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Modelling of Barriers to Innovation for SMEs of Developing Countries Using ISM Approach

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Abstract: For the growth of the country it is important to identify the factor which is responsible. In our study on innovation we found out eight barriers of innovation for SMEs which are modelled using ISM approach. In our result customer response and corruption was top rated barrier. While Taxation was bottom rated barrier further these factors were classified on their driving power and dependency power.

Keywords: Innovation, barriers, ISM, Modeling, SMEs etc.

I. INTRODUCTION

Small and Medium Enterprises (SMEs) are regarded as the main source of entrepreneurship and innovation. These enterprises provide employment to large number of people and contribute significantly to growth and GDP of an economy. In the world economy, knowledge as a determinant of competitive advantage is gradually replacing traditional factors of production like labour and capital. In order to survive and compete in the globalized market, small and medium enterprises need to use knowledge to innovate. In India, small and medium enterprises contribute about 45 percent of the gross turnover in the manufacturing sector and 40 percent of total exports **(Nomita Sharma, 2017)**. According to **(O'Bran, 2013)** in America innovation is a very important in our field to achieve their mission vision, and objectives statement. The politician and chief innovation officer are regularly mention the term innovation, **(Kurtao, 2014)** have find out important barrier of innovation which are given as Product Innovation, Process Innovation, Marketing Innovation, Business model Innovation, Supply chain Innovation and Organizational Innovation.

Indian industry has a history of scarce, and hence too expensive, capital; as a result, banks and other sources of capital continue to be conservative. Organisational barriers start from the top and include lack of goals and disinclination to risk, which is particularly high in knowledge creation and innovation activities; a preference for emerging improvements over revolutionary transformation; and failure to evolve unique, competitive business models **(Krishnan, 2006)**.

Managerial positions in India are for away from technical work. This creates barriers to innovation including: stiffness with technology and a perception of loss of control among managers and owners; failure to create durable R&D departments and board-level representation for the R&D function; insufficient investment in plant and machinery, old fashioned production tools and inadequate use of computers on the shop floor; the lack of a process positioning; belittle of commercialisation costs, poor quality product development skills, long development cycles and shifting priorities. Companies also fail to invest in training and development of skills in-house, team building, implant innovation systems, insufficient knowledge management systems and creative performance management systems. Public research firms and academic institutions also lack goal orientation and a strong research culture.

Nakane and Hall 2007 presented that some of the producers were undergoing a paradigm shift in the way they look at manufacturing operations there days. As of today, Indian firms have not fared well against the belligerent competitive master plan adopted by their international participants. **AHaleem et al 2012** has been identified distinguish some critical CSFs that are reason for growth of manufacturing sector. The attraction of enablers of innovation of SMEs are study and modelling approximate is used to customize the position of enablers. ISM is applied to comprehend the contextual relationship among the enablers and find out the critical elements of SMEs. **Gorodnichenko, Svejnar and Terrall 2015** have find that opening of border to trade and foreign investment, globalization brings golden time and pressures for domestic firms in upcoming market economy to innovate and improve their competitive positions. Many of these pressures and outcomes operate through increased competitions from and linkage with foreign companies.

This paper is presented in the following order. Section two presents the literature review and previous related work, along with the establishment of barrier. Third section shows the ISM model. Fourth section explains the results obtained. And finally, on fifth section the main conclusions and discussions are provided.

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In order to answers to the above-mentioned research questions, the present study aims at examining the following objectives:

1) To examine the type of barriers faced by small and medium enterprises in their innovative behaviour.
2) To explore as to how small and medium enterprises overcome the barriers to innovation.
3) To represent relation between the barriers of innovation with the top-rated factor and driving power study.

A survey was conducted including academy, industrial manager, professional and researcher's scholar.

II. LITRATURE REVIEW

NassarLawerwaju Masood (2015) have found of the barrier in the basis of innovation SMEs in Nigerian firm that a lack of quality, technical person, adequate financial problem, resistance to change in the enterprise's inadequate introduction of market both domestic, international inadequate government assistance etc. **(Torres, Guzma, Castro,2015)** have find out barrier to innovation for Mexican SME:s financial resources external environment as the barrier of innovation . he has fixed proposed performance key factor of SMEs. **Demirbas 2010** has find out barrier to innovation in turkey and some conclusion are the lack of state policies to support technology and R&D.The negative impact of the economy in the level of investment ,the high cost of innovation ,the lack of appropriate means of financing ,the lack of qualified personnel. **Necadova and Scholleova (2014)** has find out barrier to innovation in the Czech republic the item are the high cost ,the lack of specialist ,the payback period of investment extremely long, the equipment technology ,standard and legislation, lack of capital ,the lack of consumer response resistance to change ,the fear of risk ,ignorance of the market, the infrastructure of the business. **O`Driscoll (2014)** have given the short coming by applying the behavior model , it also test the relative influence of both reason for and ,importantly & also gave the reason against adopt in consumer& innovation adoption decision And this study provides to the innovation adoption and innovation resistance literatures by applying observable reasoning theory which allow innovation researchers and managers to test the relative impact of both reasons of the reasons against assumptions. **Westaby (2005)**.

Zhu, W ittman,Peing (2012) has find out five initial barrier for SME:s that are first competition fairness access to financial laws and regulation and tax burden, supports system. **Michaut M. K. Anne & H oogleraortrigip van H.C.(2010)** has given the collative variable closely associated with newness perception on the part of the consumer & it also explore the effort of newsmen on market success after one year.

Szymanki&Henard (2001) weiss&calantone 1994, has find out the predictor of new product performance & they are product characteristics, firm strategy characteristics and market place characteristics. **Saxena and Sahay (2009)** supervise a survey to govern the world class status of Indian firms. **Chan et al 2005** determine maintenance training system, management support and resource management as some generator for total productive maintenance execution in electronic firms. **Eid 2009** as propose complete setoff factors influencing the successful execution of world class manufacturing in Egypian manufacturing firms.

Brun 2011 had proposed the enablers of six sigma implementation in Italian firms and found management participation and dedication, cultural change, communication and culture, education and training as enablers. **Gorodnichenko, Svejnar, Terrall(2011)** have tested for the effect of globalization by the impact of increased competition and also find out the foreign direct investment on domestic firms efforts.

It also raise the technology improving the quality of the product also find the negative effect on innovation from firms. It also detect that they are more sensitive to foreign presence. **Cordeirosilviaanna, VieriaDionisi'o (2012)** according to him find out the issues of barriers to innovation – what are the barriers faced by the domestic companies, how do they ideal with and overcome then and the importance of barrier. **Carlin, Wendy, Mark E. Schaffer and Paul Seabright (2004)** has tested the hypothesis using the data transition economics. It also examines the effect of product competition on innovation. The main drivers of globalization are meliorated trade liberation successful economic reforms emerging's markets

Anh. N goe, Nguyen (June 2016) has find out complex effect on innovation. DFID find out the casts of corruption which are by coffey international it also analyze the quantitatively the effect of corruption on the firm in innovation **Anokin& Schulze (2013)** find out the longitudinal data & it carries the 64 countries from 1996 -2002 it also hypothesis that improvement in corruption control and raises the level of innovation at a decreasing rate. **Karkliusrasma (2002)** has find out the corruption of the judicial process & misuse of legislative power misuse of auditing in estimators, & ours light power, nepotism & selling of job . the study in based on the data of transparency international but it mainly gives the qualitative contribution to the debate on post communist corruption.

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Mensch (1975) has found out the economic level when he describes innovation. The political and socio cultural level can also involved in dynamic process of innovation **Rothwel (1969)** has find out linear progression from scientific discovery through technology development in firm to the market place .n**OECD (1999)** according to their innovation is complex interactive learning process, it needs the systematic approach which integrates institution to create , store of transfer the knowledge , skill and art facts.

BARRIERS OF INNOVATION

RESISTANCE TO CHANGE:

This include such factors as: disputes over educational objectives; inappropriate motivation; too narrow definitions of innovation; lack of planning for consequences outside the target system; lack of knowledge about the dynamics of change; characteristics of innovations which hinder adoption; characteristics of school systems which are not receptive to change; and the characteristics of persons associated with the innovation. The innovator/change agent must consider all of these, and make allowances for them if the innovation is to have any chance of success.

Watson (1969, p.488-496) has find resistance to change barrier related to personality development-

1. Homeostasis that are built in regulatory functions.
2. Habit that gives a satisfying response within operation produces gratification.
3. Primacy that a persistent pattern of behaviour derives from the organization first copes successfully with a situation.
4. Selective Perception and Retention produce once an attitude had been set up, a person responds to other suggestions within the frame-work of his established outlook.
5. Dependence that a continuation of dependence in n values, attitudes and beliefs accepted by the teacher as a child, from parents, teachers and significant by the others.

LACK OF FINANCE

There is an urgent need to address this formidable challenge by bringing down the cost of innovation and increasing the availability of innovation capital through banks and other support mechanisms **(AnshulPachouri and Sankalp Sharma; 2016).**

TAXATION:

Taxation has unbelievable effects on different parts of economy, which might include major impact on business formation and development. The main challenge that associated with taxation faced by the world is to create a conductive business environment to improve the growth of SMEs in the time tax compliance is fulfilled by entrepreneurs. In early of 2003s, **Robertson** supported that taxation is one of the primary factor that influence SMEs development. This statement was concluded based on the finding of **Ahwireng-Obeng&Piaray (1999)**, whose research found that when the tax rates goes higher, the profit incentives will reduce statically. While the implementation of Goods and Services Tax (GSTs) in Malaysia also has certain level of influence towards entrepreneurial success **(Lim et al. 2014)**.

UNFAVOURABLE MARKET CONDITION:

Lastly, unfavorable market condition such as disadvantages over the growth rate of market and industry, negative impact on societal attitude, lack of information sharing by government, changes regularly in government policies, unethical tactics shown competitors by competitor, and the presence of competitor with measurable advantage challenge will lead to venture falling **(Abdullah et al. 2009; Singh 2011)**.

LACK OF CUSTOMER RESPONSE:

How a customer service provider is approaching a client, their attitude toward the client is especially important. It may seem that some technical issue of how support is being offered has bigger impact on them. However, in my experience, the quality of a personal interaction between the service provider and the customer always has bigger contribution to how customer assign with his experience. This is also confirmed by the results of **Genesys Global Survey**, which show the 77% of customers say that competent customer service reps are most responsible for a happy customer experience.

UN-SKILLED LABOUR

(Gelder et al. 2007 &Hogarty 1993) have proposed several reason for planning is the main character of entrepreneurial activities, however, failure also arise when one can be contribute to inadequate business planning, the most remarkable are insufficient market research **(Ahmad &Seet 2009; Hogarty 1993),** and not having specific business goals **(Frese et al. 2006).** This was proved by the studies conducted by **Gelder et al. (2007), Hiemstra et al. (2006),** and **Singh et al. (2011),** which found that a firms that take a more proactive attitude towards business planning and strategy formulation can lower the chances of entrepreneur failure. Inappropriate leadership and unsuitable abilities become the cause of entrepreneur failure **(Lydon&Sweircz 2002).** Entrepreneur that lack of expertise and experience will bring the venture exit from the market place. The factors that contribute by this problem included inadequate knowledge in market and industry **(Liao et al. 2008),** did not go through proper training prior committed in business venture **(Carter &Auken**

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2006; Combs &Micheal 2008), and insufficient management abilities and experiences **(Carter &Auken 2006; Liao et al. 2008).**

THE IMPACT OF GLOBALIZATION:

There are demonstrated benefits from trade openness and FDI for developing and emerging economies' innovation performance which include the following:

1. Opening national markets to foreign competitors' products is a powerful means of strengthening competition and decreasing the market power of domestic producers. Firms' also react to competition by improving total factor productivity and innovation performance.
2. Openness facilitates access to foreign know-how and technologies.
3. Trade integration allows for economies of scale and specialization.
4. Trade openness leads economies to specialize in sectors which have a comparative advantage and can therefore foster the welfare-enhancing restructuring of countries' production and innovation structures. **(Organization for economic co-operation and development; Mar; 2012)**

CORRUPTION:

Corruption is government and public issue and how they impact the allocation of resources and economic growth, and how pertinent policies can improve the resulting outcomes. A definition of corruption that corresponds to this focus is "The abuse of public office for private (economic) gain".1 This excludes corrupt practices that occur exclusively among private sector agents, and purely "political" corruption, which focuses on the allocation of political power, rather than economic resources (although in practice the two frequently overlap). Even such a limited interpretation of the term "corruption" covers a considerable number of different human actions, which may in turn differently affect the operation of the economy. Therefore to analyze how "corruption" affects the economy (and growth in particular) requires the unbundling of the term into the specific human actions it comprises.

Table 1. Barriers and their relevant authors

S.No	Factors	Authors
1	Resistance to change	Nassar and Loyave(2015),Cloud, Garcia & Driscoll(2014)
2	Lack of finance	Nassar and Loyave(2015) Torres, Guzma and Castr(2015) Piperopoulo 2012 : Sharma Dr. NOMITA Sharma
3	Lack of customers response	Maria Lebed(2015), ANA Silvia Cordeiro(2012), Filipa Dionisio Vieira(2012)
4	Unfavorable market condition	Nassar and Loyave(2015) Abdulla et al 2011:Chu et al Gwija et al. S Singh 2011, CORDEIRO and VIEIRA 2012
5	Unskilled labor	Nassar and Loyave(2015)
6	Impact of globalization	TerenKatherini, Sbejnor&Gorondnichenko (2009),
7	Taxation	Torres,Guzma and Castr(2015), Zhu(2012)
8	Corruption	N Gugen and Doan Thung(2016)

III. METHODOLOGY

Qualitative research has been adopted. In this present research, a set of questionnaire was developed after reviewing the related literature and interviewing the experts of the relevant field. After this, the Delphi approach was applied. In this, the baseline questionnaire was mailed to the experts of the related field and based upon their responses on the Likert scale; critical factors which affect the growth of innovation for SMEs were obtained. Then, the ISM approach was applied to establish the relationship of these factors.

INTERPRETIVE STRUCTURAL MODELLING (ISM)

ISM methodology was suggested by **Warfield (1974)** and **Sage (1977)** is an adaptation of paired-comparison approach. ISM methodology is an interactive learning process, whereby a set of different and directly related elements are structured into a comprehensive systematic model. This model shows the structure of a complex problem, a system or a field of study, in a carefully designed pattern involving graphics as well as words **(Lal and Haleem 2009).** ISM having following steps that are:

(1) Barriers influencing the SMEs are listed.
(2) This is followed by finding the relationships between the barriers. Pair wise comparison is performed among the factors to find out the direction of their relationship.
(3) Structural self-interaction matrix (SSIM) is established from the barriers using the opinion of the experts. Based on the answers of the persons having expertise in the field of study, a table is prepared. Table 2 depicts the SSIM for the present case of the study.

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(4) This is followed by development of reachability matrix which is a matrix consisting of zeroes and one. This is represented by Table 3. It is then checked for transitivity. Table 4 represents the final reachability matrix after incorporating the transitivity. This states that if there is a relation between variable A and variable B and variable B and variable C, then there is a relation between variable A and variable C.
(5) Partitioning of the reachability matrix is performed.
(6) From the pairwise relationships of the reachability matrix, a directed graph is drawn and transitive links are removed. This is shown by Table 5.
(7) The final diagraph is transformed into an ISM by changing the factor nodes with statements.

Figure 1 represents the ISM-based structural model of barriers influencing the growth of innovation to SMEs.
Four notations are used to represent the direction of the relationship between the criteria (i and j):
V criterion i will help in achieving criterion j;
A criterion i will be achieved by criterion j;
X criterion i and j will help achieve each other; and
O criterion i and j are unrelated

Table 2. Structural self interaction matrix (SSIM) for Barriers

Sr.No.	FACTORS	8	7	6	5	4	3	2
1.	Resistance to change	X	A	X	O	A	A	A
2.	Lack of finance	A	V	V	V	A	V	
3.	Taxation	V	V	V	X	X		
4.	Customer response	X	V	V	V			
5.	Unfavorable market condition	O	X	X				
6.	Un-skill labor	V	X					
7.	Impact of globalization	A						
8.	Corruption							

Table 3 Initial Reach ability Matrix for barriers

FACTOR	1	2	3	4	5	6	7	8
1	1	0	0	0	0	1	0	1
2	1	1	1	0	1	1	1	0
3	0	0	1	1	0	1	1	1
4	1	0	1	1	1	1	1	1
5	0	0	0	0	1	0	1	0
6	1	0	0	0	1	1	1	1
7	1	0	0	0	1	1	1	0
8	1	1	0	1	0	0	1	1

Table 4 Final Reach ability Matrix for barriers

FACTOR	1	2	3	4	5	6	7	8	D.P.
1	1	1*	1*	0	0	1	0	1	5
2	1	1	1	0	1	1	1	0	6
3	0	0	1	1	0	1	1	1	5
4	1	1*	1	1	1	1	1	1	8
5	0	0	1*	1*	1	1*	1	0	5
6	1	1*	1*	0	1	1	1	1	7
7	1	1*	1*	1*	1	1	1	1	8
8	1	1	1*	1	1*	1*	1	1	8
DE.P.	6	6	8	5	6	8	7	6	

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Table 5: Level Partitioning Partition of Reachability Matrix for barriers: First Iteration

FACTOR	Reach setability	Antecedent set	Intersection	Level
1	1,2,4,6,7,8	1,2,3,67,8	1,2,6,8,	
2	1,2,4,6,7,8,	1,2,3,5,6,7	1,2,6,7	
3	1,2,3,4,5,6,7,8	3,4,6,7,[8]	3,4,6,7	
4	3,4,5,7,8	1,2,3,4,5,6,7,8	3,4,5,7,8	I
5	2,4,5,6,7,8	3,4,5,6,7	4,5,6,7	
6	1,2,3,4,5,6,7,8	1,2,3,4,5,6,7,8	1,2,3,5,6,7,8	
7	2,3,4,5,6,7,8	1,2,3,4,5,6,7	2,3,4,5,6,7	
8	1,3,4,6,8	1,2,3,4,5,6,7,8	1,3,4,6,8	I

Table 6 Second Iteration

FACTOR	Reach ability set	Antecedent set	Intersection	Level
1	1,2,6,7	1,2,3,6	1,2	
2	1,2,6,7	1,2,3,5,6,7	1,2,6,7	II
3	1,2,3,5,6,7	3,6,7	3,6,7	
5	2,5,6,7	3,5,6,7	5,6,7	
6	1,2,3,5,6,7	1,2,3,5,6,7	1,2,3,5,6,7	II
7	2,3,5,6,7	1,2,3,5,6,7	2,3,5,6,7	II

Table 7 Third Iteration

FACTOR	Reachsetability		Antecedent set	Intersection	Level
1	1,		1,3	1	III
3	1,3,5		3	3	
5	5		3,5	5	III

Table 8 Fourth Iteration

FACTOR	Reach set ability	Antecedent set	Intersection	Level
3	3	3	3	IV

Table 9 Levels of Factors for barriers

FACTOR	Reach setability	Antecedent set	Intersection	Level
1	1,2,4,6,7,8	1,2,3,67,8	1,2,6,8,	III
2	1,2,4,6,7,8,	1,2,3,5,6,7	1,2,6,7	II
3	1,2,3,4,5,6,7,8	3,4,6,7,8	3,4,6,7	IV
4	3,4,5,7,8	1,2,3,4,5,6,7,8	3,4,5,7,8	I
5	2,4,5,6,7,8	3,4,5,6,7	4,5,6,7	III
6	1,23,4,5,6,7,8	1,2,3,4,5,6,7,8	1. 1,2,3,5,6,7,8	II
7	2,3,4,5,6,7,8	1,2,3,4,5,6,7	2,3,4,5,6,7	II
8	1,3,4,6,8	1,2,3,4,5,6,7,8	1,3,4,6,8	I

IV. RESULT AND DISCUSSION

ISM can only act as a tool for imposing order and direction on the complexity of relationships among the variables. ISM technique has been found appropriate to model the barriers (eight in number). In our result Lack of customer response and Corruption are the top-rated barriers to innovation whereas Taxation is the bottom rated barriers. The major requirement of the present study was to identify the barriers responsible for the growth of SMEs. Extra care was taken to achieve accurate and reliable results. The ISM technique has been found appropriate to model these factors. Taxation has been found to have the highest dominating power, followed by resistance to change and unfavorable market condition at the second rank. Lack of finance, unskilled labor and impact of globalization are ranked third in position and lack of customer response and corruption has the lowest dominating power.. These factors will help manufacture a sustainable product which will satisfy the customer, improve the market, and create a cordial working culture in the firm. The ISM model (Figure 1) revealed the contextual relationship of identified barriers and it helped develop a hierarchical model.

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The driver dependence diagram gives some valuable insights into the relative importance of barriers and interdependencies among them. This study established a structural model to find out the barriers which are responsible for the growth SMEs. And this can act as a decision-making tool for policy-makers which can influence their decision with respect to SMEs

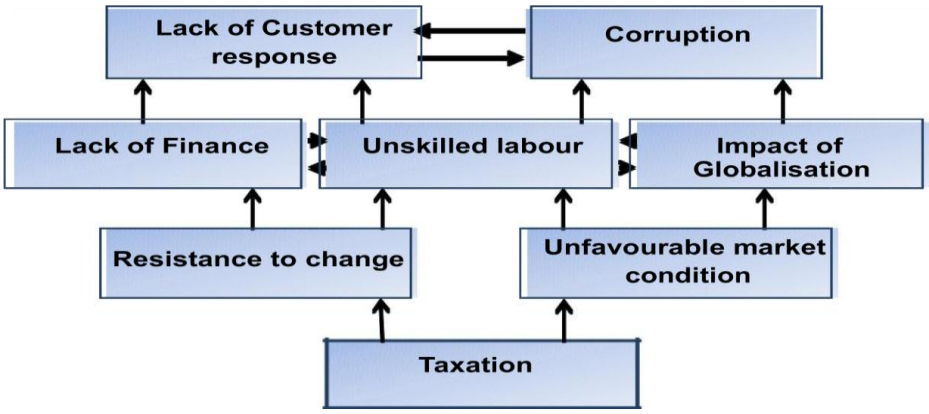

Fig 1 ISM Model for Barriers to Innovation

V. CONCLUSION

In this paper, an attempt has been made to identify the major barriers of innovation for SMEs that can be useful for successful in implementation in growth and profit of SMEs in developing countries like India, China etc. In the present work, eight variables are identified for modeling factors of innovation to SMEs. By using an ISM approach a relationship model among factors of innovation to SMEs has been developed. The decision makers had to answer a few questionnaires depicting the strength of the selected critical factors and this process enhances/refines the current decision-making process. The research done previously such as that done by Mannan in 2016 indicates that the factor affecting SMEs innovation the most is the stage of industries followed by demand, industry–university linkage, attitude to work change, and size and age. The result of our study shows that "taxation" is the key driving factor which helps in the successful implementation of integrating sustainability with innovation for Indian manufacturing SMEs. "Lack of customer response" and "corruption" has the highest dependence power.

VI. LIMITATIONS AND FUTURE SCOPE

This study suffers from few limitations also. The association among the critical factors depends on the expert's expertise in the field of study. The person who is judging the variables or the association of the critical factors can be biased and this might affect the final outcome. And since the models used can differ from industry to industry, accuracy determination and comparison are difficult due to the lack of any common base or context. In the present study, the ISM model has been developed among the factors.

These models have been established based on input from two sources:
(1) Opinion of the experts as discussed in the ISM
(2) Review of the literature

But these models are not statistically verified. Structural Equation Modeling (SEM), also known as linear structural relationship approach, has the ability of verifying these hypothetical models. Thus, it may be used in further research to verify these models. When we compare ISM and SEM, we should know that SEM has the ability of statistically verifying an already developed theoretical model; it cannot establish an initial model for testing. In contrast to this, ISM has the ability to establish an initial model with the help of managerial techniques such as brain storming and nominal group techniques (NGT) etc. It can be suggested that because of the complementary nature of both these techniques, future research can be directed in first establishing an initial model through ISM and then verifying it by applying SEM.

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