors are strong predictors of quality, intentions and satisfaction (Wolfinbarger and Gilly, 2003).

Reliability: The ability of the web site to fulfill orders properly, deliver on time, and keep personal information confidential is termed as reliability (Parasuraman et al., 1988; Janda et al., 2002; Kim and Lee, 2002). Its importance has been discussed by the information technology-based service. Moreover, Zhu et al. (2002) debated that reliability has a direct positive effect on perceived service quality and customer satisfaction by electronic banking systems. Online ordering system must provide zero - error service and protected online transactions so customers comfortably do online shopping.

Responsiveness: Customers believe that online ordering system will promptly answer their queries (Liao and Cheung, 2002). Responsiveness can also be defined as online ordering system voluntarily providing services (e.g. handling queries, information retrieval and navigation speed) which are important to its customers (Parasuraman et al., 1988; Yang, 2001; Kim and Lee, 2002). The significance of perceived service quality and customer satisfaction are highlighted by the researchers who have studied the responsiveness of web - based services (Yang and Jun, 2002; Zhu et al., 2002).

Trust: Online ordering system is comprised of the interaction between customers and online stores (Bakos, 1991). Many studies focus on the importance of online reliability between customers and online stores (McKnight et al., 2002; Krauter and Kaluscha, 2003). Trust is a substantial originator of contribution in business especially in online settings because of the increased simplicity with which online stores can behave resourcefully (Reichheld and Scheffer, 2000). Moreover, it is customer willingness to accept helplessness in an online transaction because of their positive hopes regarding future online store behaviours (Kimery and McCard, 2002). So, it can be clearly stated that trust promotes online purchasing and leaves an impact on the attitudes of customer for online shopping (Gefen, 2000; Gefen et al., 2003).

Personalization: Due to non-interaction in online shopping the possibility of potential customers turning into actual customers is less. (Yang and Jun, 2002). Personalization involves personalized devotion, special thanking notes from online stores, and the convenience of a message area for comments and queries of customers (Yang, 2001). Earlier studies have examined the influence of the buyer's service provided by internet retailers on buyer's perceptions of service quality and satisfaction (Wolfinbarger and Gilly, 2003).

Consumers will satisfy or dissatisfy to a certain extent with the service, and will make the corresponding quality evaluation of the service provided. The downside of self-service technology occurs with people who have technology anxiety and those who need better interaction making the tool another tangent to analyze the satisfaction. (Meuter et. Al, 2005) have shown

that these factors can affect adoption of self-service ordering and satisfaction with it.

Service Quality, Customer Satisfaction and Behavioral Intentions

Customer satisfaction and behavioural intention is directly associated with service quality (Qu, 1997; Pettijohn et al., 1997; Oh, 2000; Ladhari et al., 2008; Kim et al., 2009). It is not necessary that a satisfied customer will always be a loyal customer but it is certain that a dissatisfied customer will never turn for repeat visit (Soriano, 2002). It can be clearly said that customer satisfaction is necessary for service oriented organizations because it positively affects the attitudes and intentions of customers (Taylor & Baker, 1994; Mattila, 2000). Behavioural intentions and customer satisfaction are not similar but interrelated because a satisfied customer has positive reinforcement for using a particular brand or service for particular instances. (Oliver, 1980; Cronin & Taylor, 1992). According to Zeithaml et al. (1996), Word - of -mouth, repurchase intentions, complaining behavior, loyalty helps in predicting the behavioral intentions. When customers perceive service quality to be poor and dissatisfaction is felt, they complain about the service and involve in negative word-of-mouth (Richins, 1983; Singh, 1990). So customer satisfaction implies there is possibility that customer will frequently purchase from the same service organization.

Studies reveal that customer satisfaction is peculiar to online food industry as it signifies loyalty of customers, making new customers through positive word of mouth and repeat purchases. (Oh, 2000; Yüksel & Yüksel, 2002). According to Gupta et al. (2007), the online food industry earns profit if the customer is satisfied and repeatedly indulges in buying from the same service provider. Therefore studies examining the link between customer satisfaction and repeat purchase have been plentiful and the literature reveals that there is a strong relationship between customer satisfactions with repeat-purchase intentions (Stevens et al., 1995; Pettijohn et al., 1997; Kivela et al., 1999; Sulek & Hensley, 2004; Söderlund & Öhman, 2005; Cheng, 2005). Various studies have recognized the relationships between service quality, customer satisfaction and behavioral intentions, namely intention to return and to recommend.



OBJECTIVES, RESEARCH QUESTIONS AND HYPOTHESES

There is need of research on the influence of online services on customer responses, such as perceived quality of service, satisfaction and behavioural intention (Parasuraman and Grewal, 2000; Jeong et al., 2003). A clear understanding of the components of quality of service, satisfaction and behavioural intention for online commerce is important. Past studies have shown that quality of service in online commerce is a critical component of the usefulness of online commerce (Yang, 2001; Janda et al., 2002).

The Aim of the research was:

- 1) To examine the interrelationship between Service Quality Components (i.e. Website design, Reliability, Responsiveness, Trust & Personalization), Customer Satisfaction and

Behavioural Intention.

2) To identify the impact of Service Quality Components on Customer Satisfaction and Behavioural Intention.

3) To investigate the mediating role of Customer Satisfaction in the relationship between Service Quality components and Behavioural Intention.

To address the purposes following research questions were postulated:

- 1) How do Service Quality components affect Customer Satisfaction?
- 2) How do Service quality components affect Behavioural Intention?
- 3) How does Customer Satisfaction affect Behavioural Intention?
- 4) Does Customer Satisfaction mediate the relationships between Service Quality components and Behavioural Intention?

Based on Literature Review following Hypotheses were proposed in order to meet the objectives and answer the research questions:

H1: Service Quality components (i.e. Website design, Reliability, Responsiveness, Trust & Personalization) significantly affects Customer Satisfaction.

H2: Customer Satisfaction significantly affects Behavioural Intention.

H3: Service Quality components (i.e. Website design, Reliability, Responsiveness, Trust & Personalization) significantly affects Behavioural Intention.

H4: Customer Satisfaction mediates the relationship between Service Quality components and Behavioural Intention.



RESEARCH METHODOLOGY

Research Design

In this research work quantitative research approach has been used. Cross-sectional research design was used and survey using this design considers data collection from a sample that truly represents the population to which generalization is made (Cooper, Schindler, 2011). This approach is generally used for prediction of behaviour from a large population (Bordens, Abbot, 2002), and it also provides the basis for establishing the nature and degree of relationship between the study variables (Kerlinger, 1986). The epistemological standpoint directing this examination is a target method for taking a gander at social reality. In this way, it can be said this investigation is positivist in nature.

Measures and Data Collection

All the construct definitions of the instruments and the related literature is listed below in Table 1. The study adapted the measures used to operationalize the constructs from various relevant previous studies, making slight language changes to modify these measures to the online shopping context. The perceived service quality measure website design, reliability, responsiveness, and personalization were considered from the SERVQUAL model (Parasuraman et al., 1988; Kim and Lee, 2002; Yang and Jun, 2002), items for trust were reframed from Kimery and McCard (2002), items for customer satisfaction and behavioural intentions were revised from Oliver (1980), Taylor and Baker (1994) and Zeithaml et al. (1996).

Table 1: Construct Definition

Constructs	Definition	References
Website design	Perception of customers regarding user friendliness in making online purchase	Parasuraman et al. (1988) and Kim and Lee (2002)
Reliability	Perception of customers for trustworthiness and safety provided in online purchase	Parasuraman et al. (1988) and Kim and Lee (2002)
Responsiveness	Perception of customers regarding responsiveness and usefulness of the services provided in online purchase	Parasuraman et al. (1988) and Kim and Lee (2002)
Trust	Perception of customer for trust mechanism provided in online purchase	Kimery and McCard (2002)
Personalization	Perception of customers for customization of services provided in online shopping to satisfy individual's needs	Parasuraman et al. (1988) and Yang and Jun (2002)
Customer Satisfaction	Right decision, Repetitive choice and Satisfying Experience	Oliver (1980), Taylor and Baker (1994)
Behavioral Intention	Intention to revisit & recommend	Zeithaml et al. (1996).

Questionnaire was designed comprising of three parts. First, respondent's perceived service quality was measured. Second, Respondent's Satisfaction & Behavioural Intention was measured. All items were measured using a five-point Likert scale (ranging from 1 "strongly disagree" to 5 "strongly agree"). The third part consisted of demographic questions like gender, education, occupation, income and frequency of ordering food online.

Target population of the study includes the individuals ordering food online in Delhi/NCR region. The online platform considered for ordering food were Swiggy, Zomato, Foodpanda & others i.e. directly from restaurants website. Convenience sampling was used for data collection. Questionnaires were distributed to the individuals who were willing to participate in the research and they order food online. A total of 500 questionnaires were distributed by the researchers and only 371 questionnaires complete in all aspects were considered for the study, yielding a response rate of 74.2%.

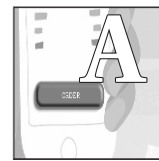
Out of 371 usable responses, 53.4% were male (n=198) and 46.6% (n=173) were female; 36.1% (n=134) were graduate, 54.2% (n=201) were postgraduate and 9.7% (n=36) include others; 37.7% (n=140) were student, 55% (n=204) were working, 5.1% (n=19) were retired and 2.2% (n=8) include others; 55.8% (n=207) were having income below 4 Lakhs, 27.0% (n=100) were having income between 4-8 Lakhs, 17.3% (n=64) were having income above 8 Lakhs; 19.4% (n=72) order food online once or more in a week, 32.6% (n=121) order food online once or more in a fifteen days, 48.0% (n=178) order food online once or more in a month; 29.1% (n=108) prefer Swiggy, 27.0% (n=100) prefer Zomato, 25.3% (n=94) prefer Foodpanda, 18.6% (n=69) prefer Others for ordering food online.

Reliability and Validity Assessment

To confirm rigidity and generality of the research findings, both validity and reliability were assessed. The reliability was assessed using Cronbach alpha, while validity was checked using content validity. To ascertain Content validity, the researcher focused on the approaches suggested by Cooper and Schindler (2011); that is, recognizing existing scales from the related literature and looking for opinions from a panel of experts, like professionals and academicians from the field of marketing. On the basis of feedback, several items were altered to improve the simplicity of research instrument. Different views has been put forth for ascertaining the level of acceptance towards the reliability measure, Hair et.al (2010) argued that alpha values of 0.60 and higher are acceptable. The reliability of overall Service Quality was 0.764, which has been estimated by the reliability of Cronbach alpha. The Cronbach's alphas for the five components of service quality were 0.704 (Website design), 0.718 (Reliability), 0.644 (Responsiveness), 0.731 (Trust) and .787 (Personalisation). The reliability coefficient for the mediating variable Customer Satisfaction and the dependent variable Behavioural Intention were 0.646 & 0.723. Cronbach's alpha values for all the variables and constructs are above the cut-off point of ($\alpha=0.60$). Thus, all measurement scales are believed reliable.

Data Analysis

Statistical Package for Social Science software and descriptive-inferential method were used for analysing the data. Descriptive statistics such as mean scores and standard deviations were figured according to the variables. To check the nature of relationship between the variables, to identify the level of autocorrelations in variables and for multicollinearity, the Pearson product – moment correlation analysis is applied. A series of regression analysis was used to test hypothesis. To test likely mediating effect of overall customer satisfaction on the relationship between service quality and behavioural intention, a hierarchical multiple regression analysis was piloted. Standardized beta were used for all of regression analyses. The value of p less than 0.05 was considered for statically significance.



ANALYSIS AND DISCUSSION

Descriptive and Correlation among the variables

Result in Table 2 represents the Descriptive statistics and Pearson correlation analysis. The mean of the variables ranged from 3.0422 to 3.4385 and standard deviations ranged from 0.52590 to 0.68905. Out of the five perceived service quality Components, Trust has the highest mean (M=3.4232, SD=0.66057) and perceived as most important component of service quality. It means that customer perceives trustworthiness and confidence in online platform is the most significant contributor for judging the service quality of online food ordering service providers. Personalization has been ranked second with (M=3.3819, SD=0.67431) which means that after trust customer centric approach is having due importance in terms of service quality. Website Design with (M=3.2217, SD=0.57470) was ranked fourth followed with Reliability (M=3.1806, SD=0.68271) and Responsiveness (M=3.0422, SD=0.68905). This finding leads us in believe that visual appeal, well organised appearance and ease of performing transaction (Website Design) are also important for better service quality. Performing order within stipulated time limit, error free transactions, interest in solving customer problem and adequate security (Reliability) also help customer to identify service quality. Prompt service, willingness to help customers & response to customer request (Responsiveness) has been ranked fifth among the five service quality component. Overall mean and variance of service quality dimension was (M=3.2499, SD=0.43496).

Table 2: Descriptive and Correlation

Variables	Mean	SD	1	2	3	4	5	6	7
Website Design	3.2217	.57470	1						
Reliability	3.1806	.68271	.461**	1					
Responsiveness	3.0422	.68905	.510**	.580**	1				
Trust	3.4232	.66057	.211**	.251**	.326**	1			
Personalization	3.3819	.67431	.570**	.504**	.465**	.458**	1		
Satisfaction	3.3073	.52590	.573**	.507**	.487**	.490**	.534**	1	
Behavioral Intention	3.4385	.67252	.421**	.382**	.389**	.398**	.550**		1

Note: ** Correlation was significant at the 0.01 level.

Correlations among the variables represent statistically significant relationship. It can be concluded that the perceived service quality components were significantly positively correlated with the variables or construct. This association provided added experimental support for the four componential conceptualization of perceived service quality. Components of service quality were significantly related to Customer Satisfaction. The highest correlation of website design with Satisfaction (r=0.573). Reliability(r=0.507) and Personalization (r=0.534) is visible and are also considerably related to Satisfaction. Finally, Responsiveness (r=0.487) and Trust (r=0.490) had a sensible significant positive correlation to the measures of Satisfaction. These relationships could be interpreted as increase in focus on service quality component leads to increase in satisfaction.

Moreover, the result showed that there were substantial positive relationship between service quality components, namely Website Design (r=0.573), Reliability (r=0.507), Responsiveness (r=0.487), Trust (r=0.490), Personalization (r=0.534) and Behavioral Intention. This means that higher increase in Service Quality components leads to increase in

customer orientation toward revisit and recommendation. The correlation results also revealed that customer satisfaction was significantly and positively correlated with Behavioral Intention (r=0.550), thus indicating that the customers with high level of satisfaction were likely to reflect positive behaviour toward company. All of the bivariate correlations among the six variables were less than 0.90 and statistically significant (p<0.01), signifying that the data was not affected by major collinearity problem and giving confidence that the measures were effective properly. Moreover, the correlations among the study variables provided initial support for our hypotheses.

As reported by Sureshchandar, Rajendran and Anantharaman (2002), there is a strong correlation between service quality and customer satisfaction, the two variables are not same from the customer's point of view and cannot be construed to mean an absolute causal relationship (Howel, 2007). The regression analysis was used to calculate the direction and level of relationships among the variables (perceived service quality, customer satisfaction and behavioural intention) in the successive analyses.

The effect of Service Quality on Customer Satisfaction

Table 3: Regression Analysis of Service Quality with Customer Satisfaction

	Beta(β)	t-value	p-value	R	R ²	F-Value	F-Sig
Model 1							
Constant		4.401	.000	.670	.449	300.763	.000
Service Quality	.670	17.343	.000				
Model 2							
Constant		4.521	.000	.720	.519	78.745	.000
Website Design	.348	7.309	.000				
Reliability	.201	4.239	.000				
Responsiveness	.062	1.272	.204				
Trust	.318	7.653	.000				
Personalization	.060	1.173	.242				

Model 1: Predictor: (Constant), Service Quality

Model 2: Predictors: (Constant), Website Design, Reliability, Responsiveness, Trust, Personalization

Note: Significant at the 0.05 Level

Result of Table 1 shows the relationship between service quality and customer satisfaction. Model 1 in this table represents a significant model fitness at R value of 0.670, R2 of 0.449, F-value of 300.763, t= 17.343, p<0.01 significant at 0.000, with nearly 44.9% of the variation in customer satisfaction described by service quality. The insertion of service quality dimensions separately in Model 2 of the above table enhanced the R2 to 0.519. All service quality dimensions have a positive and significant relationship with customer satisfaction apart from responsiveness ($\beta = 0.062$, $t = 1.272$, $p = 0.204$) and

personalization ($\beta = 0.60$, $t= 1.173$, $p= 0.242$) which are found to be insignificant. The highest disparity was explained by website design ($\beta=0.348$) followed by trust ($\beta=0.318$) and the least by reliability ($\beta=0.201$) this has been implicit by Beta calculations. This proves that if website design, reliability and trust are given weight customer will be pleased with the service quality of online food ordering system. So, the first hypothesis is supported by the results in table which proves that service quality has influence on customer satisfaction.

The effect of Service Quality on Behavioral Intentions

Table 4: Regression Analysis of Customer Satisfaction with Behavioral intentions

	Beta(β)	t-value	p-value	R	R ²	F-Value	F-Sig
Constant		5.968	.000	.550	.303	160.306	.000
Customer Satisfaction	.550	12.661	.000				

Predictor: (Constant), Customer Satisfaction

Dependent Variable: Behavioral Intention

Note: Significance at the 0.05 level

Result in Table 4 shows the relationship between customer satisfaction and behavioral intention. Regression validates the model fitness at R =.550, R2 =.303 and F= 160.306. The model shows that the value of t-statistics is significant at 0.000 ($t=5.968$, $p<0.05$) and explains about 30% of the variation in behavioral intention described by customer satisfaction. Behavioral intention is positively influenced by customer satisfaction. The second hypothesis which studied the influence of service quality on customer satisfaction is also true by the results. A satisfied customer inculcates a positive behavior and also encourages them to visit again to same provider and further give positive recommendations.

Relationship between Perceived Service Quality and Behavioral Intention: Mediating effect of Customer Satisfaction

The extent of effects of Service Quality components on Behavioral Intention and the mediating effect of Customer Satisfaction was analyzed by hierarchical regression test. For testing mediating effect of Customer Satisfaction with multiple regression Baron and Kenny's (1986) strategy was used and they also discussed that four conditions must be met to confirm the presence of mediation effect. First and foremost the predictor variable (Service Quality components) must have a significant effect on the mediator variable (Customer Satisfaction). Second one, the mediator variable (Customer

Satisfaction) must have a major effect on the dependent variable (Behavioral Intention). Third the predictor variable (Service Quality components) must have a significant effect on the dependent variable (Behavioral Intention). Finally, the result of the interpreter (Service Quality components) should not be important (in case of full mediation) or should be concentrated in strength (in case of partial mediation) after it was measured for the mediator variable (Customer Satisfaction). The first two conditions of testing mediation were satisfied by the above results. It has been proved that perceptions of Service Quality components had significant effect on Customer Satisfaction, except for Responsiveness & Personalisation with regard to first two conditions. Customer Satisfaction also had a major effect on Behavioral Intention (Tables 3 and 4). In the final step of the analysis, it was essential to establish whether perceived Service Quality components had significant effects on Behavioral Intention and whether these effects were condensed or eradicated after the effect of Customer Satisfaction had been taken into account.

Table 5: Mediating the Effect of Customer Satisfaction on the Relationship between Perceived Service Quality and Behavioral Intention

<i>Step 1</i>	Beta(β)	t-value	p-value	R	R²	F-Value	F-Sig
Model 1							
Constant		3.806	.000	.513	.263	131.555	.000
Service Quality	.513	11.470	.000				
Model 2							
Constant		3.796	.000	.555	.308	32.447	.000
Website Design	.233	4.077	.000				
Reliability	.137	2.405	.017				
Responsiveness	.082	1.410	.160				
Trust	.266	5.337	.000				
Personalization	.048	.781	.435				
<i>Step 2</i>	Beta(β)	t-value	p-value	R	R²	F-Value	F-Sig
Model 3							
Constant		2.447	.015	.583	.340	94.971	.000
Service Quality	.261	4.578	.000				
Satisfaction	.375	6.581	.000				
Model 4							
Constant		2.625	.009	.596	.356	33.487	.000
Website Design	.123	2.081	.038				
Reliability	.073	1.303	.033				
Responsiveness	.062	1.110	.268				
Trust	.166	3.193	.002				
Personalization	.029	.488	.626				
Satisfaction	.316	5.205	.000				

Model 1: Predictors: (Constant), Service Quality

Model 2: Predictors: (Constant), Website Design, Reliability, Responsiveness, Trust, and Personalization

Model 3: Predictors: (Constant), Service Quality, and Customer Satisfaction

Model 4: Predictors: (Constant), Website Design, Reliability, Responsiveness, Trust, Personalization, and Customer Satisfaction

Dependent Variable in Model 1, 2, 3, 4: Behavioral Intention

Note: Significant at the 0.05 level

Table 5, model I demonstrates a significant ability at R value of 0.513, R² of 0.263 and F-value of 131.555. The model demonstrates that (t = 11.470, p < 0.05), which is significant at 0.000, with about 26% of the variation Behavioral Intention are explained by perceived service quality. Furthermore, the presence of service quality magnitudes individually in Model 2

improved the R² to 0.308. All service quality parameters have a positive and significant relationship with Behavioral Intention (p < 0.05), with the exception of Responsiveness (β = .082, t = 1.410, p = .160) & Personalisation (β = .048, t = .781, p = .435) that is not significant (p > 0.05). It was clearly seen that among Service Quality factors, trust and competence represent the

highest and the lowest amount of variance respectively. It can also be interpreted that if these dimensions with significant beta coefficients (Website Design, Reliability and Trust) are given more attention customers will show more revisits and positive word of mouth recommendation tendency towards company. In all-purpose, the regression results confirm that service quality components is a true predictor of Behavioral Intention. The results of this study supports the hypothesis that Service Quality components significantly affect Behavioral Intention.

Model III in Table 5 recommends that customer satisfaction significantly mediates the relationship between service quality and behavioural intention ($\beta = 0.261$, $t = 4.578$, $p = 0.000$). In addition, the regression model result in model III indicates that the t-value statistics is significant at 0.000 ($p < 0.05$) with a suitability at R value of 0.583, R^2 of 0.340 and F-value of 94.971. The change in R^2 value (ΔR^2) in the regression model I and regression model III (Table 5) is 8% (i.e. 34% – 26%, = 8%), and the beta value decreased from 0.513 to 0.261 which shows that the strength of perceived service quality and behavioural intention becomes weaker when customer satisfaction being considered as intervening variable.

The customer satisfaction meaningfully mediates the relationship between service quality and behavioural intention ($p < 0.05$), with the exemption of the responsiveness ($\beta = .062$, $t = 1.110$, $p = .268$) & personalisation ($\beta = .029$, $t = 0.448$, $p = .626$) that is not significant ($p > 0.05$) for behavioural intention. This indicates that, if these dimensions with significant beta co-efficient (Website Design, Reliability and Trust) are emphasized more strongly, customer satisfaction will exhibit more tendencies to mediate the relationship between service quality and intention to revisit & recommend. Although the ΔR^2 value is small, the finding of this study support hypothesis four. It can be concluded that customer satisfaction mediates the relationship between perceived service quality and behavioural intention towards the online food ordering. The relationship between service quality dimensions (Responsiveness and Personalisation) and behavioural intention toward online food ordering is fully affected by the mediating variable customer satisfaction. But at the same time the relationship of Service quality components (Website design, reliability & trust) and customer behaviour toward online food ordering is partially mediated by satisfaction. It means that there are many other factors like value, restaurant image, hedonic and utilitarian benefits except customer satisfaction which are the probable measures of behavioural intention (Ryu et al., 2007, 2008; Ha and Jang, 2009). Results of study are supported with the findings of Namkung and Jang (2007) and Liu and Jang (2009).



CONCLUSION

The purpose of this research was to examine the mediating effect of customer satisfaction on the relationship between perceived service quality and the behavioural intention. The study used instrument dimensions of service quality by altering the SERVQUAL model in the online food ordering context. There were five major magnitudes of perceived service quality which are web site design, reliability,

responsiveness, trust and personalization.

Findings of the study suggest that service quality is an important precursor of satisfaction. In order to enhance the service quality Online food service providers must focus on appeal, appearance & user friendliness of website, perform order within stipulated time limit, provide error free transactions, show interest in solving customer problem, provide adequate security and should develop Confidence & dependability in customers for their online platform. The significant direct effect of customer satisfaction on behavioural intention substantiates the need to constantly monitor customer responses. Service providers should take customer feedback about the service received by them could mark out the customers in relevance with their evaluations and their complaint about the service quality. This could enable them to identify the issue faced by customers and take necessary measures to improve the same. The results have showed that customer satisfaction is positively and significantly related to likelihood of repeat patronage and positive recommendations. The findings have been proved with the previous results of Ranaweera & Prabhu (2003). There was a significant positive impact of service quality on behavioural intention. This means that increase in service quality components increases consumer's intention to revisit and recommend. The result of the study is in continuation with the result reported by Hamza (2013) that service quality positively affects the behavioural intentions. With the introduction of customer satisfaction as a mediator the strength of service quality as a predictor for behavioural intention got reduced this confirms mediation. Some of the service quality components show full mediation and some partial mediation. The outcome of the study relationship between service quality and behavioural intention is mediated by customer satisfaction was supported by Clemes, et.al (2011), Kitapcia, et.al (2014). The proof derived from the study, states that perceived service quality positively influences both customer satisfaction and behavioural intentions toward online food ordering system. The study also proposes that customer satisfaction significantly impacts behavioural intentions and somewhat mediates the relationship between service quality and behavioural intentions.

The online food ordering system operates hard – hitting business conditions such as: rising operating costs, changing customer choice and intense Competition. To sustain business growth and build more competition it is necessary to improve service quality. It can be proved that service quality stimulates customer satisfaction and also encourages their revisit to the same service provider and spread positive word of mouth.

By understanding customer expectations the online food providers become capable to offer superior quality thus facilitating business growth and survival in this competitive environment. The online service providers has capability to deliver relatively error-free service that contents customers by enhancing the quality of services. It also helps in matching and understanding the expectation of customers. It can also be clearly evaluated that by meeting the expectations of customers, the company has the tendency to broaden market share and retain customers' patronage which ultimately

enriches business profitability. From this study the conclusion can be derived that it is mandatory for service providers to fully satisfy customers and provide high quality service that meets and beats the customer expectations. This also enriches the profitability and increases revisit and recommendations too.



UTURE IMPLICATIONS

To start with, future research can utilize different methodologies such as longitudinal research design, interviews and focused group discussions to analyze the connection between service quality and behavioral

intention. Second, the development of the web and web based shopping will proceed, and future research can repeat comparable examinations exclusively including on the web customers, estimating real buy practices rather than aims. This method is intended to comprehend if there are any huge distinction in the impression of e-benefit nature of web clients and web buyers. Third, in spite of the fact that the scales utilized for estimating measurements of service quality are like existing scales, additionally researcher should think about growing more intricate measures to take into consideration other scope of service quality scales. Consequently, the investigation can be duplicated in various societies to give culturally diverse correlations (cross cultural comparisons).

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Test of Random Walk Hypothesis: A Study in Context of Indian Stock Market

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ABSTRACT

Presence or absence of random walk has always caught attention of academicians, stockbrokers, individuals, institutional investors, financial institutions, and regulators in the area behavioral finance. If the markets are 'weak form efficient', technical analysis fails to make any comments on future price behavior. With this view, the current paper contributes to the existing literature by investigating the weak-form market efficiency in Indian Stock market, one of the fastest emerging markets of the world. Daily data of Bombay Stock Exchange (BSE) 200 index-based companies over the period of 1 January 1991 to 31 December 2016 is tested employing Runs Test, Augmented Dickey–Fuller Test (ADF) Test, Phillips Perron Test (PP) Test, Normality Test and Variance Ratio Test. All five tests

show that Indian stock market is not 'weak form efficient'; thus, the prices do not follow a random walk and there exists a pattern in them. If these patterns can be exploited at the right time and right manner, investors can earn abnormal returns from the market. This result also supports the relevance of technical analysis as a trading strategy. At the same time, the market regulators should re-think as to why the markets are not efficient despite numerous measures taken since 1991.

Keywords : Augmented Dickey Fuller Test, Phillip Parron Test, Random Walk, Runs Test, Variance Ratio Test, Weak Form Efficiency



INTRODUCTION

Stock markets are efficient! Are they? Can there be abnormal gains by capitalizing on information asymmetry!

Stock markets are efficient or not, is a matter of concern to researchers. Markets are efficient if they reflect the true worth of a security and incorporate all the new information in its security prices in a rapid and unbiased manner. If the market incorporates new information quickly and quality of such adjustment is unquestionable, then no matter what conventional methods like technical charts are deployed, they will not guide investors to outperform the market. If the markets are efficient, there will be no way out to identify 'mispriced' securities and make profits. In this scenario, technical analysis becomes a questionable tool for forecasting.

Stock markets can be 'weak', 'semi-strong' and 'strong' form efficient. Weak form efficiency happens when today's share price fully reflects the information provided by all the previous price movements. This makes price movements totally independent of the earlier movements. Thus, technical charts do not help the investors in making any predictions. In addition to this, trading rules cannot function in the presence of weak form efficiency and no one can make more than average returns. Literature designates weak form of efficiency as 'random walk hypotheses'. When the information comprises publicly available information in addition to private information, the markets are 'semi-strong' form efficient. When the markets are 'semi-strong' form efficient, investors cannot gain from bargain opportunities by analyzing published data. If the markets absorb and reflect not only published information, but also all relevant private information, it is said to be 'strong form efficient'. Insider trading due to privileged position cannot result into gains in the presence of 'strong form efficiency'. All forms of market efficiency are inter-related to each other in the sense that if a market has to be strong form efficient, it is imperative that it should be efficient at other two levels, Keane (1983).

While revealing rational expectations equilibrium, Grossman and Stiglitz (1980) pointed out that the technical analyst capitalizes into current market prices the hidden information of past price movements. On the contrary, once the technical analyst identifies these patterns, they start to trade, and destroy these patterns and in case there are markets with no pattern, they are made 'weak form efficient'. The moment a market becomes weak form efficient, technical analysis loses its significance, Grossman and Stiglitz (1980). This would only leave 'white noise' after filtering all possible patterns. On the other hand, in the absence of technical analysis, no one will be able to capitalize information inherent in historical patterns and it will leave no scope for those who identify these opportunities first. This makes efficient market hypothesis, the most disputed proposition in finance and economics. From here emerges the significance of the concept of market efficiency (specially weak form) as resource allocation and portfolio investment are the two subject areas, which call for checking the market efficiency, Fama (1965, 1970). Not only is the concept of market efficiency relevant, but also the time taken to move towards efficiency is of equal importance. It has

been observed that as the market matures over time due to strengthening of regulatory environment and improvement in trading conditions, the stock market tends to move towards efficiency, Emerson et al. (1997) and Zalewska-Mitura and Hall (1999). In short, no investor can make greater returns than randomly select portfolio of individual stocks as the markets are efficient, Malkiel (2003).

The concept of weak form efficiency also holds its significance for the authorities that are anxious to know whether the reforms so far undertaken are effective or not. Investors and fund managers focus on trading strategies, asset pricing models, capital markets, market efficiency, etc. to make a judgment over just investments. Let us take a scenario. When random walk is present in the price series of a stock, characterized by positive autocorrelation or persistence in short period as well as negative autocorrelation or mean reversion in long period. An investor tends to invest more (less) in stocks if the relative risk aversion is greater (less) than unity. This does not happen when the returns are serially independent.

Psychology of foreign institutional investors can be rightly understood with the help of market efficiency. For them, the major concern is whether to invest or divest in stock markets of a foreign soil at a given point of time. If the prices follow a random walk, then equity is priced at equilibrium level, on the other hand when it does not follow random walk, it means distortions in the pricing of capital and risk. Thus, the study of market efficiency would give direction to allocate funds within an economy and play an important role in attracting foreign investment, boosting domestic saving and improving the pricing and availability of capital. In short, be it government, or market regulators, or retail or institutional investors (both domestic and foreign), the importance of EMH cannot be disputed.



LITERATURE REVIEW

Predictability of stock prices has interested the researchers and academicians but till date there is lack of consensus on the subject. As a beginning in this field the very first research came out by Fama (1970) which has dealt with various forms of market efficiency with a single question in the fore front i.e., 'are financial markets efficient?' As of now, a comprehensive review of past studies in the domain of market efficiency on emerging markets has been done by Kuehner and Renwick (1980) and Lim and Brooks (2011). Most of the studies bring out the weak-form efficiency of the markets, Civelek (1991), Butler and Malaikah (1992), Al-Loughani (1995), El-Erian and Kumar (1995), Abraham et al. (2002), Onour (2004), Moustafa (2004), Smith (2004), Squalli (2006), Asiri (2008), Lagoarde-Segot and Lucey (2008), Marshdeh and Shrestha (2008) and Awad and Daraghma (2009).

Sharma and Kennedy (1977) examined monthly indices of Bombay, New York and London Stock Exchanges for the period 1963-73. They employed runs tests and spectral analysis and concluded that BSE follows random walk. Barua (1981) confirmed the presence of weak form efficiency of Indian stock market for 1977-1979 by using daily closing prices of 20 shares and the Economic Times index. Gupta (1985) did a more detailed study for testing random walk

hypothesis employing daily and weekly share prices of 39 shares together with the Economic Times and Financial Express indices of share prices for the period 1971-1976. They conducted serial correlation tests and runs tests and concluded that Indian stock markets are competitive and weak form efficient. Adding to the literature Rao (1988) examined weekend price data over the period 1982-1987 by studying ten blue chip companies on the basis of means of serial correlation analysis, runs tests and filter rules. He provided evidence in support of random walk hypothesis. Sullivan et al. (1999) challenged the results of Brock et al. (1992) by stating that these results were spurious and they were in fact an artifact of data mining. Adding further he challenged the very selection of technical trading rules and criticized the biased selection of a few good performers representing a small section of the market.

On the contrary, Park and Irwin (2007) after surveying 95 modern studies found that technical trading strategies were profitable in 56 cases, which is a sign of weak form inefficiency. The results were ambiguous in 39 cases, which makes the weak form efficiency a weak proposition. These views are further supplemented by the findings of previous scholars using data from a different stock market (Toronto Stock Exchange) and blending techniques from Brock et al. (1992) and Lo et al. (2000). Market efficiency kept changing and gradually moved towards efficiency in Bulgaria, Hungary, Czech, Poland, Russia and Romania stock markets. This kind of a gradual shift from in-inefficiency towards efficiency was observed in the case of Shanghai and Shenzhen stock markets, Li (2003). Batool Asiri, (2008) studied the behaviour of stock prices in the Bahrain Stock Exchange (BSE) employing random walk models such as dickey-fuller tests popularly used as basic stochastic test for a non-stationarity of the daily prices for all the listed companies in the BSE. They further employed autoregressive integrated moving average (ARIMA) and exponential smoothing methods to forecast the prices. The results of the study confirm the presence of 'Random walk with no drift'. Kam C. et.al (1992) employed unit root test and cointegration tests to examine the relationships among the stock markets in Hong Kong, South Korea, Singapore, Taiwan, Japan, and the United States to test for international market efficiency. The study found the presence of unit root in stock prices whereas there was absence of cointegration among the stock prices, which conferred the weak form efficiency individually and collectively in the long run. Hassan Shirvani & Natalya V. Delcoure (2016) examined the presence of unit roots in the stock prices of 16 OECD countries under the assumption of cross-sectional independence across the panel. The authors find no evidence of unit roots, thus failing to reject mean reversion in the stock prices for all the countries in the sample.

Though there is a plethora of literature supporting weak form efficiency, similarly, there are many studies having another view. Early studies on technical analysis depicted a limited evidence of the profitability of technical trading rules with stock market data. Roberts (1967) is credited with the job of distinguishing among week, semi strong, and strong form of efficiency. Ray (1976) extended the work of Rao and Mukherjee (1971) to account for index series for six industries. He hypothesized that the series were independent and compared the results with the results of all industries. The outcome of his

research was that the rejection of the null hypothesis of independence. Rao did the very first study on random walk hypothesis and Mukherjee (1971) where they did spectral analysis on weekly averages of daily closing quotations of Indian Aluminum from 1955-70 with the conclusion that random walk hypothesis was rejected. Some very important and interesting results have been brought forward by Brock et al. (1992) using long period time series data from 1897 to 1986 by applying model-based bootstrap methodology. He created his model on simulated data, which had the similar properties as that of actual data. He employed widely recognized chart patterns to compare with the returns from buy and sell signals of actual price data to simulated price time series. The outcome was that the technical trading rules generated positive (negative) returns across all 26 rules and four sub-periods tested. This allowed the authors to draw statistical inferences on the profitability of various trading rules. Using widely recognized chart patterns they compared the returns obtained from the buy and sell signals in the actual price time series to the returns from the simulated price time series. Their results show that buy/sell signals from the technical trading rules generate positive (negative) returns across all 26 rules and four sub-periods tested. The entire buy-sell differences in returns were positive and were better than the returns generated by the simple buy-and-hold strategy.

International stock returns were examined by Poterba and Summers (1987) in which they found positive autocorrelation over short horizons and negative autocorrelation over long horizons. They employed variance ratio tests to show that there was a presence of transitory component in stock prices, which accounts for more than half of the variance of monthly stock returns. They also found that the possible reasons of the mean reverting property in stock prices. One time-varying expected returns and two, slowly decaying "price fads" possible because of noise trading, also that about 50% transitory component in stock prices is difficult to explain by risk factors. Time-varying expected returns due to stochastic evolution of investment opportunities lead to negative autocorrelations in annual stock returns, Fama and French (1988). Same year another important study was done by Pandey and Bhat (1988), where they examined the attitudes and perceptions of users of accounting information about the efficiency of the stock market. A structured questionnaire based survey was conducted on 160 chartered accountants, academicians, investors and chief financial executives of companies. The survey reported that the Indian stock market was not efficient in any of its three forms.

Kirt C Bultler (1992) examined stock returns in Saudi Arabia and Kuwait over the period 1985-1989 where it was found that all 35 Saudi stocks show a significant departure from the random walk due to the prevalence of institutional factors contributing to market inefficiency like illiquidity, market fragmentation, trading and reporting delays, and the absence of official market makers. Another pioneering study was done by Lo et al. (2000) and they proposed automatic chart pattern recognition model. They identified 10 reversal patterns based on a set of consecutive extreme points, which traced a particular geometrical form attached to these patterns. The study was done on a large set of individual stocks traded on the NYSE/AMEX and NASDAQ over the 1962-1996 period as well as the market indices on these U.S. exchanges. They compared

the quantiles of returns as depicted by technical patterns with returns and performed goodness-of-fit test. Sarath P. Abeysekera (2001) studied the behaviour of stock prices on the Colombo Stock Exchange (CSE) for a short period of January 1991–November 1996. They applied Runs, Autocorrelation and Cointegration tests to daily, weekly and monthly CSE index data which rejected the serial independence hypothesis. They concluded that stock prices in Colombo Stock Exchange do not confer weak form efficiency. They further checked day-of-the-week-effect and month-of-the-year-effect which were also absent in Colombo Stock Exchange stock prices. Frequency of occurrence of these patterns was in congruence with that of Lo et al. (2000). Another view on random walk is that it is a characteristic of a price series in which each price change denotes departure from previous price, Malkiel (2003). Lo et al. (2000) was extended by Dawson and Steeley (2003) using the UK stock market data and the same set of technical patterns. Following the similar approach, i.e., investigating the returns distributions conditioned on these technical patterns, they found that the returns were significantly different from the unconditioned returns distributions. Finding patterns in the price series has led to conducting non-linear studies (feed-forward neural networks or estimate the profitability of technical trading rules) as well. Many chart pattern studies to recognize the algorithms to chart patterns were developed and established, Lo et al. (2000) and Dawson and Steeley (2003). In the case of Jordanian stock market, market efficiency did not improve despite improvement in electronic trading system, Maghyreh and Omet (2003). Morocco and Egyptian markets became weak form efficient gradually against Kenya and Zimbabwe stock markets, Jeferis and Smith (2005).

A prominent study on technical analysis was done by Park and Irwin (2007), where an extensive review of literature on technical analysis was done bifurcating the period of study into two sub periods i.e., early (1960–1987) and modern (1988–2004). The criteria for this bifurcation were transaction costs, risk factors, data mining issues, parameter optimization, verification of findings with out-of-sample data, and the statistical tests used in the analysis. Thereafter, further classification was done by splitting the modern studies into seven sub-groups based on differences in testing procedures like Parameter optimization and out-of-sample tests, adjustment for transaction costs and risk, and statistical tests, Park and Irwin (2004, 2007). An important study by Kuo-Ping Chang & Kuo-Shiuan Ting (2010) done on Taiwan's 1971–1996 stock prices employing weekly value-weighted market index confirmed the absence of random walk. At the same time there was a decrease in autocorrelation after the 1990 speculation fad. Francesco Guidi Rakesh Gupta Suneel Maheshwari (2011) tested the weak form efficiency of Central and Eastern Europe (CEE) equity markets for the period 1999–2009 employing autocorrelation analysis runs test and variance ratio test. It was seen that CEE stock markets did not follow a random walk process. Further employing GARCH-M model, the results indicated that the day-of-the-week effect is not evident in most markets. Matteo Rossi & Ardi Gunardi, (2018) carried out a study on Calendar Anomalies (CAs) in France, Germany, Italy and Spain stock exchange indexes, with the help of GARCH model and the OLS regression, they concluded that existence of Calendar Anomalies (CAs). Yet another study by Nagpal, Aishwarya Jain, Megha. (2018) was

done to examine day-of-the-week effect and conditional volatility on NIFTY 50 data from the financial year, April 2000 to March 2017 employing EGARCH (1, 1) model, the results conveyed the presence of 'Wednesday Effect' in Indian stock market and thus there is evidence of informational efficiency in weak form.

Thus, there are varied views on the concept of market efficiency and till date there is no consensus on the same. These views differ due to the data, sample selection, period of study, level of development of a particular market and in extreme cases the results differ due to difference in research methodology and the type of tests employed. As right put in by Miller et al., 1994 and Antoniou et al., 1997 that the study should encompass institutional features of the emerging markets, which if ignored can lead to accept or reject the hypothesis wrongly. Therefore, GARCH models and their family Engle (1982) and advanced models by Bollerslev (1986) and Nelson (1991) could fit the non-linearity and infrequent trading in the price series.

The focus of market efficiency has shifted to emerging markets in the recent years, Chaudhuri and Wu (2003), Gough and Malik (2005), Cooray and Wickremasinghe (2008), Lean and Smyth (2007) and Phengpis (2006). These are the markets where the problem lies and need to be addressed. Concept of market efficiency was re-explored by employing GARCH-M (1,1) and Kalman filter state-space for finding out the time-varying dependency of the daily returns on their lagged values, Emerson et al. (1997), Zaleska-Mitura and Hall (1999), Rockinger and Urga (2000, 2001), Hall and Urga (2002), Harrison and Paton (2004) and Posta (2008). When the market progresses towards efficiency, this time-varying dependency is expected to become more stable and becomes infinitely small. This approach leads to identify a continuous and smooth change in the movement of prices over a period of time. This is in contrast to earlier approaches of splitting the period of study rather than into sub-periods on the basis of postulated factors as in Antoniou et al. (1997), Muslumov et al. (2003), Hassan et al. (2003), Abrosimova et al. (2005), Coronel-Brizio et al. (2007) and Lim and Brooks.

Market efficiency has caught attention all over the world, be it the markets of Egypt, Asal (1998), Mecagni and Sourial (1999) and Tooma (2003) or Kuwaiti stock market, Hassan et al. (2003), both negate the existence of efficient market hypothesis with a slight exception that efficiency improved in Egyptian market towards the end of 1997. None of the markets, viz., Egyptian, Moroccan, Tunisian stock, Kenya, Nigeria, South Africa and Zimbabwe followed a random walk, Alagidede and Panagiotidis (2009) rather there were volatility clustering, leptokurtosis and leverage effects.

We see evidently that past literature contains a large number of studies on random walks and market efficiency in developed and emerging markets as well. Many of them have focused on developed single markets, Groenewold and Kang (1993), Ayadi and Pyun (1994), Lian and Leng (1994), Huang (1995), Groenewold and Ariff (1998), Los (2000), Lee et al. (2001) and Ryoo and Smith (2002)]. The current study also falls in line and checks market efficiency in Indian stock market.

Also, most of the previous studies have relied upon a single testing procedure, [see, for instance, Poshakwale (1996), Karemara et al. (1999), Ryoo and Smith (2002) and Abraham et al. (2002)]. Whereas, in the current study, multiple Test, Normality Test and Variance Ratio tests have been employed.

Studies on market efficiency have always given mixed results when it comes to developed markets and emerging markets. For instance, in a study conducted by Chaudhuri and Wu (2003), random-walk hypothesis was rejected for ten out of the 14 emerging markets taken for the study. Phengpis (2006) extended the study of Chaudhuri and Wu (2003) employing the same data set and concluded that the results differ when methodology adopted was changed. Chaudhuri and Wu (2003) in the first instance had followed the structural break methodology adopted by Zivot and Andrews (1992) whereas Phengpis (2006) used the Lee and Strazicich (2003a) approach. Narayan and Smyth (2005) fell in line with sequential trend break test of Zivot and Andrews (1992) for checking market efficiency of 22 OECD countries. The results of their study were the presence of random walk in the price series of OECD countries inspite of the presence of significant structural breaks. Narayan and Smyth (2007) later examined G7 stock price data using the Lumsdaine and Papell (1997) and Lee and Strazicich (2003a; 2003b) tests and conferred that the random-walk hypothesis is supported for all the G7 countries but for Japan. In a nutshell, literature shows contrasting results for developed and emerging markets. Random walk is prevalent in developed markets whereas there is no consensus in case of emerging markets whether they exhibit random walk or otherwise, (Nurunnabi, 2012).

Many of the earlier work has considered weekly or longer time periods [see, for example, Karemara et al. (1999), Los (2000)], the results of which can be ambiguous sometimes. Current paper incorporates daily prices data to draw precise inferences, which are likely to be obscured at longer sampling frequencies.

The current paper makes an attempt to fill the gap in previous literature by accounting for checking weak form efficiency (by employing multiple tests dealing with normality, independence, randomness, stationarity, equal variances, etc.) using daily prices data for one of the fastest emerging markets of the world, viz., India.

For the critics of efficient market hypothesis, forecasting of future price changes is not possible as there are large number of trained participants who transfer the information very fast which makes the market more and more efficient, Lo and MacKinlay (1999). This conflict in the view and literature over the usefulness of efficient market hypothesis is an important motivation for the current study.



OBJECTIVES OF THE STUDY

Main objective of the study is:

“To examine the efficient market hypothesis in its weak form in the Indian stock market”.

Weak form efficiency cannot be examined straight way and it has to pass several tests of normality, independence, randomness, stationarity, equal variances, etc. For this

purpose, various sub objectives are framed as follows:

- (I) To examine if the BSE_200 price series follow normal distribution
- (ii) To investigate if the BSE_200 price movements are random
- (iii) To ascertain if the BSE_200 price series is stationary
- (iv) To check if the BSE_200 price series has equal variances for multiple time frames

HYPOTHESIS OF THE STUDY

To fulfill the above-mentioned objectives, the main hypothesis of the study is:

H0: Indian Stock Market is Weak Form Efficient.

The following are the sub-hypotheses framed:

H01: Daily price series of BSE_200 are normally distributed

H02: Successive price changes of BSE_200 are random

H03: BSE_200 price series has a unit root

H04: BSE_200 price series has equal variances

If not one, but the entire set of above null hypotheses as framed above are rejected, then it would convey that Indian stock market is not weak form efficient for the period under study.



DATA AND METHODOLOGY

BSE 200 index has been taken as a proxy for Indian stock market due to several reasons:

- (I) There has been a phenomenal increase in the number of companies listed on BSE over the years. Earlier S&P BSE SENSEX was serving the purpose of quantifying the price movements, but due to rapid growth of market which needed a new broad-based index series reflecting the market trends and at the same time provide a better representation of the increased equity stocks, two new broad-based index series like S&P BSE 200 and S&P Dollex 200, which were launched in 1994.
- (ii) The equity shares of 200 selected companies from the specified and non-specified lists of BSE are considered for inclusion in the sample for 'S&P BSE 200'. 200 companies is a sufficiently large number to represent the market as a whole.
- (iii) The selection of companies is primarily done on the basis of current market capitalization of the listed scrips. This makes BSE 200 a true representation of the market and the results derived from the analysis of this market can be reckoned credible.
- (iv) Finally, BSE 200 index covers market activity of the companies as reflected by the volumes of turnover and certain fundamental factors also. This way it represents technical as

well as fundamental aspects of the companies forming part of this index.

Data is extracted from PROWESS database of the CMIE (Centre for Monitoring Indian Economy) for the period January 1991 onwards till 31 March 2016. This period of study accounts for the entire period of stock market developments. Website of BSE has also been referred for the same. Various tests are applied one by one to check weak form efficiency like Normality Test, Runs test, Augmented Dickey-Fuller test (ADF) Test, Phillips Perron Test (PP) Test, and Variance Ratio Test. These tests address various issue of 'Weak form Efficiency' like normality, independence, randomness, stationarity and equal variances.

(I) TESTING FOR NORMALITY (JARQUE-BERA)

To check if the series is well modeled by a normal distribution and the likelihood of a random variable to be normally distributed is done prima facie to accept or reject the null of random walk. Graphical view of the plot gives a clue whether the series is normally distributed or not (see figure2). Skewness and kurtosis are also observed. The value for skewness should be 0 and kurtosis should be 3 for a distribution to be normal. Finally, Jarque-Bera statistic and its associated p value are seen to check for normality.

(II) TESTING FOR RANDOMNESS/SERIAL CORRELATION (RUNSTEST)

Another aspect to check for the random walk is to know the presence or absence of serial correlation. Runs test checks for serial correlation, which is formulated as :

$$\mu r = \frac{2n_1n_2 + n_1 + n_2}{n} \quad \text{Equation(1)}$$

Where, μr is mean number of runs, n_1 is number of positive runs, n_2 is number of negative runs and r is the total number of runs (actual sequence of counts). Prices should be independent for the market to be efficient, which calls for checking serial correlation in the series.

(III) TESTING FOR STATIONARITY (AUGMENTED DICKEY AND FULLER TEST AND PHILLIP PERRON TEST)

If the series has a unit root, it causes shocks to prices that permanently alter price path. Presence of unit implies that any pattern in the prices is due to only some white noise, which makes prediction possible. In the absence of unit root in the price series, it implies that the series is stationary and will tend to revert to its mean over a period of time, which makes forecasting impossible. The most popular and traditional test for checking the presence or absence of unit root in the series is Augmented Dickey and Fuller (1979) unit root test. Critics of ADF test postulate that it fails to take account of structural break in the price series leading to type 2 error i.e., identifying a stationary series as non-stationary due to the presence of structural break in slope or intercept, Perron (1989) and Zivot and Andrews (1992). Since then several tests for stationarity in the presence of structural breaks have been developed like breaks proposed by Zivot and Andrews (1992), Lumsdaine and Papell (1997), Lee and Strazicich (2003), Narayan and Popp

(2010) and Narayan and Liu (2013). Conventional efficiency tests often applied to these emerging markets are considered inadequate since they do not account for non-linear and infrequent trading caused by thinness, lack of liquidity and regulatory changes. In addition, these tests measure the efficiency in a given point of time and do not account for its evolution over time, expected to move towards weak-form efficiency as markets evolve and traders become more sophisticated.

Many existing studies done to check the market efficiency in Indian stock market have employed Dickey-Fuller and/or Phillips-Perron unit root tests without structural breaks (see eg. Ahmed et al., 2006; Ali et al., 2013; Alimov, et al. 2004; Gupta & Basu, 2007; Jayakumar et al., 2012; Jayakumar & Sulthan, 2013; Kumar & Singh, 2013; Mahajan & Luthra, 2013; Mehla & Goyal, 2012; Srivastava, 2010). Also, many of them have conducted over a short period of time (see eg. Ali et al., 2013; Jayakumar & Sam, 2012) which fail to account for structural breaks.

To overcome the problem of single testing, two tests for stationarity were employed in the current study. First, the ADF test for stationarity and then PP test for stationarity to account for structural breaks. This study contributes as well as fills the gap in literature in two ways. First by contributing to the existing literature employing tests for stationarity (see eg. Ali et al., 2013; Alimov et al., 2004; Gupta & Basu, 2007; Jayakumar et al., 2012; Jayakumar & Sulthan, 2013; Kumar & Maheswaran, 2013; Kumar & Singh, 2013; Mahajan & Luthra, 2013; Mehla & Goyal, 2012; Srivastava, 2010). Second, by addressing the gap of single testing by employing two tests for unit root i.e., ADF and PP test.

Since the data set was large and more complicated, augmented Dickey-Fuller test (ADF) was applied to examine the existence of unit root in the time series. The ADF test is stated as:

$$\Delta R_t = b_0 + b_1 p_0 R_{t-1} + \sum_{j=1}^p \Delta R_{t-j} + e_t \quad \text{Equation (2)}$$

Here, R_t is the price at time t and ΔR_t is the change in price. An alternative to ADF if PP test which is a non-parametric method of controlling for serial correlation.

The following is PP test statistic:

$$t_a = \frac{t_a (Y_0/f_0)^{1/2} - T(f_0 - v_0)(se(\hat{\alpha}))}{\sqrt{2 f_0^2 s}} \quad \text{Equation(3)}$$

where $\hat{\alpha}$ is the estimate, and t_a the t-ratio of α , $(se(\hat{\alpha}))$ is coefficient standard error and s is the standard error of the test regression.. In addition, Y_0 is a consistent estimate of the error variance (calculated as, $T - K$) s^2/T where K is the number of regressors). The remaining term, f_0 , is an estimator of the residual spectrum at frequency zero.

(IV) TESTING FOR EQUAL VARIANCES (VARIANCE TEST RATIO)

Model-based bootstrap approach was first discussed in Brock et al. (1992) and an effective tool was bootstrap reality check method which includes reality check, White (2000) and genetic programming, Koza's (1992).

[When the error terms are not an i.i.d. sequence, the random walk process is denominated martingale process, whereas the sequence $\{\epsilon_t\}_{t=1}^T$ is the so-called martingale difference sequence (m.d.s.). Campbell et al. (1997) refers to the "random walk 3". Daniel (2001) explores a wider range of possible test statistics.]

Testing for random walk hypothesis means testing for weak-form efficiency, (Fama, 1970; 1991) which helps to measure the long-run effects of shocks on the path of real output in macroeconomics (Campbell and Mankiw, 1987; Cochrane, 1988; Cogley, 1990).

Given a time series $\{y_t\}_{t=1}^T$, the RWH correspond to $\phi = 1$ in the first-order autoregressive model

$$y_t = \mu + \phi y_{t-1} + \epsilon_t$$

.....Equation(4)

where, μ is an unknown drift parameter and the error terms ϵ_t are, in general, neither independent nor identically distributed.

Testing for random walk has numerous procedures available in the literature but variance-ratio methodology has gained a lot of attention of late see, e.g., Campbell and Mankiw, 1987; Cochrane, 1988; Lo and MacKinlay, 1988; Poterba and Summers, 1988).

In this methodology, random walk is tested with the assumption that variances are linear in all sampling intervals, i.e., the sample variance of k-period return (or k-period differences), $y_t - y_{t-k}$, of the time series y_t , is k times the sample variance of one-period return (or the first difference), $y_t - y_{t-1}$. The VR at lag k is then defined as the ratio between $(1/k)^{th}$ of the k-period return (or the k^{th} difference) to the variance of the one-period return (or the first difference). Hence, for a random walk process, the variance computed at each individual lag interval k ($k = 2, 3, \dots$) should be equal to unity. The reason for the popularity of VR methodology when testing mean reversion is that VR statistic has optimal power against other alternatives, (e.g., Lo and MacKinlay, 1989; Faust, 1992; Richardson and Smith, 1991). But this method is a little complicated as this method employs overlapping data in computing the variance of long-horizon returns. The VR test is often used (see Cochrane, 1988; Lo and MacKinlay, 1988; Poterba and Summers, 1988; among others) to test the hypothesis that a given time series or its first difference (or return), $x_t = y_t - y_{t-1}$, is a collection of i.i.d. Observations or that it follows a martingale difference sequence.



EMPIRICAL RESULTS

(I) RESULTS OF CHECKING NORMALITY

Normality plot is depicted in the figure 1 along with descriptive statistic.

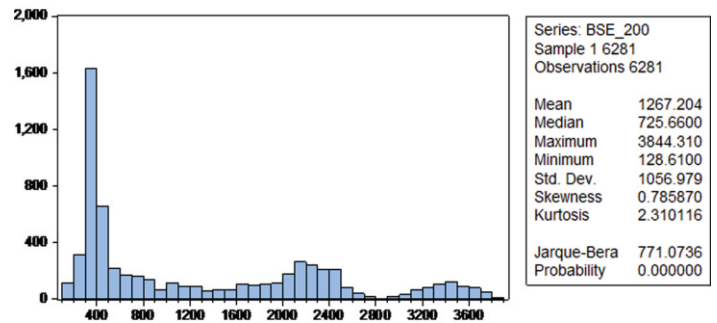


Figure 1: Normality Plot and Descriptive Statistics

An initial observation of the histogram (see figure 1) gives a clue that the prices are not normally distributed as the histogram is skewed to the left. In addition to the histogram, descriptive statistic of BSE_200 companies makes it clear that the prices are not normally distributed. Frequency distribution of the prices gives the skewness is .78 and kurtosis is 2.3. Additionally, Jarque-Bera statistic is 771.07 with p value of .00 and hence the null of normal distribution i.e., H_0 is rejected.

(II) RESULTS OF CHECKING FOR RANDOMNESS

Runs test was applied on the series to know if the BSE 200 companies follow a trend. Mean of the price series for the period under study is 1267.2. With total runs of 20 against the expected runs of 3033, standard deviation is as high as 38.2. Total number of observations in the series was 6281, with 3724 positive runs against 2557 negative runs. Z value is -78.76 with a p value .00. We thus conclude that price series is not random as the p value is less than .05, and it means that the succeeding price changes are not independent and there is a presence of trend in the series.

There is a clear indication of inefficiency of stock market in its weak form. Thus, this result helps investors to predict the future movement of prices based on previous price information.

(III) RESULTS OF CHECKING FOR STATIONARITY

Original series is plotted in the following figure where close denotes closing price of BSE 200 sensx.

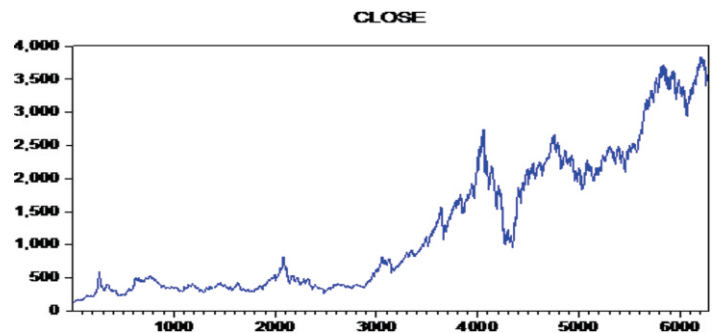


Figure 2: Original Plot of BSE_200 Index Series

Figure 2 makes it clear that the series is not stationary and there is a presence of trend. Further to support it statistically, two tests for unit root tests are done. Results of ADF and PP test are presented in table 1. Null hypothesis (H_{03}) for the both the tests is: BSE_200 has a unit root. For ADF, lag length is 1 with maximum lag of 33 based on automatic SIC. Least square method is adopted to give minimum chances of error in residuals. Total number of observations is 6279 after adjustments. Durbin Watson statistic is 1.99.

For PP test the bandwidth is 18 as per Newey West automatic selection using Bartlett Kernel. Durbin Watson is 1.79. Residual variance with no correction is 424.6621 and HAC corrected variance statistic is 508.97. Results are given in Table 1.

	ADF Test	PP Test
T-Statistic	0.123585	0.145072 (Adjusted)
Probability	0.9675	0.9690
Test Critical Values (1% level)	-3.431212	-3.431212
Test Critical Values (5% level)	-2.861806	-2.861806
Test Critical Values (10% level)	-2.566954	-2.566954

Table 1: Result of ADF and PP Test

Null hypothesis for ADF test as well as for PP test cannot be rejected, as the p values in both the cases are more than .05. These results convey there is a trend in the series and the series is not stationary.

(IV) RESULTS OF CHECKING FOR EQUAL VARIANCES

Canadian dollar, French franc, German mark, Japanese yen and the British pound for the 1139 weeks from August 1974 through May 1996.

Wright employed time series data on nominal exchange rates to illustrate his modified variance ratio tests. He checked whether exchange rate returns, as measured by the log differences of the rates are i.i.d or martingale difference, or alternately, whether the exchange rates themselves follow an exponential random walk. He extended his study to panel data as well. But the current study is restricted to time series analysis on single series, named BSE 200. The variance ratio test is performed using the 'differences, log differences, or original data in the series as random walk innovations. Variance ratio test has three major assumptions i.e.,

- (i) Series follow a random walk, so the variances are computed for differences of the data.
- (ii) Series follow an exponential random walk, so, the innovations are obtained by taking log differences.
- (iii) Series contains the random walk innovations themselves.

Lo and MacKinlay 1988 variance ratio test statistics is computed assuming hetroskedastic increments to the random walk. Test probability is computed using the default asymptotic normal results (Lo and MacKinlay 1988), or using Wild bootstrap (Kim 2006). For Bootstrap error distribution (two point, rademacher, normal), number of replications, random number generator, and to specify an optional random number generator seed. Interval based variances are compared with the variance of one period innovations by providing a user specified list of values or name of a vector containing the values. First of all, 'Exponential random walk' is observed by working with log returns to check for heteroskedastic robust with no bias correction. User specified test periods are 2,5,10,30 to match the test periods to give more meaningful inferences. Standard error estimates assume no heteroskedasticity

Results of Variance Ratio Test are given in Table 2. The null hypothesis for variance ratio test is stated:

H_{04} : Log BSE 200 is a random walk having equal variances

Joint Tests	Value	Degrees of freedom	Probability
Max z (at period 2)*	10.03019	6280	0.0000
Wald (Chi-Square)	132.0938	4	0.0000

Individual Tests				
Period	Var. Ratio	Standard Error	Z-Statistic	Probability
2	1.126570	0.012619	10.03019	0.0000
5	1.235143	0.027647	8.505320	0.0000
10	1.311368	0.042606	7.308044	0.0000
30	1.619999	0.077811	7.968044	0.0000

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = 0.000523532851404)			
Period	Variance	Variance Ratio	Observations
2	0.00029	1.12657	6279
5	0.00032	1.23514	6276
10	0.00034	1.31137	6271
30	0.00042	1.62000	6251

Table 2: Results of Variance Ratio Test

Results are shown in two sets as there are two test periods specified. The 'joint test' are the tests of the joint null hypothesis for all periods, while the 'individual tests' are the variance ratio tests applied to individual periods. Chow denning $|z|$ statistic is 10.03, which is associated with period two individual tests. Null hypothesis for random walk is strongly rejected as the approximate p-value of 0.00 is obtained using studentized maximum modulus with infinite degrees of freedom. As for Wald test statistic for the joint hypothesis is concerned, the results are similar. The individual statistics also reject the null hypothesis, as all periods have ratio statistics p value of zero. Mean, individual variances, and number of observations used in each calculation is shown in the lower panel of the output. These results also convey that the series does not follow a random walk. The analysis is further extended to allow for heteroskedasticity employing 'wild bootstrapping' and checking for statistical significance. Two point distribution with 5000 replications (the knuth generator), and a seed for random number generator of 1000 is emphasized. The results of wild bootstrap are given in Table No 3. The null hypothesis for wild bootstrap is specified:

Null Hypothesis: Log BSE_200 is a martingale

Joint Tests	Value	Degrees of freedom	Probability	
Max z (at period 2)*	10.03019	6280	0.0000	
Individual Tests				
Period	Var. Ratio	Standard Error	Z-Statistic	Probability
2	1.127483	0.025320	5.034929	0.0000
5	1.239020	0.053225	4.490756	0.0000
10	1.320374	0.077567	4.130309	0.0000
30	1.648287	0.129381	5.010698	0.0000
Test Details (Mean = 0)				
Period	Variance	Variance Ratio	Observations	
2	0.00029	1.12748	6279	
5	0.00032	1.23902	6276	
10	0.00034	1.32037	6271	
30	0.00043	1.64829	6251	

Table 3: Results of Wild Bootstrap

As the test methodology is not consistent with the use of heteroskedastic robust standard errors in the individual tests, Wald test is no longer displayed (see Table 3). Observation at this stage is that the probability values generated using 'wild bootstrap' are similar to the previously obtained results, except for the 10th period. The individual period two test, which was borderline insignificant in the homoscedastic test, is no longer significant at conventional levels. The chow

denning joint test statistic of 5.03 has a bootstrap p value of 0, which strongly rejects the null hypothesis that Log of BSE 200 is a martingale. In the end the Wright's rank variance is computed, with ties replaced by the average of the tied ranks. Permutation bootstrap is used to compute the test probabilities. The results are:

Joint Tests	Value	Degrees of freedom	Probability	
Max z (at period 2)*	11.61489	6280	0.0000	
Wald (Chi-Square)	157.2005	4	0.0000	
Individual Tests				
Period	Var. Ratio	Standard Error	Z-Statistic	Probability
2	1.146567	0.012619	11.61489	0.0000
5	1.281090	0.027647	10.16728	0.0000
10	1.361436	0.042606	8.483181	0.0000
30	1.609402	0.077811	7.831860	0.0000
Test Details (Mean = 0)				
Period	Variance	Variance Ratio	Observations	
2	1.14375	1.14657	6279	
5	1.27794	1.28109	6276	
10	1.35809	1.36144	6271	
30	1.60545	1.60940	6251	

Table 4: Results of Permutation

The standard errors employed in forming the individual z statistics are obtained from the asymptotic normal results. The probabilities of the individual z statistics and the joint max |z| and Wald Statistics, which strongly reject the null hypothesis are obtained from wild bootstrap.



CONCLUSION

This paper aimed at investigating evolving weak form market efficiency in Indian stock market. The evidence crystallized in this study does not support the market efficiency in its weak form after going through all checks of normality, randomness, stationarity and equality of variances. The results convey that the prices today are affected by the past prices and they have important information content in them. The one who is smart to exploit this information content wins over the market by making more than normal gains. The investors are, therefore, likely to benefit much by studying and utilizing the historical price data. The current study adds value to the existing literature as it employs unit root testing on high frequency data of emerging markets and also by considering

heteroskedasticity when testing for a random walk with high frequency financial data. The results of the study reveal a clear departure from weak-form efficiency. Reason for this kind of behavior could be the unstable efficiency paths being affected by the contemporaneous crises. Also, Indian stock markets are highly sensitive to past shocks indicating that undesirable shocks exert their influence for a long period. It also reveals the ineffectiveness of the stock market reforms undertaken in India.

To overcome this, Indian stock market can speed up the base of privatization, diversify financial services and improve the investment climate in order to infuse more domestic and/or foreign savings to equity markets. Additionally, liquidity provision function can be improved by introducing market making besides counteracting the shortcomings of the large individual trading by enhancing investment culture and wide spreading institutional trading.

Current study is restricted to BSE 200 companies only; the study can be extended to cover intraday data as the single variance ratio test suffers from low robustness, which becomes less effective in high frequency, Ronen (1997) and Andersen et al. (2001). Another extension of the study can do the similar analysis on other emerging markets, as the fundamental characteristics of these markets are similar.

Findings of the current study become even more relevant as it has studied the entire time period of stock market evolution in India

At macro level, study of efficient market hypothesis helps in efficient allocation of resources. In the presence of efficient markets, the market participants have complete information about all companies as depicted by corresponding stock prices. On the other hand, in the absence of market efficiency, the allocation of resources is not just and fair. Therefore it is suggested that regulators and policy makers should make stringent rules to protect the interests of the investors.

In the recent years, the focus of many researches has gradually shifted to emerging markets due to certain peculiarities attached specific to these markets. There is information asymmetry in emerging markets due to poor information disbursement mechanism. There is non-uniformity in disbursement of news to various investor groups at different points in time. This creates a lead-lag relationship between disbursement of news and its reception at the other end and dis-equilibrium is created which brings some group of investors in informational advantageous position than others. Another peculiarity of emerging markets is that of undeveloped institutional infrastructure for regulating markets, which is an essential feature for efficient market at least in the initial stages of development.

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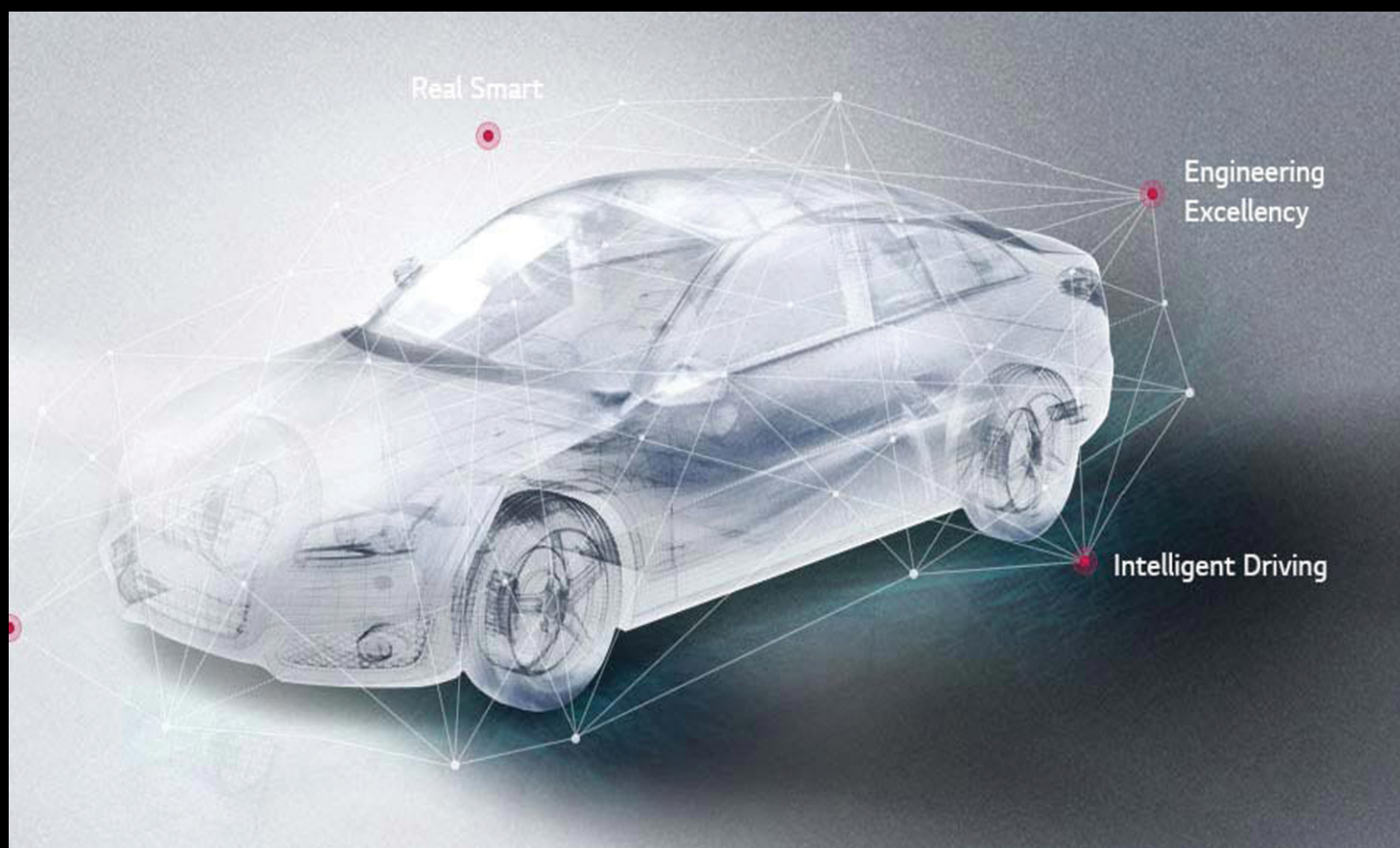
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A Study of Business Networks in Pune Auto-component Cluster of India

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ABSTRACT

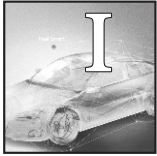
This paper aims to identify the different types of business networks formed by firms with the participants present in an auto-component cluster by using an exploratory research design. The study is being carried out in two stages, first stage involves use of semi-structured personal face-to-face interviews and second stage involves survey research method where data was collected through survey questionnaire. The study has identified four types of business networks between a firm and its buyers, only type of business network with suppliers, only one type of business network with educational institutes, four types of business networks with research institutes, lastly two types of business networks with government agencies. However with respect to networks with other stakeholders like financial institutes and competitors the study shows that such networks remains largely unfilled which is the area of concern for policy makers. The identified business networks provide a much deeper understanding of how firms connect with its buyers, its suppliers, government agencies, research and educational institutes operating in an auto-component cluster.

Keywords:: Auto-component cluster, Business networks, Clusters, Cluster participants

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INTRODUCTION

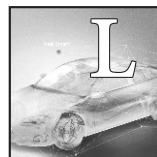
Clustering has been an age old phenomenon in India. Clusters have been in existence in India for centuries and are known for their products at the national and international level (Singh, 2010). Clusters can be defined as geographic concentration of interconnected institutions and companies in a particular field that include participants such as standards-setting agencies, universities, think tanks, trade associations, suppliers, customers, manufacturers, and government institutions (Porter, 1998). With respect to micro, small and medium enterprises (MSMEs) in India, a cluster is a sectoral and geographical concentration of micro, small and medium enterprises producing a similar range of goods or services and facing similar threats and opportunities (UNIDO, 2006; Das et al., 2007). Industrial clusters consist of firms in a region facing favourable environment and producing a particular product which help the firms in easily pooling the resources for them to become more competitive (Niu et al., 2008).

A particular characteristic of a cluster that allows enterprises to have competitive advantage is the interconnectedness or the linkages between the firms (Connell et al., 2014). Cooperation between a group of firms in order to achieve collective efficiency, penetrate and conquer markets, and overcome common problems beyond their individual reach is known as a business network (Ceglie and Dini, 1999; UNIDO, 2001). Business networks consist of independent firms coordinating their activities and working together toward common goals (Johnston et al, 1999). In small businesses, business networks are long-term contacts between organizations or external persons and business owners in order to share information (Premaratne, 2002). Business networks of firms includes inter-connections with suppliers, buyers, industry associations, R&D organisations, business development service providers, relevant government and inter-government bodies (Das, 2008). Lei and Huang (2014) define business network as a multi-facet concept where different firms display different degree of involvement. Business networks within and between firms and other supporting institutions are the basis for today's business (Connell et al., 2014).

Networking approach adopted by micro, small and medium enterprises in India has helped them to overcome many barriers such as global competition, technological obsolescence, and investment shortages (IBEF, 2013). Ceglie and Dini (1999) stated that collaborative actions involving enterprises, buyers, suppliers, services providers, local and regional government agencies help in improving competitive position of firms involve in such collaborative actions. Small and medium enterprises are able to improve their efficiency in production and capacity for learning and innovation by forming networks with other firms (UNIDO, 2001). Inter-firm collaboration and networks with supportive institutions are important determinants for firm's innovativeness (Niu, 2010b). Firms present in a cluster should focus on building strong vertical inter-firm relationship to improve their marketing performance (Lamprinopoulou and Tregear, 2011). Martinez et al., (2012) suggested that inter-firm linkages in a cluster help firms in maintaining long term competitiveness.

Networks developed with firms within a cluster strengthen the firm's competitive advantage thus making their competitive advantages different from others (Lei and Huang, 2014). Firms' relationship with agents like business service providers which helps firms in connecting with external networks plays an important role in firm innovativeness thus proving to be an important determinant of firm innovativeness (Exposito-Langa et al., 2015). Degree of cluster linkages (intra and extra) drives innovation performance of a firm in a cluster (Chandrashekar and Hillemane, 2018).

Despite this significance of business networks formed by firms in a cluster, there are some research gaps which remain relatively unexplored. There is a need to highlight the difference between the kind of relationship among firms and the other participants in a cluster (Lamprinopoulou and Tregear, 2011). Another gap highlights how firms in cluster interact with other firms suggested by Zhao et al., (2010). Therefore, there exists a need to focus and provide a better understanding of different types of business networks which a firm forms with the other participants in a cluster. In addition to this, studies conducted on auto-component sector of India are related to the following areas: analysis of different strategies adopted by firms in the Indian auto component sector to become competitive (Singh et al., 2007), creation and categorisation of knowledge (Pillania, 2008), measuring performance and leanness (Saranga, 2009; Singh, Garg, and Sharma, 2010), study of strategic technology management practices adopted by firms operating in the auto component industry of India (Sahoo et al., 2011), determining determinants of competitiveness (Joshi et al., 2013), factors contributing to efficient inventory management (Saranga et al., 2015). Given the lack of literature on types of business networks formed by the firms with the other participants present in an auto-component cluster, this study tries to answer this research gap. This paper consists of 5 sections. Section 1 is the introduction. Section 2 consists of literature review related to clusters, business networks in a cluster and its types. Section 3 and 4 are about objective and research methodology, and research results respectively. Section 5 is related to conclusion of the study and also discusses about some theoretical implications and practical recommendations along with limitations of this study and finally offers some suggestions for future research.



LITERATURE REVIEW

Cluster Concept: The underlying concept of cluster dates back to 1890 in the work of Alfred Marshal. Alfred Marshall is among the first who examined the clustering phenomenon in industrial organizations. However, Michael Porter was the one who gave relevance to cluster concept or clustering of firms. Michael Porter, introduced the term industry cluster in his book *The Competitive Advantage of Nations* in 1990. Later various other scholars and organizations worked in this area (Baptista and Swann, 1998; Morosini, 2004; Planning Commission, 2012). Baptista and Swann (1998) defined geographic cluster as an intense collection of related companies located in a small geographical area. Morosini (2004) defined industrial cluster as a socioeconomic entity characterized by a social community of people and a population of economic agents

localized in close proximity in a specific geographic region. In India, a Cluster is defined as a geographically proximate group of interconnected firms and associated institutions that shares technologies and common markets in a particular field and which are also often linked by buyer-seller relationship (Planning commission, 2012). Industry clusters are geographic agglomerations of enterprises that are specialized in one or more related industries (Giuliani, 2013). According to Fundeanu and Badele (2014), a cluster can be defined as a form of partnerships between businesses, research institutions, universities and states that favours the emergence of new form of competitive advantages.

Business Networks: Business networks can be defined as pattern of relationships that tie large number of actors together (Iacobucci and Hopkins, 1992). Business networks are sets of connected and interactive relationships among firms (Hakansson and Johanson, 1993). Structures of

exchange relationships among individuals, business actors, firms are defined as business networks (Halinen and Tornroos, 1998). Business networks are established in an open and unplanned form from interactions of firms with market, social and institutional organisations coexisting within the cluster (Giuliani, 2007). Anderson, Dodd and Jack (2010) defined business networks as a socially constructed strategic alliance for instituting change, helping companies to grow and create their future. Rietveldt and Goedegebuure (2014) define business networks as relationships that are linked together by exchange transactions. Business networks can also be broadly described as interactive relationships that individuals, businesses or any other entities have with other participants (Desta, 2015).

Business Networks formed by firms: Different types of business networks are formed by firms in a cluster. Table 1 shows the summary of literature on business networks formed by firm in a cluster.

Table 1: Summary of literature on business networks formed in a cluster

Type of Business networks	Author (s)
Horizontal networks which are formed among small and medium enterprises (SMEs) and vertical networks which are among SMEs and larger enterprises.	UNIDO (2001)
Technological alliance and Joint R&D collaboration	Yamawaki (2002)
Managerial network where the first one is network of informal ties among managers and an institutional network which is network of formal ties between the firms.	Bell (2005)
Knowledge and business networks where knowledge network are the network which link firms through the transfer of innovation related knowledge and business networks as set of relationships established by technical professionals while meeting or interacting with other firms on various business issues.	Giuliani (2007)
Information networks and knowledge networks where information networks are the networks which involve free available generic information flow between the firms and knowledge networks as the networks which are intentionally formed by the firms and which involve specific problem-solving knowledge.	Morrison and Rabellotti (2009)
External and internal networks, where internal networks defined as links among firms inside the cluster and external networks as such networks which involve firm's relations with institutions such as banks, government, university, research institutes, state government owned companies, business association and local associations.	Tambunan (2009)
Supportive and competitive where supportive network consist of NGOs, designers, banks, and government; and competitive network shows the extent of competition with the rival firms in the form of copying designs, poaching of employees, price competition, and hiding information.	Prajapati and Biswas (2011)
Localised and external networks where localised network were formed within a cluster by the firms and second, external networks involve networks with firms outside the cluster.	Li et al., (2015)
Technical and business network	Balland, Belso-Martinez, and Morrison (2016)

The above literature on business networks in clusters explains the different types of business networks formed by firms with cluster participants. However these studies do not explain the different types of relationship which could be present within a network formed by the firm with a particular cluster participant. Also we did not find a literature which covered all the cluster participants present in a cluster. Thus this study is an attempt to answer these research gaps.



OBJECTIVE AND RESEARCH METHODOLOGY OF THE STUDY

Objective: The objective of this study is to identify the different types of business networks formed by the firms with the other participants present in a cluster.

Research context: The auto-component cluster of Pune was chosen as the research setting for this study. The reasons for selecting this particular auto-component cluster stemmed from the fact that this cluster has maximum number of firms including MSMEs operating in this cluster. The major products

manufactured in Pune cluster are clutch components, gear components, brake components, shafts, axles, valves, engine components, electrical components, etc. The auto-components industry of India is active in three major regions .i.e. western region (Mumbai, Pune, Nashik, and Aurangabad), southern region (Chennai, Bangalore, and Hosur), and northern region (Delhi, and Gurgaon). In addition to these three regions, the eastern region that includes Jamshedpur and Kolkata also consist of many firms involved in auto-components manufacturing. Due to the presence of large number of unorganised units and MSMEs, the auto components industry in India is present in the form of clusters. The auto-component industry occupies a prominent place in India's industrial development which is mainly due to its capability of being the driver of economic growth. Major auto component clusters of India are Chennai auto cluster, Pune auto cluster, Gurgaon auto cluster, Jamshedpur auto cluster and Meerut auto cluster (Cluster Observatory of India, 2016). Table 2 shows details about auto components clusters present in India.

Research Method: To answer the research question, this study uses an exploratory research design which is carried out in two stages, first stage involves use of semi-structured personal face-to-face interviews and second stage involves survey research method where data was collected through survey questionnaire.

The interview method was used to get an idea about the type of linkage or relationship a firm could share with a particular participant in a cluster. The duration of the interviews ranged from 25 to 40 minutes. Respondents during the interviews indicated their agreement to interview questions (including probing questions) like your firm acquire information either informal or technical, your firm engage in resource sharing, your firm engage in R&D collaboration, your firm share human resource, your firm do joint marketing, your firm do joint training and development of workers, etc. In order to get deeper understanding of the relationships among firms and participants and to improve the reliability of data short notes were also made at the time of interview. Different types of linkages were derived after analysing data collected through these interviews.

The questionnaire method was used to find out the appropriate measure of different business networks which could be formed by firms with cluster participants. Due to the lack of appropriate measures of business networks a questionnaire based on the data collected through interviews and appropriate literature was developed. Responses from interviews are used to form questionnaire for each type of cluster participant like buyers, suppliers, research institutes, local associations and government agencies. Reviews of owner and managers of firms, academicians, and experts working in auto-component industry were also taken into consideration to refine survey questions, questionnaire wording, identifying and removing misleading questions, and to improve the overall presentation of the survey instrument. The questions were developed based on relationships like acquiring information either informal or technical, resource sharing, R&D collaboration, sharing human resource, joint marketing, and training and development of workers between firm and stakeholders in a cluster as suggested by interviews and

Table 2: Summary of major auto-component clusters of India

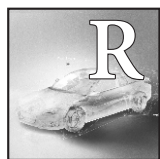
Name	State	No. Of firms	No. Of workers
Shamli Axles and Wheels	Uttar Pradesh	40	600
Meerut Auto Components	Uttar Pradesh	4700	26000
Chennai Auto Components	Tamil Nadu	3000	NA
Jalandhar Auto Parts	Punjab	1500	50000
Pune Auto Components	Maharashtra	6000	47000
Ahmednagar Auto & Engineering	Maharashtra	406	8000
Aurangabad Auto Components	Maharashtra	650	20000
Hubli Auto Component	Karnataka	1000	10000
Peenya Automobile Components	Karnataka	1000	1000
Faridabad Auto Components	Haryana	2500	10000
Gurgaon Auto Components	Haryana	5000	260000
Jamshedpur Auto Components	Jharkhand	506	25000

Source: Cluster Observatory of India (2016)

previous literature. Respondents in the survey indicated their responses to questions / items through using seven point Likert scale, with 7 as strongly agree, 6 as agree, 5 as slightly agree, 4 as neutral, 3 as slightly disagree, 2 as disagree, and 1 as strongly disagree.

Sample: Firms operating in Pune auto-component cluster are included to form a sampling frame. The sampling frame consisting of firms operating in Pune auto component cluster was made with the help of database of Maharashtra Chamber of Commerce, Industries and Agriculture (MCCIA). We used convenience sampling technique for this study. The sampling elements or the respondents were the managers and owners who had knowledge and experience of working in an auto-component sector. Data for interviews and questionnaire was collected from managers and owners of firms operating in the cluster at their offices. Twenty interviews were conducted at the first stage and then at second stage 100 questionnaires were filled from the owners and managers of firms operating in Pune auto-component cluster.

Data analysis tool: This study has used content analysis and factor analysis for analyzing the data. When the phenomenon to be observed is communication then content analysis is an appropriate method (Malhotra and Birks, 2006). As per Malhotra and Birks (2006), content analysis includes observation as well as analysis where the unit of analysis may be words, characters or themes; they also stated that it is one of the classical procedures for analysing textual material in qualitative research. Researcher can decide the themes before analyzing the text or new emerging themes can also be added (Thornton, Henneberg, and Naud, 2013). Initially while coding the data, we extracted those themes which were suggested by previous researchers like R&D collaboration and technological alliance, institutional tie-ups, technical and informal information transfer, and inter-firm cooperation. However as this study relates to little unexplored research area and is exploratory thus we also involved some new themes. Since the survey questionnaire was self-developed thus an exploratory factor analysis was carried out using SPSS to ensure the rightness of newly created questionnaire and to extract mutually independent common factors from multiple relevant variables which were names as different business networks among firms and cluster stakeholders.



RESULTS

Themes identified from interviews

For exploring the different types of business networks between a firm and cluster participants, firstly, different themes were identified separately for each cluster participant by analysing the data which was collected through semi-structured personal face-to-face interviews.

Table 3 shows the summary of the themes identified for each cluster participant.

Table 3: Types of themes identified with cluster participants

Participant(s)	Type of Theme	Possible relationship
Buyers / Suppliers/ Local Associations and Government agencies/ Research Institutes	Information exchange	Exchange of information about new equipments and markets, exchange of information through communicating with employees, sharing specific technical knowledge, sharing databases, taking advice, etc.
Buyers / Research Institutes	Technological Collaboration	Sharing technologies, jointly producing new products, joint R&D, jointly working on new patent(s), jointly purchasing specific equipments, etc.
Buyers / Research Institutes	Resource sharing	Sharing infrastructure resources, incubation center, human resources, and raw materials, etc.
Local Associations and Government agencies	Joint Marketing	Getting help in branding and promotion of products, in entering new market,
Buyers / Local Associations and Government agencies/ Research Institutes	Joint training	Organising workshops on skills enhancement, carrying out joint entrepreneurship programs, etc.
Local Associations and Government agencies	Support for development	Getting help in getting quality certification, in internet and e-commerce, in getting subsidies, etc.

However this was not the case with respect to other participants like financial institutes and competitors. With these participants we did not find any themes which suggested absence of all kinds of linkages between firms and them. The firms' owners and managers clearly stated that their firms do not share any kind of linkages with these participants.

Exploratory Factor Analysis on the questionnaire developed

For exploring the different types of business networks between a firm and cluster participant, a questionnaire was developed on the themes identified after the interviews and appropriate literature for measuring business networks formed by firm with each cluster participant. After the development of questionnaire an exploratory factor analysis

was carried out to ensure the rightness of newly created questionnaire. Reliability and content validity of the questionnaire was determined and exploratory factor analysis was carried out individually for each cluster participant.

Reliability: The reliability is commonly defined as the degree of consistency of a measure. The most general method of reliability estimation is the internal consistency method. The internal consistency of a set of measurement items refers to the degree to which items in the set are homogeneous (Singh and Shrivastava, 2013). Internal consistency was assessed using Cronbach's alpha (Cronbach, 1951). Table 4 illustrates that the values of Cronbach's alpha coefficients ranged from 0.70 to 0.89 for all business networks identified which indicates the questionnaire has good reliability.

Table 4: Cronbach's alpha values of business networks

Business network	Cronbach's alpha value
Business networks with buyers	0.702
Business networks with educational institutes	0.856
Business networks with suppliers	0.889
Business networks with government agencies and local associations	0.790
Business networks with research institutes	0.766

Content validity: A measure has content validity if there is general agreement among the subjects and researchers that the instrument has measurement items that cover all aspects of the variable being measured (Singh and Shrivastava, 2013). Content validity depends on how well the researchers created measurement items to cover the content domain of the variable being measured (Nunnally, 1967). Content validity is not evaluated numerically rather it is subjectively judged by the researchers. In this study the developed instrument have content validity since selection of measurement items were based on an exhaustive review of literature and detailed reviews of owner and managers of firms, academicians, and experts working in auto-component industry, which indicated that the content of each factor is well represented by the variables.

Exploratory factor analysis to find business networks formed by firms with cluster participants individually. Table 5 provides summary of EFA applied to find out business networks.

Exploratory factor analysis to find business networks with buyers: Prior to applying EFA, the study first calculated KMO value. The KMO value was 0.768 suggesting that data was suitable for factor analysis. The Kaiser-Meyer- Olkin (KMO) measure of sampling adequacy is an index used to examine the appropriateness of factor analysis. Values ranging from 0.5 to 1.0 indicate that factor analysis is appropriate whereas values below 0.5 imply that factor analysis may not be appropriate (Malhotra and Birks, 2006). The factor analysis results suggested four factors for business networks with

Table 5: Summary of EFA

Business network with cluster participant	Factors extracted
Business networks with buyers	4
Business networks with educational institutes	1
Business networks with suppliers	1
Business networks with government agencies and local associations	2
Business networks with research institutes	.4

buyers, with a cumulative explanatory variation of 70.81 percent. The result of factor analysis is shown in Tables 6. It can be seen from Table 6 that Factor I contains six questions, Factor II contains five questions, Factor III contains four questions and Factor IV contains three questions. The factors extracted in factor analysis were named as Information Network, Technological Collaborative network, Resource sharing network and Training network.

Table 6: EFA for business networks with buyers

	Factor loading	Accumulated explained variance (%)
Information Network		21.67
Your firm exchange information related to markets with your buyers	0.871	
Your firm share specific technical information with your buyers	0.813	
Employees of your firm can obtain data required for work from databases of your buyers	0.727	
In order to solve work problem employees of your firm usually communicate with workers of your buyers	0.691	
Your firm exchanges information about new equipments with your buyers	0.817	
Your firm take advice from your buyers	0.862	
Technological Collaborative network		19.44
Your firm is engaged in Joint R&D with your buyers	0.852	

Your firm jointly introduces new products with support of your buyers	0.865	
Your firm work on new patent(s) with support of your buyers	0.834	
Your firm uses technologies developed by your buyers	0.784	
For purchase of specific equipments your firm collaborates with your buyers	0.802	
Resource sharing network		16.62
Your firm shares infrastructure resources (land) with your buyers	0.834	
Your firm shares incubation center with your buyers	0.899	
To solve a technical issue your firm pools human resources with your buyers	0.850	
Your firm jointly use raw materials with your buyers	0.821	
Training network		13.08
Your firm gets help in comprehensive training of your employees from your buyers	0.894	
Your firm carries out joint entrepreneurship programs with your buyers	0.877	
To organise workshops on skills enhancement your firm set up consortia with your buyers	0.842	

Exploratory factor analysis to find business networks with educational institutes: The KMO value was 0.778 suggesting that data was suitable for factor analysis. The factor analysis results suggested only one factor for business network with educational institutes, with a cumulative explanatory variation of 63.58 percent. The result of factor analysis for educational institutes is shown in Tables 7. The factor extracted was named as Recruitment and Training network.

Table 7: EFA for business networks with educational institutes

	Factor loading	Accumulated explained variance (%)
Recruitment and Training network		63.58
Your firm easily obtains talented individual from educational institutes	0.844	
Your firm gets help in comprehensive training of your employees from educational institutes	0.837	
Employees of your firm get opportunity to learn technical skills from members of educational institutes	0.743	
Your firm carries out joint entrepreneurship programs with educational institutes	0.739	
To organise workshops on skills enhancement your firm set up consortia with educational institutes	0.816	

Exploratory factor analysis to find business networks with suppliers: The KMO value was 0.853 suggesting that data was suitable for factor analysis. As was expected, the factor analysis result suggested only one factor for business network with suppliers, with a cumulative explanatory variation of 64.38 percent. The result of factor analysis is shown in Tables 8. The factor extracted was named as Information network.

Table 8: EFA for business networks with suppliers

	Factor loading	Accumulated explained variance (%)
Information network		64.38
Your firm exchange information related to markets with your suppliers	0.851	
Your firm share specific technical knowledge with your suppliers	0.831	
Employees of your firm can obtain data required for work from databases of your suppliers	0.776	
In order to solve work problem, employees of your firm usually communicate with workers of your suppliers	0.726	
Your firm exchanges information about new equipments with your suppliers	0.803	
Your firm take advice from your suppliers	0.821	

Exploratory factor analysis to find business networks with government agencies and local associations: The KMO value was 0.799 suggesting that data was suitable for factor analysis. The factor analysis results suggested two factors for business networks with government agencies and local associations, with a cumulative explanatory variation of 62.94 percent. It can be seen from Table 9 that Factor I contains four questions and Factor II contains six questions. The factors extracted in factor analysis were named as Informational & training network and Market Development network.

Table 9: EFA for government agencies and local associations

	Factor loading	Accumulated explained variance (%)
Informational and training network		37.50
Your firm exchange information related to markets with government agencies and local associations	0.746	
Your firm acquires information about trade events, meetings, and seminars or other types of events from government agencies and local associations	0.711	
To organise workshops on skills enhancement your firm set up consortia with government agencies and local associations	0.839	
Your firm carries out joint entrepreneurship programs with government agencies and local associations	0.859	
Market Development network		25.44
Your firm get support of government agencies and local associations for entering into a new market	0.832	
For branding and promotion of products, your firm jointly participates in industrial fairs with government agencies and local associations	0.819	
In getting quality certification your firm get support from government agencies and local associations	0.720	

Your firm get assistance in ITR (Income Tax return) filling from government agencies and local associations	0.756	
To get subsidies your firm get support of government agencies and local associations	0.785	
In making more use of internet and e-commerce your firm get support of government agencies and local associations	0.814	

Exploratory factor analysis to find business networks with research institutes: The business networks formed with research institutes were similar to business networks formed with buyers. The KMO value was 0.706 suggesting that data was suitable for factor analysis. The factor analysis results suggested four factors, with a cumulative explanatory variation of 74.35 percent. The result of factor analysis is shown in Tables 10. It can be seen from Table 10 that Factor I contains five questions, Factor II, III, and IV contains three questions each.

Table 10: EFA for research institutes

	Factor loading	Accumulated explained variance (%)
Information network		24.39
Your firm exchange information related to markets with research institutes	0.845	
Your firm share specific technical knowledge with research institutes	0.835	
In order to solve work problem, employees of your firm usually communicate with employees of research institutes	0.722	
Your firm exchanges information about new equipments with research institutes	0.840	
Your firm take advice from research institutes	0.857	
	Factor loading	Accumulated explained variance (%)
Technological Collaborative network		41.255
Your firm is engaged in Joint R&D with research institutes	0.871	

Your firm jointly introduces new products with support of research institutes	0.883	
Your firm uses technologies developed by research institutes	0.848	
Resource sharing network		57.810
Your firm shares infrastructure resources (land) with research institutes	0.807	
Your firm shares incubation center with research institutes	0.931	
Your firm jointly use raw materials with research institutes	0.864	
Training network		74.356
Your firm gets help in comprehensive training of your employees from research institutes	0.897	
Your firm carries out joint entrepreneurship programs with research institutes	0.882	
To organise workshops on skills enhancement your firm set up consortia with research institutes	0.837	

After applying EFA, we can confirm the presence of construct validity. Construct validity refers to the degree to which a good representation of the measures can be made from the operationalisations in a study to the theoretical constructs on which those operationalisations were based. The two most widely adopted subcategories of construct validity are convergent validity and discriminant validity (Anderson and Gerbing 1988; Holmes-Smith 2013). Convergent validity is the extent to which the scale correlates positively with other measurements of the same construct and Discriminant validity is the extent to which a measure does not correlate with other constructs from which it is supposed to differ (Malhotra and Birks, 2006). Principle component factor analysis was used in this study to measure convergent and discriminant validity. Convergent validity is demonstrated if the items load strongly (more than 0.50) on their associated factors and discriminant validity is achieved when each item loads more strongly on its associated factor than on any other factor (Grandon and Pearson, 2003). Factor analysis tables 6, 7, 8, 9 and 10 illustrate that all items loaded more strongly on their associated factors than on other factors. Thus, there is evidence to support convergent and discriminant validity in this study.



ONCLUSION

This study contributed to the existing literature of business networks formed by the firms with the other participants in an auto-component cluster. The primary objective of this paper was to explore different types of business networks a firm can form in Pune auto component cluster. The study has identified four types of business networks each in case of buyers and research institutes which are informational network, technological collaborative network, resource sharing network, and training network. Even the owners of many firms told us that “...working with big buyers and research institutes in the auto-component industry has helped their firm in making their business grow further.” In case of business networks with the suppliers, the study has identified only one type of business network .i.e. informational network. Similarly with educational institutes, the study found only one type of business network .i.e. Recruitment and training network. Lastly with government agencies and local associations, the study found two types of business networks .i.e. Market Development network and Informational and training network. Following are the business network discussed in detail with some answers of interviewee from the interviews conducted.

- **Informational network:** This network involves flow of information either technical or informal between firm and the cluster participant like buyers, research institutes, and suppliers. Depending on the type of the information required, firms establish different linkages with the cluster participant. In this network, firms take advice, exchange information related to markets and new equipments, share specific technical knowledge. In this network, firms engage with the cluster participant for utilizing their databases and their employees as a source for solving any identified issue. All of these aspects of linkages can be crucial for firms to grow their business. In this context the owner of a company stated that “...most of our technical information generally comes from buyers, research institutes, and suppliers”. The owner of another company stressed that “...their firm get complete assistance from their buyers, suppliers, and research institutes in getting their technical problem solved”.

- **Technological Collaborative network:** This network involves firms working jointly with participants like buyers and research institutes for new innovations. Firms in this cluster use technologies developed by these participants, jointly introduces new products with support of the buyers and research institutes, engaged in Joint R&D with them, and also jointly work on new patent(s). In this context the owner of a company told us that “...working with research institutes and buyers help their firm in getting access to new technologies, moving to new markets, and getting market-specific expertise”. The manager of another company stated that “plenty of products of their firm are in demand just because of the innovation brought by these participants which has added value to their products”. In addition the manager of another company stressed that “...tie up with research institutes and buyers help in making sure that their product is as per set international standards”.

- **Resource sharing network:** This network is formed with buyers and research institutes. The main focus of this network is sharing resources like land and incubation centres for increasing production of firm. This network involves joint usage of raw materials by firms with the research institutes and their buyers. In such network there is easy mobility of workforce between them. In context of this the manager of a company outlined that "...such transfer of workforce helps our firm to know about new opportunities that exist in the market like new technologies used by other firms and also to know new potential suppliers in the market".

- **Training network:** The main focus of this network is working jointly with buyers and research institutes for increasing skills of employees. In this network firms join hands with research institutes and their buyers so that the employees of their firm get the opportunity to learn technical skills from members of these cluster participants, to set up consortia with them in order to organise workshops on skills enhancement, getting help in comprehensive training of their employees, and to carry out joint entrepreneurship programs with the buyers.

- **Recruitment and Training network:** This type of networked was observed with educational institutes. This network is quite similar to training network formed by firms with their buyers and research institutes. In addition to learning technical skills, organising workshops for skills enhancement and comprehensive training, this network involves recruitment aspect where firms easily obtains talented individual from the educational institutes by going there for recruitment. In context of this the manager of a company outlined that "...their firm always prefer to visit these colleges for recruitment of skilled employees". Owner of another company told us that "...working with these cluster participants has helped their employees in enhancing their knowledge and skills."

- **Marketing and development network:** The main focus of this network is working jointly for increasing the market of firms. In this network firms take help of government agencies and local associations for marketing their products, entering new market. In this network firms jointly participates with local agencies in industrial fairs to promote its brand. In context of this the manager of a company outlined that "...their firm always prefer to attend industrial fairs jointly with local associations in order to promote their product". Apart from marketing aspect, this network also involves the support or the assistance that a firm gets from the government agencies and local associations for their growth and development in the form of assistance in Income Tax return filling, support in getting quality certification, support in making more use of internet and e-commerce, and support in getting subsidies.

- **Informational and training network:** This network is slightly different from the informational networks formed by firms with their buyers, research institutes, and suppliers. This network involves more flow of informal information between firms and local associations and government agencies. In this network firms exchange information related to markets, and utilise the relationship with government agencies and local

associations for acquiring information about trade events, meetings, and seminars. Apart from exchange of informal information, this network also involve setting up of consortia between firms and local associations in order to organise workshops on skills enhancement and they also carry out joint entrepreneurship programs.

The business networks identified in the study are partially consistent with those identified in the previous research work carried out in other countries as discussed in the literature review section. However with respect to network with other participants like competitors and financial institutes, the study showed contrasting results. The study suggests that there is no such cooperation between a firm and these participants .i.e. the linkages between them remain largely unfilled. There is no dissemination of information, no sharing of resources, and no collaboration. In this context, even the manager of a company outlined that "the variety of linkages with participants other than buyers, research institutes, suppliers for obtaining valuable technical or informal information is absent".

The study provides theoretical contributions to the existing literature. Through this study the authors have tried to answer the research gap of lack of literature on types of business networks formed by firms with the stakeholders present in an industrial cluster. This study has enriched the understanding of business networks which could be present in an auto component cluster between a firm and other cluster stakeholders. This study has also supported the existing fact that firms do not have access to networks with all cluster participants just by being present in a cluster. As it was found that the firms of Pune auto-component cluster are aware of the fact that they are part of a cluster, however still most of them had business networks only with their buyers and research institutes, and government agencies, not with other stakeholders like educational institutes, competitors, and suppliers.

This study suggests the following recommendations to firms present in a cluster.

- A firm in a cluster should focus more on developing networks with participants like suppliers and educational institutes. Since business networks with the suppliers and educational institutes were related to only information and training aspect. Thus the absence of other types of business networks with suppliers and educational institutes is an area of concern for firms and policy makers. Combination of new .i.e. direct or indirect relationships with these stakeholders could put the firms in a strategic position through which they can easily reap the benefits from being embedded in this cluster. Even the manager of a company outlined that "the variety of linkages like technological collaboration and resource sharing are absent with educational institutes and suppliers". In addition to this the manager of another company stated that "forming more linkages with educational institutes and suppliers would help them in sensing new opportunities since such organizations can influence relevant legislative bodies to shape regulations and standards in their favour."

- Networks with supportive institutions and government are

important determinants for firm innovativeness (Niu, 2010b). Thus emphasis should be given to networks with these cluster participants.

- This paper also suggests that the policy makers should focus more on the networking aspect with stakeholders in a cluster and include this aspect in diagnostic study report and soft interventions part of medium small enterprises – cluster development programme (MSE-CDP) for all auto-component clusters present in India.

The findings from this research will add academic value in the context of expanding knowledge in relation to the impact of business networks on the performance of the firm and will also contribute in filling gaps within the existing literature related to types of business networks formed by the firms with the cluster participants. The findings would also provide deeper

insight into the future development of auto-component clusters in India. This study suggests that firms operating in Pune auto-component cluster should focus more on networks with all cluster participants especially educational institutes, financial institutes, and competitors for better management of their firms as it is evident that by simply moving to the cluster does not lead to better firm performance, instead it is formation of business networks with all the participants which assist a firm in making more informed decisions. The study has been limited to only one cluster thus it might not be appropriate to generalize the findings. Further research in this area needs to be done by taking other clusters in order to generalize the findings. Also further research could be carried out in exploring the possible reason for absence of business networks with cluster stakeholders other than buyers and government agencies.

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An Examination of ISO 9001 Certifications in the BRIC Countries

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ABSTRACT

The ISO 9001 certification process provides companies an opportunity to assess business practices to improve operations. This voluntary process has gained popularity world-wide. The purpose of this paper is to analyze the impact of globalization on the number of ISO 9001 certifications issued in Brazil, Russia, India and China (BRIC countries). The International Organization for Standardization and the World Bank provides data for the analyses. The overall results show the change in foreign direct investment (FDI per Capita) is associated with the adoption of ISO 9001 for the BRIC countries. After controlling

for the country, analysis reveals that both the change in FDI per capita and the lagged change in FDI per capita are positively associated with the number of ISO 9001 certificates. Further investigation reveals that the conditions in Brazil and Russia are statistically associated with the number of organizations obtaining ISO 9001 certificates.

Keywords: ISO 9001, BRIC, globalization, quality management

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INTRODUCTION

The globalization and economic growth over the past two decades are linked with a significant increase in the spread of international management practices, specifically quality management systems (QMS) based on the ISO 9001 standard (Salgado et al., 2016). Researchers have examined a range of issues from cost/benefit analysis of a company to worldwide issues (Salgado et al., 2016). In this evolving field of research no studies have analyzed the influence of globalization on the number of ISO 9001 certifications in Brazil, Russia, India, and China (BRIC countries). Therefore, this study fills the gap by examining the role of Foreign Direct Investment and Gross National Product (FDI per Capita and GDP per Capita) have in the adoption of ISO 9001 standards in the BRIC countries. Studying the ISO 9001 data for the BRIC countries is important as they are a significant region for the global economy, with increasing numbers of certifications in the past decade. Understanding the association between the adoption rate of ISO 9001 and both economic growth and FDI is important to business leaders, government institutions and consumers. Both economic growth and FDI can lead to greater creation of wealth and opportunities. Determining whether ISO 9001 adoption is associated with economic growth and FDI at the country level should impact the leaders of individual companies considering adherence to the ISO 9001 standards.

In 1987, the International Organization of Standardization (ISO) published the first set of ISO 9001 standards with the goal of improving an organization's products and processes through a rigorous set of quality management systems. Sampaio et al. (2011) state the ISO 9001 certification is considered one of the best tools for improving quality management systems. The evolution of ISO 9001 certification in the world is consistently increasing despite the stabilization period in 2002 and 2003. Since 2004 there has been a robust growth in the number of certificates issued worldwide, totaling over 1.0 million certificates by nearly 180 countries in 2015 (Salgado et al., 2016; ISO 2016).

The value of ISO 9001 certification regarding improvement of performance is still highly questioned. Many researchers have tried different empirical approaches to determine the relationship between these two constructs (ISO 9001 and performance). Some research used a comparison of results between certified and non-certified companies to conclude that the former companies outperform the latter in reducing defectiveness, costs, and reworking. These studies also show a high level of profit and productivity for certified companies. Yahya and Goh (2001) reported that certified companies have higher profits than non-certified ones. In addition, Koc (2007) determined certified companies had a competitive advantage (volume flexibility, product variety, delivery results, and quality) over non-certified companies (Galetto et al., 2015).

The purpose of this paper is to analyze the influence of globalization on the number of ISO 9001 certifications in the BRIC countries. Other countries have been studied, but not specifically the BRIC countries in relationship of the influence of globalization. Given this gap, the following two questions guide this research: Is there a relationship between key

economic variables and the adoption of ISO 9001 for the BRIC countries? Is the relationship between the economic variables and the adoption of ISO 9001 uniform across the BRIC countries?



LITERATURE REVIEW

This study focuses on the adoption of ISO 9001 standards in the BRIC countries. Consequently, the literature review's focus is on diffusion of ISO 9001 internationally and the economic factors. Considering the wide dispersion, which involves 187 countries in the world and every kind of organization, it is not surprising that a considerable amount of research focuses on ISO 9001 standards. Most empirical research (utilizing ISO 9001 data) on cross-national diffusion falls within two categories. The first category primarily deals with comparative practices adopted by nation-states or governments as opposed to firms or companies in a large sample of countries. The second category consists of comparative studies based on a limited number of countries. This would include Cole's (1985) analysis of the diffusion of small-group activities in the United States, Japan, and Sweden (Guler et al., 2002). Mussina and Buljan Barbaca (2017) examine the influence of globalization in ISO 9001 adoption in Kazakhstan, Croatia and Germany. The authors discovered that the adoption rate in Kazakhstan varied considerably from year to year.

Saraiva and Duarte (2003) found mixed results when analyzing a potential association between the number of ISO 9001 certificates in a country and its economic activity. Guler et al. (2002) determined that one of the leading factors potentially explaining the number of ISO 9001 certificates is the presence of large multinational firms. The results suggest that if a country has a relatively high number of large multinational firms, the large multinational firms tend to influence the decision of local organizations whether to obtain ISO 9001 certificates.

Sampaio et al. (2009a) examine several economic factors and the adoption ISO 9001 in the European Union. The author found that in countries with relatively higher amounts of R&D spending the typical ISO 9001 organization tends to be smaller. In addition, the authors' analyses reveal that a country's competitive rank, as measured by the Institute for Management Development, is inversely associated with the number of ISO 9001 organizations certified.

In the study by Salgado et al. (2016) the authors examine the adoption of ISO 9001 by organizations in North America and South America. Using Gross National Income as their key economic variable, the authors realized a positive relation between economic activity and the number of ISO 9001 certificates. Interestingly, only Argentina and Canada did not have a statistically significant relation between economic activity and the number of ISO 9001 certificates. The authors' results build upon and largely confirm previous work by Saraiva and Duarte (2003) and Sampaio et al. (2009a).

As ISO 9001 has gained acceptance and grown in popularity, many studies have tried to understand its effects on businesses and in the world [see Benner and Veloso (2008), Psomas and Fotopoulos (2009), Sampaio et al. (2009b);

Alolayyan et al. (2011), and Salgado et al. (2014)]. According to Sampaio et al. (2009a), when huge economic groups determine that their suppliers must have their quality systems certified, it results in an increase of the number of companies becoming ISO 9001 certified (Salgado et al., 2016).

Many papers study the evolution of ISO 9001 certification worldwide and specific regions such as Asia and the Middle East (Marmion et al., 2010; Al-Darrab et al., 2012), Europe (Franceschini et al., 2004; Franceschini et al., 2010; Llach et al., 2011; Sampaio et al., 2011), American Continent (Salgado et al., 2016), Portugal (Teixeira Quiros and do Rosario Fernandes Justino, 2013), Spain (Marin and Ruiz-Olalla, 2011), Australia and New Zealand (Feng et al., 2008), Spain (Martinez-Costa et al., 2008, 2009) and Italy (Galetto et al., 2015).

Several studies investigate the adoption of ISO 9001 certification globally and in specific areas (Salgado et al., 2016). Clougherty and Grajek (2008) examine trade and FDI and found that the amount of ISO 9001 certificates is associated with an increase in trade from developing nations to developed nations. In addition, there was no significant association among the developed world in terms of FDI. However, the authors were able to show an increase of FDI from developed nations to developing nations. Le (2009) found that the level of ISO 9001 saturation is associated with an increase in international trade, particularly for less developed countries. Unlike previous works examining the ISO 9001 standards at a country level, this study makes several improvements to the growing body of literature. The focus of this study is the BRIC countries, allowing for greater clarity of analysis. The BRIC countries contribute about 33 percent of the worldwide ISO 9001 certificates (ISO 2016), representing a significant portion of ISO certificates. In addition, the analysis focuses on the change of both GDP and FDI variables examine the dynamic association of the economic variables and the number of ISO 9001 certificates. Finally, lagged variables are included in the model to account for the ISO 9001 accreditation process can exceed a year.



DATA AND METHODOLOGY

In order to examine the potential association between the number of ISO certificates in the BRIC countries and key economic variables of globalization, data concerning the number of certificates for each country for the time period of 1993-2015 were collected from the International Organization for Standardization. The International Organization for Standardization is the entity responsible for the development and administration of the ISO standards. The key economic variables, represented by GDP per Capita and FDI per Capita, were collected from the World Bank. Both organizations are dedicated to making significant amount of data available to the public.

Given the distribution of the data, it is necessary to focus on the change of the variables from year to year. This effort also allows a closer examination on the change in GDP per capita and the change in FDI per capita have on the change in the number of ISO 9001 certificates in each of the BRIC countries. In addition to the current change in the two economic variables, the change in the prior year for both economic

variables were included in the analysis. The motive of including the change of the economic variables during the prior year is because obtaining the ISO 9001 certificate is a time-consuming process that may extend over multiple years.

The formal analyses of the association of GDP per Capita and FDI per Capita involves the two regression models. The first model examines the association of the change in the number of ISO 9001 certificates and the change and lagged change of the two economic variables. The second model includes country-specific dummy variables to indicate the potential unique situation that each country may possess.



DESCRIPTIVE STATISTICS AND RESULTS

Table 1 provides a snapshot of ISO 9001 certifications for each of the BRIC countries. Despite being first published in 1987, ISO 9001 certificates attained in the BRIC countries in 1993 are relatively few. Brazil led the BRIC countries with 113 organizations certified, followed by India with 73. By 2004 the number of certifications grown dramatically. China leads the BRIC countries with 132,926 certificates. Data concerning the number of certificates in 2015 reveal the continued adoption of ISO 9001. In fact, by 2015 each of the BRIC countries more than doubled their number of certificates from 2004. Table 1 also provides data concerning the number of ISO 9001 certificates per 1,000 inhabitants for each of the BRIC countries. Given the low number of total certificates for each country for 1993, none of the BRIC countries possess more than 0.001 certificates per 1,000 inhabitants. By 2004, all four of the BRIC countries witness a dramatic increase in both the total number of certificates and the number of certificates per 1,000 inhabitants. In terms of certificates per 1,000 inhabitants, China led the BRIC countries with 0.1026 followed by Brazil with 0.0331. In examining the data for 2015, China again leads the BRIC countries with 0.2134 certificates per inhabitants.

Table 1: Snapshot of ISO 9001 certificates

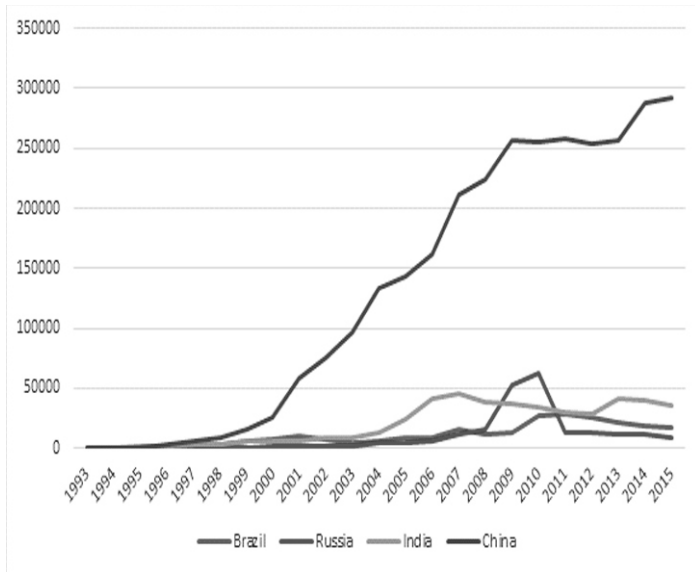
Country	1993		2004		2015	
	Total	Per Capita (per 1,000)	Total	Per Capita (per 1,000)	Total	Per Capita (per 1,000)
Brazil	113	0.0007	6,120	0.0331	17,529	0.0851
Russian Federation	5	0.0000	3,816	0.0265	9,084	0.0630
India	73	0.0001	12,558	0.0112	36,305	0.0281
China	35	0.0000	132,926	0.1026	292,559	0.2134

Total Total number of ISO 9001 Certificates. Data obtained from the International Organization for Standardization.

Per Capita Total number of ISO 9001 Certificates divided by the Country's population in terms of 1,000s. Data obtained from the International Organization for Standardization and the World Bank

Figure 1 plots the number of organizations certified as ISO 9001 in BRIC countries from 1993 to 2015. China experienced rapid growth in the number of ISO 9001 certificates starting in the year 2000. In India, the number of ISO 9001 certificates grew sharply after 2004. In contrast, Russia did not have substantial growth in the number of ISO 9001 counties until after 2008. However, the number of certificates in Russia declined after the year 2010. The number of certificates in Brazil grew at a steady pace.

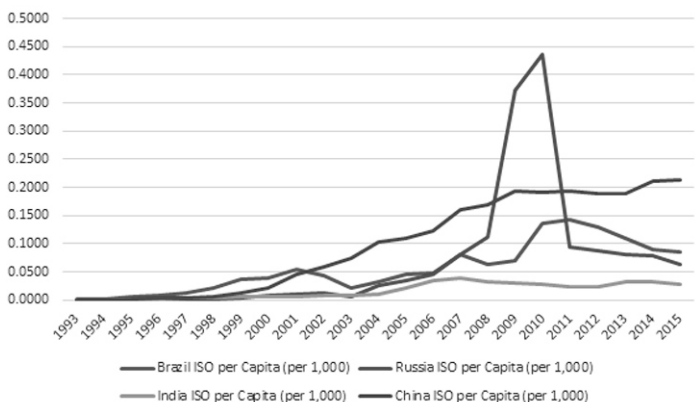
Figure 1 ISO 9001 Total numbers



Total number of ISO 9001 Certificates. Data obtained from the International Organization for Standardization.

In Figure 2 the number of ISO 9001 certificates for each of the BRIC countries is deflated by the number of inhabitants, in thousands. The data of certificates per 1,000 inhabitants shows the steady growth for China. In contrast, India's quantity has remained stable over the 1993-2015 period. The data in Figure 2 reveals greater volatility in the number of certificates per 1,000 inhabitants in Brazil and Russia than the other two BRIC countries, marked by periods of growth and reduction.

Figure 2 ISO 9001 per Capita



Per Capita Total number of ISO 9001 Certificates divided by the Country's population in terms of 1,000s. Data obtained from the International Organization for Standardization and the World Bank

Table 2 provides the descriptive statistics for the BRIC countries. China leads the BRIC countries with the most ISO 9001 certified organizations with a mean of 131,599.17 over the 1993-2015 time frame. For the other three countries, India is second with 19,638.17, followed by Brazil with 10694.22 and Russia 9,657.87. The Kruskal-Wallis statistic is 20.974, suggesting significant differences in the number of ISO 9001 organizations between the countries. The second row of data in Table 2 provides the number of ISO 9001 certified organizations for each country deflated by the country's population in the thousands. According to the data, China possesses the greatest number of certified organizations per 1,000 inhabitants with a mean of 0.0988 over the sample period. Russia has the second highest amount of certified organizations per 1,000 inhabitants with 0.0675. The Kruskal-Wallis statistic suggests significant differences among the BRIC countries in terms of the number of ISO 9001 certified organizations per 1,000 inhabitants. An examination of the standard deviation for the ISO 9001 variables reveal both the growth and volatility of the number of ISO 9001 certificates in the BRIC countries. The growth and volatility of the number of ISO 9001 certificates are also represented in Figures 1 and 2.

Interestingly, the difference among the BRIC countries of the year-to-year change in the number of ISO 9001 certificates, captured by the Change in ISO 9001 per Capita is not significantly different. Taken together, these two results suggest that even though the levels of ISO 9001 certificates in the BRIC countries are dissimilar, the trend or growth is not statistically different. The final four rows of Table 2 provide the economic information collected from the World Bank. Brazil has both the largest GDP per Capita and FDI per Capita. The Kruskal-Wallis statistic for both GDP per Capita and FDI per Capita is significant, suggesting significant differences exist between the countries. In terms of volatility, the greatest change in GDP per Capita exists for China. The Kruskal-Wallis statistic for change in GDP per Capita is significant, suggesting material differences exist within the BRIC countries. According to the final row of Table 2, Brazil has the greatest mean for the change in FDI per Capita. The Kruskal-Wallis statistic is not significant, suggesting that there are no material differences for the BRIC countries in terms of the change in the year-to-year FDI per Capita.

Table 2 : Descriptive Statistics

	Brazil	Russia	India	China	K-W Statistic
Total number of ISO 9001 Certificates					
Mean	10,694.22	9,657.87	19,638.17	131,599.17	20.974***
Standard Deviation	8,800.41	16,116.13	16,873.13	112,480.09	
ISO 9001 per Capita					
Mean	0.0553	0.0675	0.0163	0.0988	13.235***
Standard Deviation	0.0433	0.1129	0.0136	0.0831	
Change in ISO 9001 per Capita					
Mean	36.01	69.81	44.74	76.31	1.91
Standard Deviation	63.50	104.37	83.19	135.89	
GDP per Capita					
Mean	9,758.47	8,588.14	1,016.68	3,053.28	73.870***
Standard Deviation	1,306.23	2,336.95	367.03	1,751.76	
Change in GDP per Capita					
Mean	1.62	2.35	5.32	8.89	45.66***
Standard Deviation	2.47	6.09	2.05	1.91	
FDI per Capita					
Mean	198.98	156.86	13.02	91.46	40.317***
Standard Deviation	156.17	171.79	12.18	68.61	
Change in FDI per Capita					
Mean	32.22	27.03	28.65	11.63	1.40
Standard Deviation	64.09	69.51	50.21	22.99	

*** Significant at the 1% confidence level

Total number of ISO 9001 Certificates

GDP per Capita

FDI per Capita

Total number of ISO 9001 Certificates. Data obtained from the International Organization for Standardization

Gross Domestic Product, deflated by population. Data obtained from the World Bank.

Foreign Direct Investment, deflated by population. Data obtained from the World Bank. Changed variables are calculated by finding the percent change from the previous year for the previously defined variables.

Panel A of Table 3 provides the statistics of the base model examining the role of GDP and FDI in the number of ISO 9001 certificates for the BRIC countries. Given the effects of outliers with the data, each variable was winsorized at the 10 percent level. This process reduces the effects of the outliers on the results. According to the results there is a positive and significant relation between FDI per Capita and the number of ISO 9001 certificates. The coefficient for the GDP per Capita variable is not significant, suggesting no discernible relation between the size of the overall economy of the BRIC countries and the number of ISO 9001 certificates. Both coefficients for the lagged economic variables are not significant. It appears the prior year's economic performance does not impact the growth or decline in the number of ISO 9001 certificates of the current year.

The results of regression analysis utilizing indicator variables are presented in Panel B of Table 3. The use of indicator variables allows for analysis of the relation among the variables on a country-specific level. With the inclusion of the country-specific variables, both the current change in FDI per Capita and the lagged FDI per Capita have significant coefficients. These coefficients are positive, suggesting a direct relationship between the number of ISO 9001 certified organizations and the change in Foreign Direct Investment. The coefficients for both GDP per Capita variables are not significant. This result indicates that the change in the current year GDP and the prior year GDP are not associated with the current change in the number of ISO 9001 certificates. In the model, Russia serves as the base and the intercept. The other three BRIC countries are represented as indicator variables. The coefficient for the intercept (representing Russia) is significant and positive. The result suggests that the change in the number of ISO 9001 certificates in Russia is more sensitive to the volatility of the economic variables. The coefficient for

Table 3 : Regression Results

Panel A			
Variable	Coefficient	t statistics	p value
Intercept	35.228	2.502	0.014
Changed in GDP per Capita	2.425	0.814	0.418
Changed in FDI per Capita	0.303	1.748	0.084
Changed in GDP per Capita lagged	-2.885	-0.943	0.349
Changed in FDI per Capita lagged	0.253	1.506	0.136
			Adj. R Squared 0.037
Panel B			
Variable	Coefficient	t statistics	p value
Intercept	67.730	3.575	0.001
Changed in GDP per Capita	0.713	0.228	0.820
Changed in FDI per Capita	0.352	2.032	0.046
Changed in GDP per Capita lagged	-4.923	-1.515	0.134
Changed in FDI per Capita lagged	0.320	1.896	0.062
Brazil	-50.665	-2.274	0.026
India	-32.382	-1.425	0.158
China	12.909	0.447	0.656
			Adj. R Squared 0.091

Changed variables are calculated by finding the percent change from the previous year for the previously defined variables. Lagged variables represent the prior year's observations of the previously defined variables. Brazil is coded as 1 if the observation comes from Brazil, otherwise 0. India is coded as 1 if the observation comes from India, otherwise 0. China is coded as 1 if the observation comes from China, otherwise 0

Brazil is negative and significant. The negative coefficient demonstrates that despite the economic levels of the country it appears the change in the adoption rate of ISO 9001 is inversely related to the economic variables. The coefficients for India and China are not statistically significant. This result advocates that the two unique country-specific environments are not associated with the adoption rates of ISO 9001 in India and China.



CONCLUSION

Since the inception of the ISO 9001 standards, organizations have voluntarily chosen to go through the accreditation process. This worldwide adoption of the standards provides researchers an opportunity to study numerous issues. The most researched topics in this area are the current diffusion of quality, the motives for certification, the problems/benefits of

certification, and the influence of certification on economic performance.

Unlike previous studies, this research examines the role that two economic variables have in the adoption of ISO 9001 standards in the BRIC countries. Adoption of ISO 9001 in the BRIC countries remained relatively low until the early 2000s. Results show that the overall adoption of ISO 9001 differs significantly among the BRIC countries. China has the most ISO 9001 certified organization both in terms of overall numbers and ISO 9001 certificates per capita.

The outcomes represent an important contribution to both researchers and companies. The results show the change in FDI per Capita is associated with the adoption of ISO 9001 for the BRIC countries. After controlling for the country, further analysis reveals that both the current change in FDI per Capita and lagged change in FDI per are positively associated with the

number of ISO 9001 certificates. This result suggests that this economic activity is associated with the number of organizations voluntarily fulfilling the ISO 9001 requirements. In order to further examine the unique relation of the economic variables and the ISO 9001 certificates, each country was assigned an indicator variable. The results show that the coefficients for both Brazil and Russia are statistically significant, revealing an association between the economic variables and the number of ISO 9001 certificates.

Researchers are examining both the significant costs and potential benefits associated with the adoption of ISO 9001 that organizations face. In addition, researchers are examining ISO 9001 certification from a macro perspective. The authors believe the outcome of this study represents an important contribution to the macro examination of ISO 9001. This study shows that key economic variables are not universally associated with the adoption of ISO 9001 among the BRIC countries. Both Brazil and Russia appear to have a unique relationship between the economic variables and the

change in the number of ISO 9001 certificates. Future research is necessary to further explore these situations. In addition, further research must examine the role of business practices, including but not limited to ISO 9001, can have on economic development in order to gain greater insight into globalization.

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BBA/B.COM (H) PROGRAMMES

- 1. Assistant Professor:** (I) A Master's Degree with 55% Marks (or an equivalent grade in a point-scale wherever the grading system is followed) in a concerned/relevant/allied subject from an Indian University, or an equivalent degree from an accredited foreign university.
(II) Passing of NET/SLET/SET conducted by UGC or the CSIR or who are or have been awarded Ph.D. Degree in accordance with the UGC Regulations 2009 or 2016 and their amendments from time to time as the case may be exempted from NET/SLET/SET.
- 2. Associate Professor:** (I) A Good Academic record with a Ph.D Degree in the concerned/ allied / relevant discipline.
(II) A Master's Degree with at least 55% marks (or an equivalent grade in a point-scale wherever the grading system is followed).
(III) A Minimum of 8 Years' experience of teaching and / or research in an academic / research position equivalent to that of Assistant Professor in a University, College or Accredited Research Institution/ Industry with a minimum of seven publications in the peer-reviewed or UGC-listed journals.
(IV) A minimum Academic/ Research score as stipulated in the UGC Regulations on Minimum Qualifications, July 2018.
- 3. Professor:** (I) An Eminent scholar having Ph.D qualification(s) in the concerned /allied/relevant discipline, and published work of high quality, actively engaged in research with evidence of published work with, a minimum of 10 research publications in the peer-reviewed or UGC-listed journals and a total research score as stipulated in the UGC Regulations on Minimum Qualifications, July 2018.
(II) A minimum of 10 yrs of teaching experience in university/ college as Assistant Professor/Associate Professor/Professor, and / or research experience at equivalent level at the University/ National Level Institutions with evidence of having successfully guided doctoral candidate.

OR

An outstanding professional, having a Ph.D Degree in the relevant/allied/ applied disciplines, from any academic institution (not included in A above)/ industry, who have made significant contribution to the knowledge in the concerned/allied/relevant discipline, supported by documentary evidence provided he/she has 10 years' experience.

II. EMOLUMENTS

Designation	Pay Scale	Other Admissible Allowances
Assistant Professor	Rs.15,600-39,100 AGP 6,000	Other allowances and benefits as per norms
Associate Professor	Rs.37,400-67,000 AGP 9,000	
Professor	Rs.37,400-67,000 AGP 10,000 (Minimum Basic Rs.43,000)	

III OTHER REQUIREMENTS

- Candidates who have cleared NET or having Industry experience will be preferred for the position of Assistant Professor in MBA.
- Recently retired persons with PhDs may also apply.
- Application has to be in the prescribed form. Applications not in the prescribed form or having incomplete details are likely to be rejected.
- Duly filled in application form can either be submitted online or in person at the Institute's address mentioned above.
- Command over English Language and Computer Skill is essential.



DELHI INSTITUTE OF ADVANCED STUDIES

(NAAC Accredited 'A' Grade Institute, Approved by AICTE and Affiliated to G.G.S. Indraprastha University, Delhi)

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