Investigations on Barriers to the Incorporation of Information and Communications Technologies in Small Scale Industries

BHAGWAN SHREE RAM
Department of Management Studies (Research)
Anna University of Technology, Coimbatore
Principal, AAIST, Sriperumbudur, 602105, AU Chennai, Tamil Nadu
INDIA
bhagwan62@yahoo.com http://www.arignaranna.org

M. SELVARAJ
Professor, Department of Management Studies
Anna University of Technology, Coimbatore
Sona Institute of Management Studies, Salem 636005, Tamil Nadu
INDIA
drselvarajmuthusamy@gmail.com http://www.sonatech.ac.in

Abstract: - In this research paper the investigations are made on the incorporation barriers of the Information and Communications Technologies (ICT) in the small scale industries in Chennai, Tamil Nadu state of India. Here the researcher creates a suitable ecosystem with explanations about the successful qualities to be possessed, risk to be faced, constraints to be studied and challenging time to be crossed in achieving the aim of success in small scale industries. To evaluate the barriers of implementation of ICT in small scale industries and motivate the new entrepreneurs to launch the new industry in this sector, a well built supportive ecosystem with dimensions of the skilled and efficient human resources, modern information and communications equipment and technologies, the regulatory systems, healthy legal environments and the improved infrastructure of international standard are very much important to fulfil their entrepreneurial thrust. This research paper deals with the investigations of barrier parameters of the implementation of the ICT in small scale industries. Small scale industries play very important roles in the Indian national economies, due to their numbers and the large share of the workforce involved. However, despite the recognition of important roles of small scale industries in the economy, some crucial ICT implementation barriers prevent them from developing and contributing sufficiently. This research paper identifies and determines the important implementation barriers of ICT in the small enterprises in Chennai, India.

Key-Words: - Economic growth, ICT Barriers, Factor Analysis, Small Scale Industries.

1 Introduction

This research paper aims to understand, identify and determine the barrier factors to the implementation of the information and communication technologies and e-business in the Small Scale Industries (SSIs) in Chennai, India. In terms of value addition potential, the small scale industries and enterprises offer tremendous opportunities in the country. This research study consisted of face-to-face structured interview with decision-makers and entrepreneurs of 231 out of 327 selected small scale industries and enterprises in Chennai and they were interrogated whether they had intentions to grow the industries, how they grew their businesses or intended to do so, and what, if anything, interfered with this process. The purpose of the research study is to examine barriers factors to the implementation of the information and communication technologies and e-business in the small scale industries from the perspective of individual entrepreneur, with an emphasis on the meaning of barriers and the context in which they are perceived. Findings suggest that the relationship between barrier factors to the implementation of the information and communication technologies and e-business in the small scale industries and small industrial growth is a complex issue.

A perennial question for small industrial management is: why the businesses do not grow as per the expectations. One potential way of explaining why a large number of SSIs do not grow is through the notion of 'barriers'. The significance of the current research is in providing a more complete picture of small industrial growth. This is accomplished by researchers understanding of barrier factors to the implementation of the ICT and e-business in the small scale industries, and by extending this understanding beyond the context of market economies. The greater economic benefits are well known and include the creation of wealth, jobs and innovation stated by Carter and Jones-Evans [7].

2 Literatures Review

In the review of research on small business growth, Davidsson, Achtenhagen and Naldi [8] suggested that the reasons so few firms grow were varied and include the fact that many firms operate in mature industries where the potential to grow is absent; Taylor and Murphy [21] agree and acknowledge that each individual SSI is different and should be treated as such. This reinforces the 'small firm and ICT from the small firm perspective' which advocates the uniqueness of each SME and the purpose of adopting or implementing ICT. Further, the functionalist perspective has been explained by Burrell and Morgan [6]; studies about the small scale industries and entrepreneurship research has been presented by Grant and Perren [14] including research on barriers to small industrial growth, limits our understanding of these issues by 'writing individuals out of the story and ignoring the 'emotion and personal angst of entrepreneurs'.

Jennings, Perren and Carter [17] explained about the various effects of ICT barriers on the growth of small enterprises. The current research takes steps towards resolving these issues by examining barriers from the perspective of small business owner-managers those are willing to implement the ICT facilities in their enterprises. In some cases, it might be also being difficult to determine whether influences on the ICT barriers are internal or external has been explained by Davidsson et al., [8]. The concept of the ICT barriers implies a 'perceived discrepancy' between an individual's conception of the current reality and the desired state of reality has been distinguished by Barth [2].

Perceptions of ICT implementation barriers to small industrial growth are said to be influenced by characteristics of the individual including knowledge and motivation (as indicated by background, education and experience), as well as by external characteristics such as stage of growth, geographical location, and national industrial environment shown by Huang and Brown [16]. The idea that ICT implementation barriers in SSIs embody a perceived discrepancy between real and desirable conditions appears in other kinds of studies about barriers (not just studies on business growth), including those on barriers to internet usage by Grant and Waite [13] and barriers to career development in SSIs, by Albert and Luzzo [1].

The absence of strong regulations can also be effective initial entry barriers of ICT in SSIs as explained by Desai, Gompers, and Lerner [9]. Entrepreneurship developments in the area of WECS systems in India have been explained by Bhagwan Shree Ram and Selvaraj in [5] where ICT technology is having vital rore. Bertrand and Kamarz [3] examine the expansion decisions of French retailers following new zoning regulations introduced in France. They find a strong relation between increases in entry deterrence (such as rejection of expansion or entry decisions) and decreases in employment growth. Black and Strahan in [4] have explained about the economical development which seems to foster entry. Di Patti and Dell Ariccia [10] examine whether entry is higher in informational opaque industries in Italian regions that have a more concentrated banking sector.

Finally, Fisman and Love [12] find that SSIs with higher dependence on trade credit financing exhibit higher growth rates in developing countries with relatively weak financial institutions. Dr. Bashar [11] finds in his research that the average sizes of firms in human capital intensive industries are larger in countries that protect property rights.

This investigation deals with the determination of parameters of the barriers of implementation of ICT in small scale industries in Chennai in India. It evaluates the effect of each critical elements of the entrepreneurial barrier in the above industries. This study will help in understanding the outline some of the characteristics of the barrier of ICT implementations in the small industries in Chennai.

3 Problem Statement

A variety of circumstances have contributed about the barrier of ICT implementations in the small industries, these relate to finance, labour availability, marketing, technology, innovation, creativity, competitiveness, ICT rule and regulations, socio-cultural, infrastructural, risk taking capabilities, fear of competition, advantage seeking, proactively, creativity are amongst others.

The problem is that SSIs are mainly using traditional tools to stay competitive. Both the traditional and the modern ICT tools are important for the competitiveness of the business growth. The research paper follows a nonparametric qualitative research approach and uses semi-structured questionnaires with open-ended questions as data gathering method. There are a number of reasons why SSIs might not implement ICT tools, such as limited funds, lack of knowledge, lack of skilled staff and lack of tools. The article highlights the limitation that SSIs have in using ICT and make recommendations on how to overcome them.

4 Objectives of the Case Study

The entrepreneurial barrier is about creativity, innovation and opportunity taking that result in organizational wealth creation and success. Such a mindset allows entrepreneurs to make convincing decisions in the face of uncertainty. A case study on the barriers to the implementation of ICT in small scale industries in Chennai, Tamil Nadu state of India, is having two major objectives:

1. To study the profile of entrepreneurs of small scale industries those are willing to implement ICT.
2. To investigate, determine and measure the critical elements of the barriers to the implementation of ICT in small scale industries in Chennai**.**

4.1 Research Methodology

This research is based on the proper method of data collection and suitable technologies of analysis of data. In this research paper data collection method and tools of principal component methodology of factor analysis have been applied as suggested by Gupta [15] and Kothari [18].

4.2 Sources of Data

The study consists of both the primary and the secondary data. The primary data were collected from the various small scale industries in Chennai. There are around 231 such industries in and around Chennai running SSIs and having various engineering processes like machining, fabrication, manufacturing of the automobile components, gears, chemical products, agricultural products processing and cloth item and textile industries working throughout the year. Out of the 327 entrepreneurs, 231 of them were chosen randomly by adopting stratified entrepreneurs operating small scale industries of random sampling method. The geographical distribution of the sampled small industries entrepreneurs is shown in the following table 1. Interview schedules were applied to collect information from the small industries entrepreneurs.

Table 1: The Geographical Distribution of the Sample of Entrepreneurs operating SSI

Places of Samples Taken	No. of Samples	% of Respondents
Chennai West	74	32.03
Chennai South	63	27.28
Chennai Central	48	20.78
Chennai North	46	19.91
Total	**231**	**100**

A well structured interactive interview pattern, questionnaire and schedule were prepared with the help of SSIs entrepreneurs and concerned officials of small scale industries owners association of Chennai. Field survey method was adopted to collect the first hand information from the entrepreneurs of SSIs of Chennai. The researcher personally arranged the interactive interview with each and every respondent for this purpose. The secondary data were collected from the records maintained by the association of small scale industries entrepreneurs, industrial development board and earlier literary work published from the same areas. Certain relevant information was collected from the central and Tamil Nadu state government reports, magazines and leading journals.

4.3 Frame Work of Analysis

For analyzing the data, the researchers have used simple statistical tools like percentage, range, SPSS software, two-way tables and chi-square test and standard deviation. In addition to these tools, Henry Garrett ranking method and Factor analysis also employed to rank the issues of SSIs entrepreneurs in the study area. A number of standard text books [14] and [17] were consulted to do analysis.

4.4 Construction of Interview Schedule

The main aspect of the present research was identified from the pilot study with some selected small scale industrial entrepreneurs. The schedules hence prepared were circulated among some eminent research experts, professors, faculty guide and the association members of small industries for a critical view with regard to format sequence. The schedule was drafted after their critical and valuable suggestions.

4.5 Period and Scope of Investigations

The researcher has started the collection of secondary data from February 2010 onwards and the field of investigation was made for a period of twenty four months from April 2010 to March 2012.

In this research, an attempt has been made to investigate, determine and measure the critical elements of the barriers of implementation of ICT in small scale industries. A substantial part of the survey is devoted to the profile study and core factors which affects the barriers of implementation of ICT in small scale industries. The survey attempts to provide a resource and a basis for discussions on the leading issues in the small scale industries problems. The findings of this assessments and interpretations will be having fruitful value for the future researchers all the times for the progress of other sectors of the industries in other places of developing countries.

5 Percentage Analyses

Percentage analysis has been given in the following tables. Table 2 shows details about the gender of the respondents; table 3 shows the types of the small industries; table 4 presents the area of location the automobile entrepreneurs in Chennai.

Table 2: Gender of the Respondents

Gender of Respondents	Number of Respondents	Percentage of Respondents
Male	164	70.99
Female	067	29.01
Total	**231**	**100**

From the table 2 it is inferred that 70.99% of the respondents are belongs to masculine gender and 29.01% of the respondents are belongs to feminine gender. The table 3 shows that 26.84% of the respondents main business activity includes automobile industries, 22.94% of the respondents main business activity includes casting of ferrous and non ferrous components, 19.05% are from engineering industries, 16.88% industries belong to chemical engineering and 14.29% of the respondents main business activity involves in agro-based industrial products.

Table 3: Types of the Industries

Types of Enterprises (E)	No. of Respondents	% of Respondents
E1: Automobile industries	62	26.84
E2: Casting industries	53	22.94
E3: Engineering industries	44	19.05
E4: Chemical industries	39	16.88
E5: Agro-based industries	33	14.29
Total	**231**	**100**

The table 4 shows that 32.03% of the respondents are located in the Chennai West; 24.24% of the respondents located Chennai South; 22.51% of the respondents are located in Chennai Central and 21.22% of the respondents are located Chennai North.

Table 4: Area of Location the small industries

Places of Samples Taken	No. of Samples	% of Respondents
Chennai West	74	32.03
Chennai South	56	24.24
Chennai Central	52	22.51
Chennai North	49	21.22
Total	**231**	**100**

6 Limitations

The study is limited only to Chennai and hence, the findings and suggestions drawn in this research study may or may not applicable to other places. The respondents do not maintain many records and so they had to recall their memory and furnish the information for the query put forth by the researcher. Hence the data collected were subject to recall bias so chances of missing of data cannot be ignored.

7 Ranking Method

There are lot of ICT implementations barrier factors for incorporation in the SSIs in Chennai. The main barriers elements are identified as follows:

1. High Cost of the implementation of ICT Systems
2. Lack of suitably well qualified staff
3. Security concerns
4. Lack of e-Business competences
5. Lack of entrepreneurial experience
6. Fast technological changes in ICT
7. Low market support
8. Lack of strong ICT rules and regulations
9. Socio cultural barriers

Table 5: Influencing Factors Analysis

Environmental Factors	Total score	Mean score
Technology related	14508	62.81
Organizational environment related	12151	52.60
Business related	10558	45.71
Government related	09658	41.81

A frame of twenty questionnaires with zero to five point scale has been made with the help of

experts, professors and previous literatures. The details are given in the table 5. The factors are: Technology related, Organizational environment related, Business related and Government related. The table 5 show that amongst all the Influencing Factors the 'Technology related' factor in small scale industries are having 62.81% score in comparison with the next highest score of 52.60% of the factor 'Organizational environment related', Third place with 45.71% is of 'Business related' and last factor is the 'Government related' with 41.81% of small scale industries in Chennai.

7.1 Evaluation of Environmental Factors

In order to identify the important factor which the promoter entrepreneurship, all the environmental factors have been studied, analyzed and classified under four categories.

7.2 Barriers Faced by the Entrepreneurs

During the sample analysis of the answers given by the entrepreneurs, some important ICT implementation barriers to the small scale industries in Chennai have been observed. The result analysis is listed in the table 6.

Table 6: Barriers Faced by the Entrepreneurs

Barrier Factors	Total Scores	Mean Score
1. High cost of the implementation of ICT Systems	16648	72.0
2. Lack of suitably well qualified staff	15438	66.83
3. Security concerns	14322	62.0
4. Lack of e-Business competences	13584	58.8
5. Lack of entrepreneurial experience	12337	53.4
6. Fast technological changes in ICT	11388	49.3
7. Low market support	10304	44.6
8. Lack of strong ICT rules and regulations	09034	39.1
9.Socio cultural barriers	08617	37.3

In order to identify the problems of the implementation of ICT in SSIs in Chennai, the researcher divided the areas into nine heading viz., cost, skilled staff, security, competences, experience, technological changes in ICT, market, ICT laws, socio and cultural barriers. The table 6 shows that the most important barriers faced by small industries entrepreneurs recently is 'Cost of implementation of ICT Systems' with a score of 16648 points. Second and third ranks were given to 'Lack of suitably well human resources' and 'Security concerns' with 15438 and 14322 points respectively; fourth, fifth and sixth place goes to 'Lack of e-Business competencies', 'Lack of entrepreneurial experience' and 'Fast technological changes in ICT' among the Small Scale Industries units with a score of 13584, 12337 and 11388 points respectively; seventh factor the 'Low market support' with 10304 point; eighth factor 'Lack of strong ICT rules and regulations' with 9034 points and 'Socio cultural barriers' with 8616 points are observed.

8 Factor Analyses

A factor analysis is like a regression analysis as it tries to 'best fit' factors to a scatter diagram of data in such a way that factors explain the variance associated with responses to each statement. Factor analysis was conducted by the researcher in the following seven stages:

1. In-house research;
2. Formation and formulation of questionnaire;
3. Collection of primary and secondary data;
4. Feeding and processing the input;
5. Analyzing the output;
6. Identification of all factors and naming them
7. Findings for the entrepreneurial mindset and the requisites for the ICT implementation barriers to the small scale industries in Chennai.

8.1 Factors Chosen for the Analysis

The parameters of ICT implementation barriers to the small scale industries in Chennai have been selected by the researcher. Nine factors have been selected after the careful study and analysis of the outcome on the reply of the questionnaires delivered by the SSI entrepreneurs. Each factor consisted of four statements.

The main nine identified factors are as follows:

F1 High cost of the implementation;
F2 Lack of suitably well qualified staff;
F3 Security concerns;
F4 Lack of e-Business competences;
F5 Lack of entrepreneurial experience;
F6 Fast technological changes in ICT;
F7 Low market support;
F8 Lack of strong ICT rules and regulations and
F9 Socio-cultural barriers.

Five point scaling technique was employed to arrive at the opinions of the entrepreneurs on each statement. 36 statements were chosen and classified under nine factors. Factor analysis was employed using the SPSS software.

8.2 Kaiser-Mayer-Olkin (KMO) Measure of Sampling Adequacy

This index compares the magnitude of the observed correlation co-efficient to the magnitude of partial correlation co-efficient. Instances of small values indicate that the correlation between pairs of variable cannot be explained by other variable and hence, factor analysis will not be appropriate. Here the value of the KMO measure is 0.748 with the zero significance value.

8.3 Pearsons Correlation Coefficient (r)

$$r = \frac{[(1/n)\sum(X-\bar{X})(Y-\bar{Y})]}{\sigma_x \sigma_y}$$

Where 'r' is the Correlation Coefficient and σ_x and σ_y is the standard deviations between variable factors X and Y. Here 'n' is total numbers of the respondents. Its value has been found acceptable for this research work. The nominator of the equation (1) is called as covariance between x and from above equation, it can be derived as:

$$r = \sum (XY) / \sqrt{\sum X^2 Y^2}$$

Where $x = (X - \bar{X})$ and $y = (Y - \bar{Y})$

8.4 Measure of internal consistency

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. A "high" value of alpha is often used as evidence that the items measure an underlying (or latent) construct. Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability (or consistency). The formula for the standardized Cronbach's alpha:

$$\alpha = \frac{N\,\bar{0}}{\bar{0}(N-1)+\bar{Y}}$$

Here N is equal to the number of items, $\bar{O}$ is the average inter-item covariance among the items and $\bar{Y}$ equals the average variance. One can see from this formula that if we increase the number of items, the Cronbach's alpha will be high. Additionally, if the average inter-item correlation is low, alpha will be low. In this investigation numerical value of Cronbach's alpha is more than 0.724, which can be considered as a good value.

8.5 Eigen - Values and Communalities

A factor's Eigen value or latent route is the sum of the squares of its factor loading, helps us to explain how well a given factor fits the data from all respondents on all the statements. Here Eigen value has been taken more than numerical value of one. The first three factors are having value more than one. The method for the determination of communalities has been adopted from the book of Kothari [17]. Table 7 shows the Communalities of factors.

Table 7 Communalities

Factor (F)	Extraction
F1; High cost of the implementation	0.907
F2; Lack of suitably well qualified staff	0.929
F3; Security concerns	0.815
F4; Lack of e-Business competences	0.988
F5; Lack of entrepreneurial experience	0.935
F6; Fast technological changes in ICT	0.856
F7; Low market support	0.629
F8; Lack of strong ICT rules and regulations	0.963
F9; Socio cultural barriers	0.714

9 Extraction Method: Principal Component Analysis

Simple correlation between the nine factors were calculated and correlation components were arranged of the nine factors (F1 to F9) to form the Correlation Matrix, shown in the table 8.

9.1 Factor Loading

The researcher has applied the factor analysis to assess the major attributes influenced the attitudinal orientation of small scale industrial entrepreneurs in Chennai. Table 8 is a correlation matrix constructed based on the ratings. The analytical process is based on a matrix of correlation between the variables (F1 to F9). Valuable insights can be gained from an examination of this matrix. If the factor analysis should be proper the variables must be correlated. If the correlation between all the variables is small, factor analysis may not be appropriate. In this inter correlation matrix the correlation between all the variables are in good fit, and the factor analysis may be appropriate. K.M.O. and Bartlett's Test is tabulated in the table 9.

Table 8: Correlation Matrix

Factors	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1	**1.000**	0.422	0.174	-0.030	0.354	0.468	0.222	0.750	0.340
F2	0.422	**1.000**	0.140	-0.396	0.629	0.709	0.411	0.459	0.590
F3	0.174	0.140	**1.000**	-0.330	0.101	0.179	0.302	0.250	0.252
F4	-0.030	-0.396	-0.330	**1.000**	-0.180	-0.210	-0.199	-0.110	-0.301
F5	0.354	0.629	0.101	-0.180	**1.000**	0.761	0.212	0.338	0.541
F6	0.468	0.709	0.179	-0.210	0.761	**1.000**	0.333	0.388	0.389
F7	0.222	0.411	0.302	-0.199	0.212	0.333	**1.000**	0.490	0.120
F8	0.750	0.459	0.250	-0.110	0.338	0.402	0.490	**1.000**	0.414
F9	0.340	0.590	0.252	-0.301	0.541	0.389	0.120	0.414	**1.000**

Table 9: K.M.O. and Bartlett's Test

Kaiser-Meyer-Olkin measure of sampling adequacy	0.748
Bartlett's test sphericity approx chi-square	715.64
Degree of Freedom (DF)	36
Significance	0.00

Table 10: Total Variance of factors

Barrier Factors	Eigen values	Percentage of variance	∑ %
F1	4.891	54.341	54.341
F2	1.569	17.438	71.779
F3	1.281	14.234	86.013
F4	0.764	08.493	94.506
F5	0.343	03.814	98.320
F6	0.095	01.054	99.374
F7	0.033	00.369	99.743
F8	0.023	00.257	100.00
F9	-5.058E-017	-5.620E-016	100.00
Total	**9.00**	**100%**	**100%**

In the table 9, Kaiser Meyer Olkin (KMO) measures of samples adequacy are used to test the appropriateness of the factor model.

Bartett's test is applied to test the null hypothesis that is to find out that the variables are not correlated. Since the approximate chi-square value on attitudinal orientation 18.24 which is significant at 1% level.

The value of KMO statistics (0.748) is acceptable. Table 10 shows the Total Variance of factors. 'Rotations sum of squared loadings' was found equal to be of 86.013%, which is equal to the percentage of variance.

Table 11 shows the Component Matrix and table 12 shows the Rotated Component Matrix.

Table 11: Component Matrix *

Factors	Component		
	1	2	3
F1	0.608	0.032	0.733
F2	0.941	-0.187	-0.096
F3	0.332	0.726	-0.423
F4	-0.900	-0.288	0.310
F5	0.801	-0.513	-0.176
F6	0.858	-0.341	-0.074
F7	0.485	0.628	-0.007
F8	0.684	0.325	0.621
F9	0.792	-0.211	-0.194

Extraction Method: Principal Component Analysis.
* 3 components extracted.

It is clear that factors are having high correlation with same component factors. For a better interpretation, it is taken further to the next step.

Table 12: Rotated Component Matrix **

Factors	Component		
	F1	F2	F3
F1	0.261	0.916	-0.028
F2	0.889	0.295	0.229
F3	0.038	-0.076	0.899
F4	-0.685	-0.186	-0.697
F5	0.960	0.097	-0.068
F6	0.891	0.246	0.060
F7	0.087	0.336	0.713
F8	0.213	0.912	0.292
F9	0.811	0.140	0.192

Extraction Method: Principal Component Analysis.
** Rotation converged in 5 iterations. Rotation Method: Varimax with Kaiser Normalization.

9.2 Results and Discussion of the Findings
It is learned from the above table that the result of Varimax procedure of factors are presented. Rotation does not affect the percentage of total variance explained. That factor can then be interpreted, in terms of variables that load high on it.

9.3 Principal Component Analysis
It is observed from the above table that the initial Eigen values for a factor indicate total variance attributed to the factor. The Eigen value for a factor indicates total variance attributed to the factor. Factor one F1 High cost of the implementation, accounts for a variance of 4.891 which is 54.341% of the total variance; likewise the second factor F2 Lack of suitably well qualified staff factor accounts for variance of 1.569 which is 17.438% of the total variance; third factor F3 Security concerns factor accounts for variance of 1.281 which is 14.234% of the total variance and the first three factors combine to account for 86.013% of total variance. Similarly the factor F4 to F9 is shown in the table 10.

Table 13: Component Transformation matrix

Component	F1	F2	F3
F1	0.816	0.443	0.372
F2	-0.495	.202	0.845
F3	-0.299	0.874	-0.384

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

In this approach, only the factors with Eigen values greater than 1.0 are retained other factors are not included in this model. Table 13 gives Component Transformation Matrix. Since there are 3 components possessing Eigen values which are greater than 1.0. That is six components are said to be, extracted from the total of nine factors. The facilitating factors that influences attitudinal orientation of the entrepreneurs was studied and found that component one F1 (High cost of the implementation) has high co-efficient among the selected variables. Therefore, this component may be labelled as a major influencing factor as strategic parameters of barrier to the implementation of ICT in the operations of the SSIs in Chennai. It could be observed from the above factor analysis that nine different components have been selected and analyzed. Each component offered different outcome focuses on influence of barrier to the implementation of ICT in the operations of the SSIs in Chennai. Out of these nine factors, only three factors such as (F1 High cost of the implementation; F2 Lack of suitably well qualified staff and F3 Security concerns) factors reveal the high co-efficient. From the analysis, it is evident that the respondents agreed to the fact that all the nine factors are intended to induce the influence of barrier to the implementation of ICT in the operations of the small industries. These nine factors considered to be the determinants of high barriers to the implementation of ICT in the operations of the SSIs.

Ngwenyama in [20] argues that everyone assumes that ICT will successfully bring about benefits, but not all environments are the same. The issues affecting successful implementation or adoption of ICT are both socio-economic and technological. MacGregor and Vrazalic [19] agree that the barriers to adopting the ICT by SSIs are both socio-economic and technological, by pointing out that the barriers can be caused by factors external and or internal to the SSIs.

10. Findings and the Requisites for Implementation Barriers of ICT in the Small Scale Industries

Findings and the requisites of the case study for barriers to the implementation of ICT in the small scale industries have been provided below.

10.1 Findings for the Barriers to the implementation of ICT in the SSIs :
1. From the analysis, it is identified that the 41 % the entrepreneur are fall under the age group range of 32 – 45 years. The Chi-square test reveals that at 5% level of significance the hypothesis "age of the respondents and their volume of business are associated" holds good.
2. While analyzing the educational level of the respondents, it is observed from the analysis that 51 % of the small industries entrepreneurs are belonging to the school level education, 39% are completed their collegiate education, and 10 % of automobile entrepreneurs are illiterate in education level. The Chi-square test reveals that the hypothesis "educational qualification and the volume of business are associated" holds good at 5% level of significance.
3. The marital status of the entrepreneurs are studied and it is noted that majority of the sample respondents 70 % are unmarried in the field of industries where as only 30% of the respondents are married. It is also found that the percentage of high volume of business is highest 60% among the unmarried and the hypothesis 'marital status and the

volume of business are associated' holds good at 5% level of significance.

4. The communal status of the entrepreneurs are studied and it is identified from the analysis that 60 % of the respondents belong to the Chettiyars community, 24 % of the respondents belongs to the Gounders community and only 16 % of the respondents belongs to the Nadars community in the study area. The Chi-square test reveals that hypothesis 'communal status and volume of business are associated' does not holds good at 5% level of significance and hence the people from any communal background can get succeed in the small scale industries / business.

5. The type of family was studied and noted that 54% of the sample respondents maintains joint family and the remaining respondents maintains nuclear family system. Similarly, the analysis of the family size reveals that about 46% of the entrepreneurs are belonging to the normal sized family with less than four members. The Chi-square test reveals that the hypothesis 'type of the family and the volume of business are associated' does not holds good at the 5% level of significance.

6. It is identified from the analysis that 48% of the entrepreneurs are having less than 10 years of experience in the industry, 32% of the entrepreneurs are having more than 15 years experience and 20 % of the sample respondents having 12-18 years of experience prior to starting their own business / SSI. The Chi-square test reveals that the hypothesis experience and the volume of business are associated, holds good at 5% level of significance.

7. Type of ownership is studied and noted that 52 % of the entrepreneurs are sole proprietorship and the remaining are operating their business as the partnership firm.

8. It is identified from the analysis that 48% of the entrepreneur falls under the category of Rs 40 lakh – Rs 65 Lakh wealth position, 27 % of the respondents are having less than 40 Lakh as their wealth position and remaining 25% of the entrepreneurs are having above 70 Lakh as their wealth position (1 US$ = Rs. 51 and 1 lakh = 10 million). The Chi-square test reveals that hypothesis 'wealth position and the volume of business are associated' holds good at 5% level of significance and hence the SSI entrepreneurs with high wealth position can achieve a huge volume of business.

9. The parent's background of the respondents is studied and noted that 51% of the sample respondent parents background are professional, 34% of the parents background are business, 15% of the family backgrounds are from agriculture.

10.2 The Requisites for Barriers to the implementation of ICT in the SSIs

The capacity for entrepreneurship can and should be deliberately developed within small organizations. This imperative facilitates both the recognition and the exploitation of opportunity.

1. Creation of an entrepreneur's knowledge base on the following:
   a. Quality concepts about the value added products in small scale industry
   b. ICT Technology linkages
   c. National and international ICT, production and processing standards – old and new
   d. Ideas on changing behaviour of customers towards ICT and the value added products.
2. Creation of support system
   a. Catalytic ICT programmes for technology absorption, quality up gradation, investment generation, productivity improvement and employment generation with focus on weak and small entrepreneurs including women.
   b. On farm sector support by way of training and testing facilities
   c. ICT Services for producers on value added
   d. Technical training programmes, information support programmes with special focus on grading standards at local market levels
3. Market Intelligence and exchange of ideas on good ICT management practices including supply chain management.
4. ICT Consultancy and advisory services for helping entrepreneurs prepare state of economic environment reports, which could be utilized by them for preparing memorandum on fiscal issues.
5. Preparation of small industry business guide for the benefit of new entrepreneurs using ICT should be reviewed frequently.

To conclude, there is immense scope for undertaking the barrier to the implementation of ICT in the operations of the SSIs in Chennai.

11 Conclusions

The ICT service platforms are targeting a particular business of SSIs, and there are various types of business solutions for SSIs. Moreover, most of them are Internet based solutions. Therefore, the SSIs in Chennai, India have a new chance to adopt the ICT and face the concrete barriers and the influencing factors now emerging in the process of the ICT adoption. Barriers to the entrepreneurs running the small scale industries in the Chennai are stereotyped as agile and capable of making decisions in real time. These time-compressed strategic decision processes are created to meet the needs of

customers, adapt to the industrial environment, and compete in a continuously changing competitive world. A mathematical approach to investigate the relationships between various barrier parameters of entrepreneurs operating small industries in Chennai has been investigated. Implications of the outcome arise from the logic of solving the managerial and entrepreneurial problem. Here the researcher creates a suitable ecosystem with explanations about the successful qualities to be possessed, risk to be faced, constraints to be studied and challenging time to be crossed in achieving the aim of success in the small industries.

References:

[1] Albert, K. A. and Luzzo, D. A. 1999. The role of perceived barriers in career development: A social cognitive perspective. *Journal of Counseling and Development*, 77(4): 431 - 436.

[2] Barth, H. 2004. *Barriers to growth and development in small firms*. Published doctoral dissertation, Lulea University of Technology, Sweden.

[3] Bertrand, Marianne, and Francis Kramarz, 2002, Does entry regulation hinder job creation? Evidence from the French retail industry, *Quarterly Journal of Economics* 117, 1369-1413.

[4] Black, Sandra E. and Philip E. Strahan, 2002, Entrepreneurship & bank credit availability, *Journal of Finance*, 57, 2807-2833.

[5] Bhagwan Shree Ram and M. Selvaraj, 2012, Entrepreneurship in the Environmentally Friendly and Economically Sound Renewable Energy Conversion System, *WSEAS Transactions on Environment and Development,* 1(8), pp. 13 – 22.

[6] Burrell, G., and Morgan, G. 2003. *Sociological paradigms and organizational analysis*. Aldershot: Ashgate Publ. Limited.

[7] Carter, S., and Jones-Evans, D. 2006. Introduction. In S. Carter & D. Evans-Jones (Eds.), *Enterprise and small business: Principles, practice and policy* (2nd ed.): 1-4. Harlow, UK: Pearson Education.

[8] Davidsson, P., Achtenhagen, L., and Naldi, L. 2004. *Research on small firm growth: A review.* Proceedings of the European Institute of Small Growth Business.

[9] Desai, Mihir, Paul Gompers, Josh Lerner, 2003, Institutions, capital constraints and entrepreneurial firm dynamics: Evidence from Europe, NBER,W.P. No.w10165, Dec.

[10] Di Patti, Emilia Bonaccorsi and Giovanni Dell'Ariccia, 2004, Bank competition and firm creation, *Journal of Money, Credit, and Banking* 36, 225-252.

[11] Dr. Bashar S. El-Khasawneh, 2008. "Entrepreneurship Promotion at Educational Institutions: A Model Suitable for Emerging Economies", *WSEAS Transaction on Business and Economics* 2(5), pp. 27-35.

[12] Fisman, Raymond and Inessa Love, 2003a, Trade credit, financial intermediary development and industry growth, *Journal of Finance* 58, 353-374.

[13] Grant, I. C., & Waite, K. 2003. "Following the yellow brick road" – Young adults' experiences of the information super-highway. *Qualitative Market Research,* 6(1): 48-57.

[14] Grant, P., & Perren, L. 2002. Small business and entrepreneurial research: Metatheories, paradigms and prejudices. *International Small Business Journal* 20(2): 185-211.

[15] Gupta. S.P., 1992. "Statistical Methods", Sultan Chand and Sons Publications, New Delhi.

[16] Huang, X. & Brown, A. 1999. An analysis and classification of problems in small business. *International Small Business Journal*, 18(1): 73-85.

[17] Jennings, P. L., Perren, L., & Carter, S. 2005. Guest editors' introduction: Alternative Perspectives on entrepreneurship research. *Entrepreneurship Theory and Practice*, March: 145-152.

[18] Kothari. C. R, 1992. "Research Methodology, Methods and Techniques", *Wiley Eastern Limited,* New Delhi.

[19] Mac-Gregor, R. C. and Vrazalic, L., 2006, 'The Effect of Small Business Clusters in prioritizing barriers to E-commerce adoption in regional SMEs,' *Journal of New Business Ideas and Trends,* 4 (1), 24-44.

[20] Ngwenyama, O., 2009, 'Factors Affecting ICT Expansion in Emerging Economies: An Analysis of ICT Infrastructure Expansion in Five Latin American Countries,' Information Technology for Development [Online], http://www3.interscience.wiley.com

[21] Taylor, M. and Murphy, A., 2004, 'SMEs and E-Business,' *Journal of Small Business and Enterprise Development*, 11 (3), 280–289.