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## Spirits and Challenges of Tribal Women Entrepreneurs in Bangladesh: An Empirical Study

Mohammad Mizenur Rahaman<sup>1</sup>, Md. Jahangir Alam<sup>2</sup>, Tanzilur Rahaman<sup>3</sup>

### Abstract:

*The aim of this study is to discuss issues regarding spirits and challenges of tribal women entrepreneurs in Bangladesh. This paper is mostly based on primary data and some secondary data; for the identification of these issues the authors has reviewed different research articles and reports. Findings of this study reveal that tribal women are the special categories people who got their entrepreneurial spirits from self motivation, family, relatives and other ethnics. These people contribute immensely in balance development of the country by overcoming different challenges through their entrepreneurial spirits. They also facing some challenges in doing their business activities like not getting fair price of the products, communications problems, product imitating, improper distribution channel, impact large business organizations etc. This paper also tried to identify how the challenges are minimized by their entrepreneurial spirits.*

**Key words:** Entrepreneur, tribal women, challenges and spirits of tribal women.

### 1. Introduction:

Bangladesh is densely populated and one of the low per capita income generated countries in the world with a rich tribal people presents. Though the percentage of tribal is simple 1% on total population but they contribute vastly in different way through their workings and innovations. These socio economic characteristics they got from origin. Among the tribal people, women are creative and hard workings in nature (Partha, 2001). Many of the women are coming to be entrepreneur but their success rate is not so satisfactory. Entrepreneurial talents and managerial capabilities are important for success of any entrepreneur. Managerial capabilities mainly depend on educational background, prior experience, proper training and also family origin (Rahaman & et al. 2010).

Entrepreneurship is the purposeful activity of an individual or group of associated individuals to initiate, maintain or aggrandize profit by production or distribution of economic goods and services. Women entrepreneurs are those women who think of a business enterprise, initiate it, organize and combine the factors of production, operate the enterprise and undertake risks and handle economic uncertainty involved in running a business (Khanka, 2002). The International Labor Organization (ILO, 1984, cited in Islam and Aktaruzzaman, 2001) defines an entrepreneur as a person with a set of characteristics that typically includes self-confidence, result-oriented, risk taking, leadership, originality and future-oriented. Generally main features of entrepreneurship are as (i) being an economic agent, (ii) being creative, (iii) taking and bearing risk, (iv) being

innovative, and (v) being dynamic (Nawaz, 2009). Women entrepreneurs is an enterprise owned and controlled by women having a minimum financial interest of 51 per cent of the capital and giving at least 51 per cent of the employment generated in the enterprise for women. (The Government of India, 2011)

Tribal women entrepreneurs have been taking interest on business enterprise. Tribal women are working with traditional (cloth making, farming etc) and non-traditional (beauty salon, tailor etc) activities. At present many tribal women are entering in the new business considering than before but they are facing many types of challenges in doing business. It is inspiring that a new women entrepreneur's class is increasingly emerging in Bangladesh by taking the challenge of working in a male-dominated, competitive and complex economic and business environment. Their entrepreneurship not only improves their living conditions and earns more respect in the family and the society but also contributes to the economic development through increasing export, supplies, employment generation, productivity and skill development etc. Despite of this importance the major objective of this research is to have an overview of the spirits and challenges of tribal women entrepreneurs.

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## **2. Problem statement:**

A good number of studies were conducted on development of tribal women entrepreneurs in Bangladesh. In view of the need to bring the rural tribal women folk in the development stream of the country, many organizations tried but this is not satisfactory. Large numbers of tribal women entrepreneurs are rising with their own effort, hard work, dedication and perseverance. Many of the tribal women faces social, financial, technical barriers tremendously at the initial stage of starting business, some of them overcome such types of barrier successfully. There are lots of challenges facing tribal women entrepreneurs in Bangladesh. With the spirit of becoming an entrepreneur tribal women are overcoming these challenges.

## **3. Research Questions:**

This research has been conducted on the basis of some important questions. That are-

- i. What are the sources of spirits of tribal women entrepreneurs?
- ii. What are the challenges of tribal women entrepreneurs?
- iii. Do the spirits of tribal women entrepreneurs is sufficient for overcoming challenges?

## **4. Research Objectives:**

The main objective of the study is to identify the spirits and challenges of tribal women entrepreneurs in Bangladesh. Others objectives are:

- i. To find out the sources of spirits of women entrepreneur.
- ii. To find out the challenges of women entrepreneur.
- iii. To find out whether the spirits of women entrepreneur is sufficient for overcoming challenges.
- iv. To recommend for the development of this study.

## **5. Research Methodology:**

The study mainly focused on quantitative analysis using survey technique to explore pertinent information from the selected respondents. Major steps and procedures followed in this study were as follows:

### **Population & Sample:**

Since the study conducted on tribal women entrepreneurs thus all the tribal women entrepreneurs considered as a population for the study. Respondents were selected based on purposive and convenience sampling and sample size determined 150 based on the researchers' convenience. Survey was conducted through structured questionnaire among 150 tribal women entrepreneurs of Sylhet Division. Since no comprehensive directory for tribal women entrepreneurs in Sylhet Division is available, the respondents for questionnaire survey were purposively selected for this research. At every stage of the selection of respondents, priority was given on the objectives of the study.

### **Data collection:**

In this research data were collected from primary and secondary sources. Primary source data were collected from individuals through face to face (direct) interviews, using a structured questionnaire. The questionnaire was divided into two segments on the basis of the nature of information: (a) personal information, (b) information related to the spirits and challenges of the tribal women entrepreneurship. The questionnaire was comprised of approximately fifteen questions. The respondents for the questionnaire were selected from the women who directly owned enterprises in Sylhet division. Secondary sources of information including from published books, journals, newspapers, articles, internet and concerned organizations have also been used to develop this study further.

### **Data Analysis:**

After completion of the field study, data inserted in to computer program (SPSS). Collected data analyzed by using SPSS and descriptive statistics mainly used as analyzing techniques.

## **6. Literature review:**

### **6.1 Status of tribal people and prospect of entrepreneurship development:**

The term "tribal communities" or "ethnic groups" refers to those people whose linguistic and/or cultural background is different from the linguistic and cultural background of the mainstream population of Bangladesh

(Khaleque, 1998). Indigenous People are less than 5% of the world's population and about 15% of the world's poor people. Almost 170 million ethnic minorities and indigenous people are living in Asia (Elhaut, 2006). Bangladesh is a small but densely populated country of south Asia with a rich tribal presence. There are around 1.21 million tribal people are living in Bangladesh which constitutes 1.13% of the country's total population (Khaleque, 1998). The study revealed that traditionally agriculture is the prime occupation of the ethnic people while trading, crafts, weaving and so on are their secondary occupation. Indigenous societies are matrilineal.

The global evidences buttress that the tribal women have been performing exceedingly well in different spheres of activities like academics, administration and so on. Now, they have started plunging into industry also and running their enterprises successfully. There are lots of spirits for being an entrepreneur of tribal women. They are also facing lots of problems. The tribal population is dependent on Agriculture and Mullah *et al.* (2007) found that majority of the people do not have cultivable land. Majority of the tribal people specially women are living in the most remote and less favored area where the agricultural productivity has lagged behind, poor-income, below standard health and sanitation facilities and low levels of education (Elhaut, 2006). Their vulnerability and the historical injustices they have suffered as a result of the loss of their lands and related resources are globally acknowledged. Mullah *et al.* (2007) have acknowledged that the tribal people consistently facing social, economical, health, religion, land and law and order problems and 50% of the people are living under poverty line and among them 20% are living under core poverty line (ADB Report, 2006). Though some studies were conducted on entrepreneurship development in Bangladesh, no significant research study was conducted on the spirits and challenges of tribal women entrepreneurs either in rural or urban areas of Bangladesh. We tried to find out the spirits and challenges of tribal women entrepreneurs in Bangladesh. The government, NGOs and other organizations are now playing the vital roles to improve the social and economic condition of the tribal people specially the women.

Ten years ago, a majority of the women workers in Bangladesh worked in the informal sector. They were mostly unpaid and did not contribute directly to formal economic activities. However, the demographic structure of the labor participation in Bangladesh is witnessing a remarkable change. An increasing number of women are working in the formal sector as entrepreneurs and paid workers, a situation that was not seen in the past. This gradual transformation of women's participation from the informal to the formal sectors has resulted in an upward mobility in the social and economic status of women, especially that of poor women in the country.

In order to gain an understanding of the current situation, it becomes important to trace the factors that are contributing towards a progressive transformation in the status of women in the country. Since the early 1990s, the growth of manufacturing industries provided women an opportunity to enter the formal labor market. A large number of rural women migrated to cities at a very young age, thereby reducing women labor in agriculture in rural areas. A new generation of women workers emerged in the country that was financially independent and lived alone in urban areas without male supervision.

Moreover, expansion of credit facilities gave women access to funds. Initially, women had access to less than one percent of the credit in the formal banking sector in Bangladesh. However, with the advent of the micro finance sector, many women had the opportunity to actively participate in income generating activities. Women, who mostly participated in non-farm activities and homestead farming, engaged in small-scale production, especially in rural areas. On an average, women earn 40% less than men in Bangladesh and have limited ownership over assets. Although there is a persistent problem of under-remuneration of women employed in formal sector activities, the potential of women's economic contribution is slowly gaining recognition.

*A research study conducted by the Bangladesh Women Chamber of Commerce and Industry* reveals that women entrepreneurs are more likely to hire other women. In addition to creating jobs opportunities for women, such a trend will result in an overall increase in the progress of women in the country. Greater participation of women in remunerative work will not only improve their living conditions but also improve their bargaining positions. Employed women will have better access to mainstream banking services which will help them to save and invest their income in tangible assets.

## **6.2 Situation of the Tribal Women in Bangladesh:**

Indigenous societies are matrilineal. The inheritances of property possess through daughters. For economic reasons and because of losing lands in the villages, many indigenous people are coming to the towns, cities and semi urban areas for jobs and employment. The influence of Christianity and its modern education also are contributing to the migration of the indigenous people to city centers. A large number of them now work as domestic workers, care takers, sales-girls, beauticians, garments workers, nurse etc. in the urban areas. This mobility and migration of the indigenous people to the urban areas to earn their livelihood is also responsible for their vulnerability to various forms of oppressions, abuses and insecurities.

Most indigenous women's lives remain centered on their traditional roles, and they have limited access to markets, productive services, education, health care, and local government. This lack of opportunities contributes to high fertility patterns, which diminished family well-being; contribute to the malnourishment and generally poor health of children, and frustrated educational and other national development goals. In fact, acute poverty at the margin appear to be hitting hardest at women in Bangladesh. As long as women's access to health care, education, and training remain limited, prospects for improved productivity among the female population remain poor. The economic contribution of indigenous women is substantial but largely unacknowledged. In most cases they are responsible for most of the post-harvest work, which is done in the Chula, and for keeping livestock, poultry, and small gardens. A major portion of them largely depend on domestic and traditional jobs. Those with more education work in government, health care, and teaching, but their numbers remained very small (World Bank report, 2008).

**7. Findings and Analysis:**

From the analysis of the survey findings on basic factors of tribal women entrepreneurs was made to project significant. Most of the tribal women entrepreneurs' age in between 20 to 40 which is actually age of spirits. About 78% of tribal women entrepreneurs within above mentioned age group (Table –A02). Most of the cases they are self educated or have informal education. Most of their level of education is up to secondary level about 80% (Table –A03). Though the tribal women in Bangladesh unique because of their entrepreneurial activities but they are facing different types of problems which are in fact challenges for successful growth of the business. There are different types of challenges for them like not getting fair price of the products, communications problems, product imitating, improper distribution channel, impact large business organizations etc. Most of the respondents explain they are facing challenges because of the product price not fair compare with raw materials prices. Since they are lived in remote area communication is another important problem. Again after development of the new product general business people imitating their product just after first marketing. Thus they fail to hold their success in long run. About 76% tribal women entrepreneurs' claim they are facing above mentioned challenges (Table – A04).

However they have spirits for continuing entrepreneurial activities and running their business long run. From the survey study, it was also found that the majority of tribal women are self motivated with family inspiration for doing their job successfully while only 34% tribal women are motivated from the others sources like relatives, NGO workers, government organization etc. (Table – A05). They have spirits mainly from family members and self motivation which will help to overcome their challenges. But they need some government and NGO support for solving few problems like fair price, communications and copy right for not imitating.

Although they are expecting government support but only six percent got such benefits as a financial assistance from the government bank but few have NGO support (Table – A06). Most of the tribal women entrepreneurs (about 74%) strongly agree that they have need government and NGO support for overcoming the challenges while 18% agree they need it but nobody disagree about the support of NGO and government (Table – A07). Even 100% respondents have same views either agree or strongly agree about the result of government and NGO support for increasing earnings of the business (Table – A09). Again only 12% of the respondents agree or strongly agree that their entrepreneurial skills is sufficient but majority part put no comments on it (Table – A08) because most of the respondent have no clear knowledge about the concept of entrepreneur though they are innovating new things regularly.

**Table: B-1: Cross tabulation of overcoming the challenges through entrepreneurial spirits.**

		Sufficiency of spirits for overcoming the challenges				Total
		Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	
Challenges	Not getting fair price of product	8	7	10	5	30
	Communication Problems	0	4	10	10	24
	Improper Distribution channel	8	2	2	0	12
	Imitating product	12	20	6	4	42
	Impact of large business	1	5	5	7	18
	Others	2	8	9	5	24
	<b>Total</b>	<b>31</b>	<b>46</b>	<b>42</b>	<b>31</b>	<b>150</b>

Source: The Author

Analysis found relationship between challenges of tribal women entrepreneurship and spirits of tribal women for solving problems of entrepreneur not contradictory. Most of problems can be solved by their spirits while

others can be solved by the support of government and NGO. About 50% respondents agree or strongly agree on different aspects and confident they are able to overcome the challenges while only 20% respondents disagree on few issues which are able overcome by themselves (Table –B1) but these can be solved by government intervention and NGO support e.g. communication problems, not getting fair price, imitation of product etc.

### **8. Recommendations and Conclusion:**

Tribal women entrepreneurs start their business at early stage before 20. Age is not very important factor for doing their business. Women of different age group have some contribution. Most of them are not well educated which is one kind of challenge for them because they could not earn profit without proper knowledge of business and the market. Most of the tribal women entrepreneurs doing cloth business because of their tradition which can be considered main spirit of the tribal women. They make almost every kind of cloth (Sharee, dress, nokhsi katha, bed sheet etc). Most of the time tribal women entrepreneurs are motivated by their family and themselves. They spend huge time for their work this can be a spirit to overcome their challenges. Their main challenges that fair price problem, face transportation problem, export problem to overcome. If they get proper government support and NGO support they will be able to overcome their challenges with their spirits. Tribal women entrepreneurs can contribute to the business if they get proper facilities.

To overcome the challenges of tribal women entrepreneurs few actions are articulated from analysis of survey findings:

- i. Government should provide sufficient support for the tribal entrepreneurs in financing, transporting, fair price getting, ensuring copyright law, and supplying raw materials of innovative products.
- ii. NGO's should provide special support tribal women entrepreneurs so that they can apply their spirits to overcome their challenges like arranging training for skills development, increasing self awareness etc. in addition to the support of government organization.
- iii. Tribal women entrepreneur have informative about current change of the globalize world to holdup their success in long run.

### **9. Limitations of the study:**

The present study like many others has its limitations. First, this study was based on survey method which mainly focused on selected quantitative factors rather failed to conduct in-depth study on respondents because of time and cost limitations. It has captured the data on selected respondents purposively about their spirits and challenges based on structured questionnaire, because of data unavailability. Again the study conducted only on Sylhet region considering researcher convenience which help to researcher to study behavior of the respondents uniquely but it cannot be claimed as a generalized findings as data collected from 150 respondents only and considering few theories.

### **10. Future Research Directions:**

On the basis of the findings of this study and also considering its limitations, the researcher can suggests some directions for future research. This will contribute to the field of tribal women entrepreneurs.

Firstly, researcher has focused on sources of spirits and challenges of tribal women but not focused on relationship between sprits and challenge overcome of the tribal women. Thus the future study may be model of overcoming challenges through spirits of tribal women entrepreneurship.

Secondly, Future study may be sufficiency of support services to uplift tribal women entrepreneurship in Bangladesh.

Finally, Future study may be strategic capability of the tribal women entrepreneurs in penetrating new market.

It is hoped that someone will be interested enough to pursue all these potential areas of future research. Nevertheless, it is worth mentioning that the present researchers is committed to the pursuit of all these issues.

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**Appendix: 01 (Statistical Table):****Table: A1 - Descriptive Statistics**

	AG E.R	ED U_ R	B_T YP E	W_P REF ER	K_ CL OT H	D_T O_S _B	TIM E_R AN	S_P RO FIT	F_P ROB	R_P ROB	GO V_S	NG O_S U	SKI LL_ E	GOV T_S UP
<b>N Valid</b>	150	150	150	142	142	150	150	150	150	150	150	150	150	150
<b>Missing</b>	0	0	0	8	8	0	0	0	0	0	0	0	0	0
<b>Mean</b>	2.44	2.08	1.16	1.71	4.93	3.04	3.88	1.34	2.62	2.00	1.98	1.34	2.84	1.16
<b>Std. Deviation</b>	.951	1.20 9	.370	1.23 5	1.21 8	2.27 6	.480	.479	1.12 3	.000	.141	.626	.468	.370
<b>Skewness</b>	.179	.562	1.91 3	1.31 2	- .709	.511	- 4.97 6	.697	1.53 4		- 7.07 1	1.68 1	- 3.04 3	1.913
<b>Std. Error of Skewness</b>	.337	.337	.337	.365	.365	.337	.337	.337	.337	.337	.337	.337	.337	.337
<b>Minimum</b>	1	1	1	1	2	1	1	1	2	2	1	1	1	1
<b>Maximum</b>	4	4	2	4	6	6	4	2	5	2	2	3	3	2

**Source: The authors**

- \* AGE.R = Age of respondent
- \*EDU\_R = Education qualification
- \*B\_TYPE = Type of business
- \*W\_PREFER = Why prefer this business
- \*K\_CLOTH = Kind of cloth
- \*D\_TO\_S\_B = Driver to start business
- \*TIME\_RAN = Working time range
- \*S\_PROFIT = Profit satisfactory
- \*F\_PROB = Problem faced
- \*R\_PROB = Religious problem
- \*GOV\_S = Government support
- \*NGO\_SU = Sufficient NGO support
- \*SKILL\_E = Employee skill
- \*GOVT\_SUP = Sufficient government support

**Table-A02: Respondent's Age**

		<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	<=20	09	6.0	6.0	6.0
	21-30	75	50.0	50.0	56.0
	31-40	42	28.0	28.0	84.0
	40+	24	16.0	16.0	100.0
	Total	150	100.0	100.0	

**Source: The authors (development from the field study)**

**Table-A03: Educational Qualification of respondents**

		<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	Up to class 5	72	48.0	48.0	48.0
	class6-9	24	16.0	16.0	64.0
	S.S.C	24	16.0	16.0	80.0
	H.S.C or above	30	20.0	20.0	100.0
	<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>100.0</b>	

**Source: The authors (development from the field study)**

**Table-A04: Types of problems facing**

		<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	Not getting fair price of product	30	20.0	20.0	20.0
	Communication Problems	24	16.0	16.0	36.0
	Improper Distribution channel	12	8.0	8.0	44.0
	Imitating product	42	28.0	28.0	72.0
	Impact of large business	18	12.0	12.0	84.0
	Others	24	16.0	16.0	100.0
	<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>100.0</b>	

**Source: The authors (development from the field study)**

**Table-A05: Source of Motivation**

		<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	Self	60	40.0	40.0	40.0
	Family	36	24.0	24.0	64.0
	Others	54	36.0	36.0	100.0
	<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>100.0</b>	

**Source: The authors (development from the field study)**

**Table -A06: Taking Government Support**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	9	6.0	6.0	6.0
No	141	94.0	94.0	100.0
Total	150	100.0	100.0	

Source: The authors (development from the field study)

**Table –A07: Need of NGO and Government support**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	101	74.0	74.0	74.0
Agree	27	18.0	18.0	92.0
Neither Agree nor Disagree	12	8.0	8.0	100.0
Total	150	100.0	100.0	

Source: The authors (development from the field study)

**Table -A08: Entrepreneurial skills sufficient**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	6	4.0	4.0	4.0
Agree	12	8.0	8.0	12.0
Neither Agree Nor Disagree	132	88.0	88.0	100.0
Total	150	100.0	100.0	

Source: The authors (development from the field study)

**Table –A09: Government and NGO support can increase the earnings of the business**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	126	84.0	84.0	84.0
Agree	24	16.0	16.0	100.0
Total	50	100.0	100.0	

Source: The authors (development from the field study)

**Table –A10: Government Support \* Sufficient Government Support Cross tabulation**

		Sufficient Government Support				Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Government Support	Yes	6	3	0	0	9
	No	0	0	30	120	141
Total		6	3	30	120	150

## **A Review of Entrepreneurship Literature and Theories: Key Findings and Recommendations for Entrepreneurship Development in Bangladesh**

Dr. Bashir Ahmed Bhuiyan\*

### **Abstract**

*The study examines existing literature and theories of entrepreneurship and finds diversity in the scope of their applications. Notable issues covered in the existing theories are importance of entrepreneurship in socio-economic development, environmental aspects, traits of entrepreneurs, process of developing entrepreneurship, financial and non-financial support services required etc. . Based on the study limitations of reviewed theories and models have been identified and lessons have been learned for entrepreneurship development in Bangladesh. The important recommendations for entrepreneurship development in Bangladesh are: removing traditional beliefs and dogmatism, developing entrepreneurs through predesigned developmental programs, upholding spirit of capitalism and adventurous spirit, inculcating religious values and preparing devotees with entrepreneurial orientation, government initiatives for technological development and capital accumulation, ensuring flexible societal culture that provides independence to choose occupation, ensuring integrated support services, education and training, favorable attitude of the family members and reference groups, environmental favoritism and financial assistance as entrepreneurial inputs.*

**Key Words:** Financial and non-financial support services, Adventurous spirit, Capitalism, Education and Training, Environmental favoritism

### **Introduction**

The review of literature on entrepreneurship amply demonstrates the diversity in their problems, theories, concepts; conceptual frameworks or models etc. Intellectuals, practitioners, academicians and researchers in the field of entrepreneurship have developed a plethora of theories, models and frameworks. Different theories exposed different aspects of entrepreneurship. The notable aspects covered are importance of entrepreneurship in social and economic development of a country, (Sexton & Smilor, 1997; Steward, 1991) process of the emergence of new entrepreneurs, development of the existing enterprise, entrepreneurial capability and role of support services for the entrepreneurship development of a country. Present study aims to review existing theories of entrepreneurship, explore important issues and elicit some lessons for entrepreneurship development in Bangladesh.

### **Methodology of the Study:**

This article is developed based on the review of existing literature and theories of entrepreneurship development. Conceptual review on the related terminologies has been completed. Theories and models for review have been selected based on their insight and categorization in the existing literature. First, general theories have been reviewed and then integrated models and theories have studied to learn lessons for entrepreneurship development in Bangladesh. All the selected theories and models have been critically evaluated and ultimately derived lessons for improvement of the entrepreneurship development scenario in Bangladesh. Basically, in this article as research methodology citations and descriptive-analytical methods have been applied.

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### **Review of the Concepts of Entrepreneurs, Entrepreneurship, and Entrepreneurship**

**Development:** Interest on the terms entrepreneur and entrepreneurship are centuries old which are defined variously by intellectuals of different disciplines (Bhuiyan, 1998). And there are long debates on the topics like characteristics, functions and approaches for identifying and developing an entrepreneur. The social scientists, economists, psychologists and behavioral scientists have attempted to define the terms from their own viewpoints. Entrepreneurs have been characterized by distinguished characteristics as risk bearing capacity and decision making under uncertainty (Mishra, 1991). According to Palmar (1971) the review of the literature on entrepreneurship shows strange and contradictory results. One study identifies that major roles of the entrepreneur are risk bearing and coordination of factors of production (Majid, 1993). Hawley attributed entrepreneurship as the separate factors of production with other such as land, labor, and capital and risk taking has been considered as its distinguished characteristics (Cochran, 1968). Management scholars believe that entrepreneurs should possess some managerial abilities including human relations, communication and conceptual skills. Managerial skills and ability make entrepreneurs successful in their endeavors and conceptual skills, help in visualizing new businesses, new products and new ideas (Habibullah, 1985).

Schumpeter (1934) identifies critical role of entrepreneurship in economic development. According to him, an entrepreneur is an individual who introduces new product in the market, new production technology, new market for produced goods, and new source of raw materials and new organization of any industry. Schumpeterian entrepreneur is an innovator who creatively responds to a situation and causes discontinuous dynamic change. But Schumpeterian entrepreneur is seldom found in the underdeveloped economies, as under-developed region could not provide basic condition and necessary infrastructure for the development of the Schumpeterian type of entrepreneur (Deshpande 1984).

Max Weber drew the correlation between 'spirit of capitalism' and 'adventurous spirit'. He expressed the view that a person endowed with unusual will, strong character, and clarity of vision could be an entrepreneur. A society where capitalism-oriented mentality and attitude are absent, Weberian type of entrepreneur could not grow. He believes that 'Protestant ethic' provides mental attitude for developing entrepreneurial spirit while as Hindu religion supports stratification is antithetical to the entrepreneurship development. A.N. Pandey challenged the Weberian concept and maintained that Indian religion provided identity concept, which is supportive for economic pursuits rather than restraining this objective (Deshpande 1984). Weberian concept is also incompetent to analyze the concept of entrepreneurship with universal character.

David McClelland explained the term entrepreneurship with need for achievement motivation characteristic. According to McClelland, achievement motivation among the people of underdeveloped economy can be developed through training programs. Entrepreneurship development is not an automatic or spontaneous; rather it requires responsiveness and continuous striving of human agency to create something new, by organizing, coordinating and undertaking risks and handling uncertainties that warrant development of a supportive environment (Sharma 1979). An entrepreneur in the modern sense is the self starter or doer who organizes and builds own enterprise(s) by virtue of individual efforts (Rani 1996).

In the present study, an entrepreneur is defined as a person or an individual, who assumes opportunities, command over resources, and eventually run and survive through the enterprise by individual efforts or by the assistance of the support institutions. And all functions relating to initiate, manage and continue the enterprise is entrepreneurship. The empirical studies show that entrepreneurship development is the systematic, well-perceived and deliberative process for preparing the attitude of potential and would-be entrepreneurs, providing them motivational and technical training, supporting them with financial and material resources, assisting them in starting and managing firms and marketing produced goods and sustaining through the continuous operations in the competitive environment through advisory and other kinds of services.

## Debates on Entrepreneurship Theories

Literature on entrepreneurship development is comprised of different theories. Islam and Mamun (2000) reviewed four kinds of theories to assess a person's potentiality to become a successful entrepreneur. According to their analyses, entrepreneurial theories are: *psychological or personal, socio-anthropological and cultural, background factors theory and social theory*. Bhuiyan (1998) reviewed the existing theories on entrepreneurship development and explained three types of theories: *economic theories, sociological theories and psycho-behavioral theories*. Deshpande (1984) classifies models of entrepreneurship into: psychological, sociological and integrated models. In the present study some of the important theories and models are reviewed from the total jungle of entrepreneurship with a view to attaining some lessons for entrepreneurship development and identified important factors that have impact on the entrepreneurship development.

## Theories and Models for Entrepreneurship Development

As a result of continuous research and deliberation of the authors, academicians and intellectuals many theories and models has been developed in the discipline of entrepreneurship. Some of the important theories and models from the existing literature are reproduced and reviewed in this section to gather and strengthen the knowledge for further analyses of the entrepreneurship development issue especially to determine the needs of support services for entrepreneurship development.

## General Theories of Entrepreneurship Development

To get ideas on the relevant factors and processes some of the general theories have been reviewed.

**The Economic Theories:** The concept of entrepreneurship gets priority in the economic literature due to its vital contribution as a living factor in changing the economic status of a country or a region. Theorists of entrepreneurship in the economic paradigm relate the concept with economic issues. The economic theories show the path for entrepreneurship development and its impact on the economic growth and development. Richard Cantillon first introduced the term entrepreneurship in economic literature and associated it with risk bearing activity. He referred to the industrial revolution of U.K. and France of the eighteenth century where entrepreneurs played their visible roles by taking risk and transforming the resources (Kritzner 1979). But how necessary characteristics for entrepreneurship could be developed is not evident in his dissertation. The classical economists like Adam Smith and Ricardo considered entrepreneurship as an economic function and stressed on the importance of capital accumulation as well as free play of the economy that provides continuous reinforcement in the reinvestment cycle for generating surpluses in the business and fostering capital accumulation process to support entrepreneurial resources in a society. This contributes to the enhancement of production in an economy through the use of division of labor and specialization of the work concept to keep the economic upliftment process in its propelling stage (Saha 1990;1991). J.B. Say regarded effective superintendence and administration as the basic requisites of entrepreneurship and risk-taking and coordination of the factors of production are the essential functions of an entrepreneur (Bhuiyan 1998). J.S. Mill considered superintendence, control and direction as the entrepreneurial functions. He drew the distinction between entrepreneurship and capital. In his opinion, profit is the payment for entrepreneurship and interest is the payment for capital and viewed managerial and administrative function is the responsibility of the entrepreneurs (Mill 1848). A leading political economist Karl Marx opined that pure entrepreneurial return is the outcome of allout improvements in the business and is the product of the social inequality. An entrepreneur is the product of social inequality and be regarded as social parasite. According to him, capitalists introduce improvement in the technology to enhance the productivity of labor and create surplus in his business to facilitate further accumulation process of capital (Saha 1990;1991)

The neoclassical economists found the substitution of labor by capital for further increase in production calls for higher investment made by entrepreneurs. Therefore, modernization and



improvement in technology takes place through the positive initiative of a class of people known as entrepreneurs. Schumpeter considered human factor as the change agent in the process of the economic development. He posits innovation as a single entrepreneurial function (Kilby 1979). Modern economists supported the earlier views but hold the opinion that a society's capital accumulation and investment objectives will be fulfilled by the growth of population, rate of technological change, and increase in the level of income of that society. According to neoclassical economists, economic growth should be accompanied by equitable distribution of income and wealth of the nation, if the standard of living of the people is to be increased.

The authors from other disciplines could not accept the viewpoints of the economists without criticism. Critics of the economists opined that economic theories basically concentrated on some central issues like capital accumulation, increasing investment, growth of population, improvement in the technology and living standard of the mass people etc. without focusing on whether entrepreneurship can be developed, how conducive environment can be developed to support the entrepreneurial activities, how more entrepreneurial supply in the society is possible etc. Economic paradigm also ignored the social context and psycho-behavioral aspects having impact on the entrepreneurship development. So, it is apparent from above discussion that economic theory could not provide an integrated model for entrepreneurship development that captures all the problems and factors that have universal application.

**Socio-cultural Theories:** A socio-cultural setup is measured by the forces like value system, religious beliefs and interrelations among the dwellers, social stratification and cohesion. The Socio-cultural dimensions have a substantial impact in creating entrepreneurs and developing entrepreneurship in the society. It relates the social condition and cultural set-up with entrepreneurial supply and development (Katz, Brockhaus and Hills 1993). A social setup where venture establishment as a profession is respected and valued supplies more entrepreneurs than that of a structure where it is not recognized and supported. Entrepreneurs are emerged due to social reasons along with other supportive factors. Traditional values are always inimical to the entrepreneurship. If people are always evaluated by their ascribed status, certain people are permitted to accept only particular job, and economic relationships are determined by kinship, politics, religion or other social structures, these can not contribute properly to develop entrepreneurial resources in the society (Huq 1965). But in a social structure where people are evaluated by their achieved status, they are free to choose their occupation and relationship is evaluated by economic achievement can supply the entrepreneurial class. F.W. Young states that a society is changed dramatically, when some subgroups of that society are not accorded with due respect but they have access to the institutional resources and have strong desire to remove their low status by means of undertaking economic ventures (Deshpande 1984). He suggested for creating some supportive institutions in that society to promote entrepreneurship.

Religious values as a factor of social structure have impact on developing entrepreneurial culture. Weber (1930) mentioned positive relationship between Protestantism and capitalist spirit. He extended in his analysis that spirit of capitalism is absent in the Hindu religion because here followers are internalized to the doctrines of that religion and remain immune to and insulate against external pressures and change (Dwijendra 1971). Although number of social scientists in the West supported this theory, intellectuals from Muslims and Hindu Community did not take these analyses without criticism. A. N. Pandey challenged the Weberian concept by arguing that Hindu religion is supportive to economic achievement as this religion provides identity symbol and thereby they collectively become involved in economic pursuits. On the contrary, Muslim intellectuals viewed Islam, as a religion, has guided mankind to become associated with sacred as well as secular economic activities. Islam encouraged innovation based on the direct teachings of the holy Quoran and Hadith (Holy sayings of Prophet Muhammad [sm.]) and the optimal utilization of the available resources in various portfolios. So, Islamic ideology is supportive for entrepreneurship development (Sadeq 1989).

By summarizing the sociological theories we find that socio-cultural factors have direct impact on the entrepreneurial supply of a country or a region. An ascriptive society is inimical to the entrepreneurship while achievement-oriented society is conducive to the growth of entrepreneurship. Solidarity group denial of access to important social networks with better

institutional resources represents a prospective sector for the emergence of entrepreneurship than others in the same society. Flexible social customs and occupational diversity are the favorable determinants of entrepreneurship development.

Socio-cultural theories are regarded as imperfect to explain the total aspects of the entrepreneurship development. According to these theories, entrepreneurship development process is conditioned and reconditioned by socio-cultural and religious values while other important variables like technical, economic and environmental aspects are ignored. The intellectuals in socio-cultural theories failed to indicate how entrepreneurship development is possible in the existing social norms and structure. Empirical studies rejected the proposition of Young about the solidarity groups with available institutional resources. A true entrepreneur is aware of the art of procurement of resources although he may not possess resources as per needs. Here, the importance for developing and promoting special institutions to support the entrepreneurs was ignored although it was a key issue in the supply of entrepreneurial zeal in the society.

**Psycho-Behavioral Theories:** The theme of these theories is whether a society will be blessed with entrepreneurial resources depends on the psychological and behavioral characteristics of the common people of the society. The differences in the attitudinal states, judgmental ability, and proper anticipative power make a person exceptional to others in performing the job and undertaking the occupation and combination of these characteristics are popularly known as entrepreneurship.

Under this approach, McClelland emphasized achievement motivation as the vital ingredient for entrepreneurship development. In his early proposition, he believed that entrepreneurial attitude was developed through child rearing practices while, at the later stage, it was established that arousal of latent needs for achievement among the adults are possible by arranging training programs. This assists in preparing them to exploit opportunities through the development of eagerness in undertaking risky venture. An entrepreneur does the best for attaining an inner feeling of self-content but not for social recognition or prestige. According to this theory, persons having tendency to assume personal responsibility, moderate risk, seek feed-back on their achievement for improvement and sacrifice the small interest for the sake of big one are the attributes of entrepreneurial occupation (Islam & Mamun, 2000).

Psychologists were of the view that entrepreneurs should have the ability to take risk. Although economists did not find any boundary to take the risk, psychologists considered moderate or calculated risk taking as suitable for the success of an enterprise. Another quality for identifying the entrepreneurial quality is locus of control. Some people are usually controlled and directed by their own confidence and beliefs. They have self-confidence on their ability and power. Other groups think that every thing is predestined and they have no control over the situation. They always blame the environment for their failure. An entrepreneur is found to remain in the internal locus of control.

Everette Hagen postulated creative innovation as the fundamental characteristic of economic growth. He comprehended that it takes time to create a supportive environment for facilitating innovation in a traditional authoritarian society. Transition from traditional to creative stage takes longtime even a period of several generations (Hagen 1962).

The summary of psycho-behavioral theory is that human drive for entrepreneurial occupation is directed and controlled by some inner-psychological characteristics, such as, need for achievement, creativity, tendency to take risk and states in the locus of control etc. Psychologists are not in unison about the possibility of entrepreneurship development by systematic preplanned efforts. McClelland's findings justify the need for training program for developing entrepreneurial quality while Hagen's propositions support it as the outcome of natural evolutionary process. As per these theories, entrepreneurship depends on specific combination of circumstances which are difficult to achieve. Although some of the proponents provide policy options for entrepreneurship development by training programs, others did not provide any comment in this regard. Hagen's theory of status withdrawal is inapplicable in the backward society as well as in a society where democratic setup prevails. Here, psychic and behavioral aspects are over emphasized while economic and sociological aspects have been ignored. Thus, the level of psychological and behavioral characteristics is complex to understand and apply in the pragmatic society. From totality concepts and

universality viewpoints, these theories are not sufficient to explain all the variables and relations among them in the context of entrepreneurship development. So, rethinking of new paradigm is the need of reality.

**Background Factor Theories:** Personal traits or background is one of the important factors to determine the entrepreneurship performance (Lee and Jo 1996). Background factors include age, education, family background, community, group relationships, honesty, birth order, child rearing practice, and work experience. Empirical study witnessed that age ranging from 20 to 50 years is suitable for risk, innovation of the new ideas and thereby undertaking successful entrepreneurial ventures.

Some other studies revealed that education plays important role for developing entrepreneurial competence, but higher education is not always favorable for entrepreneurship development as in under-developed societies, highly educated people generally run after the elitist occupation (Khan 1996). In spite of this argument, it is recognized that education is the basic conducive factor especially for the development of technical entrepreneurship (Madhavi 1994).

An individual can not become entrepreneur without the help of family members (Khan 1996, Rani 1996, Cox 1996)). Both unique and joint families are helpful for the enterprise development and vice versa based on the situation involved and the attitude of other members of the family. In the same way, community support, attitude of the peer groups, co-workers or reference groups are also important to facilitate the development of entrepreneurs. This theory is also referred as Traits School of Entrepreneurship Development or in some cases as the People School of Entrepreneurship Development. But in traits school, concept of peer groups, co-workers and reference groups are dropped from the list of Influencing factors. In this theory, researchers and authors are interested to identify common traits of the successful entrepreneurs that can be imitated and thereby success opportunities of the emulators are increased (Shaver and Scott 1991).

In fact, all variables cited in the background factors have direct impacts on entrepreneurship development. But these are not the sole criteria. Other arranging factors like training of the potential individuals, helping them by providing finance, sheds, water, organizing forum, congenial policy guidelines, proper enactment and enforcement of the law are also important factors which were not considered in this theory. Therefore, we need to establish a theory or model where we can provide remedy to the problems impeding entrepreneurship development. On the other hand, all the previous theories described in the preceding sections provide evidence that the background factors theory represents partial description of needed factors that should be refined in keeping with the actual needs of the society.

**Anthropological Theories:** Anthropology is defined as the study of human races especially its origins, development, customs and beliefs (Oxford Advanced Learners Dictionary 2005). Some people intend to become entrepreneurs under the influence of anthropological factors. Socio-cultural change and various other forces relevant to this change stimulate the people to choose entrepreneurship as an occupation. The different theories combindly constitute the anthropological theory group. These are urban-orientation theory, marginal and tension theory and social cohesion theory.

The urban orientation theory provides the identity concept between rural and urban people. Rural people measure the status by tradition and traditional occupation while urban dwellers give importance on financial pursuits. Due to variation in the choice, entrepreneurship supply is much more evident in the urban areas compared to rural location. Because of increasing opportunity, people become urban-oriented and start to migrate to the urban area from rural location. As a result of this tendency, entrepreneurial resource is found to increase in the urban area. Thus it can be concluded that urban centric mentality and environment may help generate more entrepreneurs in a community.

Marginal and Tension theory holds the view that when a man is forced to live in two societies, he / she tends to possess antagonistic attitude towards particular culture under the influence of tension. This person is identified as the marginal man. However, another study identifies marginal man as the person who keeps himself or herself aloof from his or her own culture. Another view

highlights that persons falling in between accidental and oriental culture are recognized as marginal man who strive hard for recognition in the new society by involving in business ventures. The proponent of the Marginal Man theory is Robert Park. In another study it has been found that high level of social cohesion is found in a group of people who are living outside of their society, culture or the country. They maintain this cohesion for maintaining their existence and improving their status in that society. Researchers are in unison on this aspect. Another important issue is that inter-group conflict results in intra-group cohesion. When a person of cohesive community starts a business he or she tries to involve others by integrating their cohesive forces concerned with this business. Hence, social cohesion theory bears a significant importance in creating entrepreneurs in a society.

So, all the above three theories using anthropological approach for entrepreneurship development provide the concept that entrepreneurs can emerge from migrants, marginal man as well as from the cohesive subgroup.

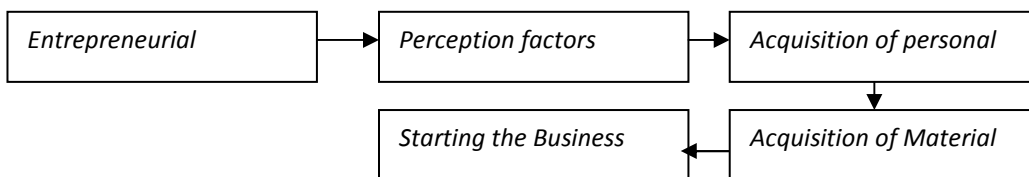
The empirical study suggests that these theories are silent about how entrepreneurial qualities would be developed among the potential group of people for developing them as entrepreneurs. Clearly, prospective individuals will prove their worth within an immediate period of time by establishing profitable ventures if they are provided with support assistance after assessment their needs.

**Integrated Models:** The proponents of integrated models provided their concepts by depicting all variables relevant to the entrepreneurship development phenomenon in an integrated manner. As a result of their efforts, a number of models have emerged in this category although they are also not sufficient to explain the entire length and breadth of phenomena. The following are some important models belonging to the integrated approach of entrepreneurship development:

**Model of T. V. Rao**

Rao (1975) suggests the model for entrepreneurial development in following manner:

Figure 1: Entrepreneurship Development Model of T.V. Rao



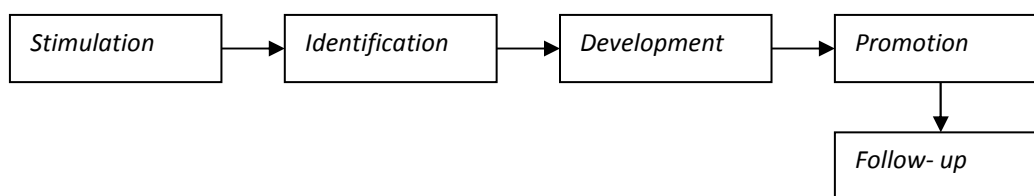
**Source:** Deshpande, Manohar U., (1984) Entrepreneurship of Small Scale Industries: Concepts, Growth and Management, page: 57

According to this model, entrepreneurial disposition includes need for motivation, long-term involvement through goal setting and its execution, acquisition of resources (personal, social and material) and a favorable socio-political system suitable for establishment and development of an enterprise. This model, although discussed some important factors but ignored technical skills of the individual, role of government and community in the entrepreneurial supply. The implementation process is also not clear in this model. No empirical data have been presented here to justify the model.

**Model of Venkata Rao**

(B. Rao 1975) recommended for applying five stages model to promote small-scale entrepreneurship. These stages are: stimulation, identification, development, promotion, follow-up.

Figure 2: Entrepreneurship Development Model of B.S. Venkata Rao



**Source:** Deshpande, Manohar U., (1984) *Entrepreneurship of Small Scale Industries: Concepts, Growth and Management*, page: 58

In the stimulation stage, the government plays the active role to create supportive industrial atmosphere, policy framework favoring the role of small industry, wide publicity of industrial development programs and support institutions. In this stage, awareness is created among the people. At the second stage, prospective entrepreneurs are identified. According to this model, prospective entrepreneurs are found in the rural artisan, factory workers, persons having formal training in engineering and technology and graduates in business administration and management. The third stage will focus on developing the entrepreneurs through managerial training programs, counseling on technology and formulating the bankable projects. And at the promotion stage, supporting institutions provide developmental facilities, services and incentives to the entrepreneurs. Finally, follow-up stage reviews the results of previous policies and programs and seeks some new ways to improve the entrepreneurial performance.

This model is much clear and wide than previous models and theories. But it does not identify how this model could be applied. This model can not be accepted due to lack of empirical evidence to apply it. Again, it is not clear how this model will work in the present days of globalization.

#### **Model of Akhouri**

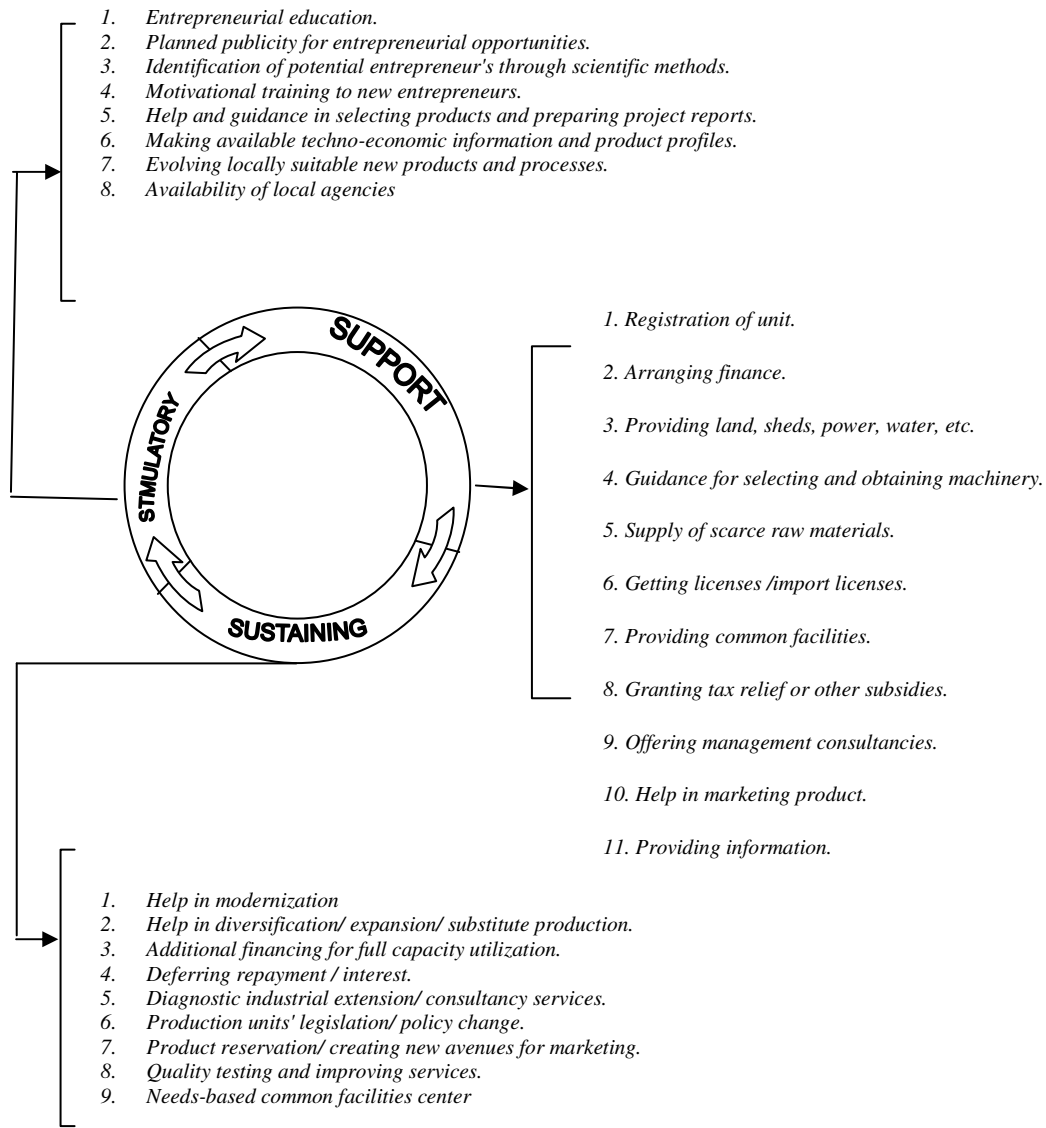
Akhouri (1975) prescribed a complete cycle for promotion and development of entrepreneurship. In the complete cycle, he described three set of factors: stimulatory, support and sustaining activities.

**Stimulatory activities** refer to the functions that induce persons to accept entrepreneurship as an occupation in the society. The **support activities** help in establishing and maintaining the enterprise while **sustaining activities** assist the entrepreneurs in running their ventures with efficiency and profitability.

This model is widely accepted by the researchers. And several researchers have used it empirically to test environmental context for entrepreneurship, especially, in studying the state of small entrepreneurial development in some Asian countries viz. Bangladesh, Honkong, India, Korea, Malaysia, Philippines and Thailand. In spite of its wide acceptance till to date, it is not clear whether all the functions described in the cycle follow some sequence at the practical operations as described in the model. In no country, whether it is developed or developing, government or non government institutions do not follow the sequence prescribed in this theoretical model rather they are found to conduct their operations only to meet the requirements of the enterprises. Moreover, the effectiveness of the model may be reduced with the changes in the institutional support framework for entrepreneurship development in a country in keeping with the demand of time.

Figure 3: M.M. P. Akhouri's Entrepreneurship Development Cycle

**ENTREPRENEURIAL DEVELOPMENT CYCLE**



**Source:** Sharma, S.V.S. (1979), Small Entrepreneurial Development in Some Asian countries: A Comparative Study, Light and Life Publishers, Pp: 107-110.

**Macro View Theory:** This theory entails a broad array of factors that relate the success or failure of the entrepreneurial ventures. In this broad category, there are three schools of thought to explain the macro view theory at a glance. These are **environmental schools, financial / capital school and displacement school of thought** for entrepreneurship development. **Environmental school** holds the view that factors in the external environment has direct impact – positive or negative - on the entrepreneur's lifestyle and their performance. Major factors in the environment include institutions, values and socio – political framework that strongly influences the development of entrepreneurs (Van 1993). The **financial / capital school of thought** is based on the needs for seed capital and growth capital of the business. According to this theory, if an entrepreneur is provided with needed capital, it helps to run the enterprise smoothly. So, acquisition and management of finance are the major requisites of entrepreneurship development process. In essence, this school evaluates entire venture development process from financial management

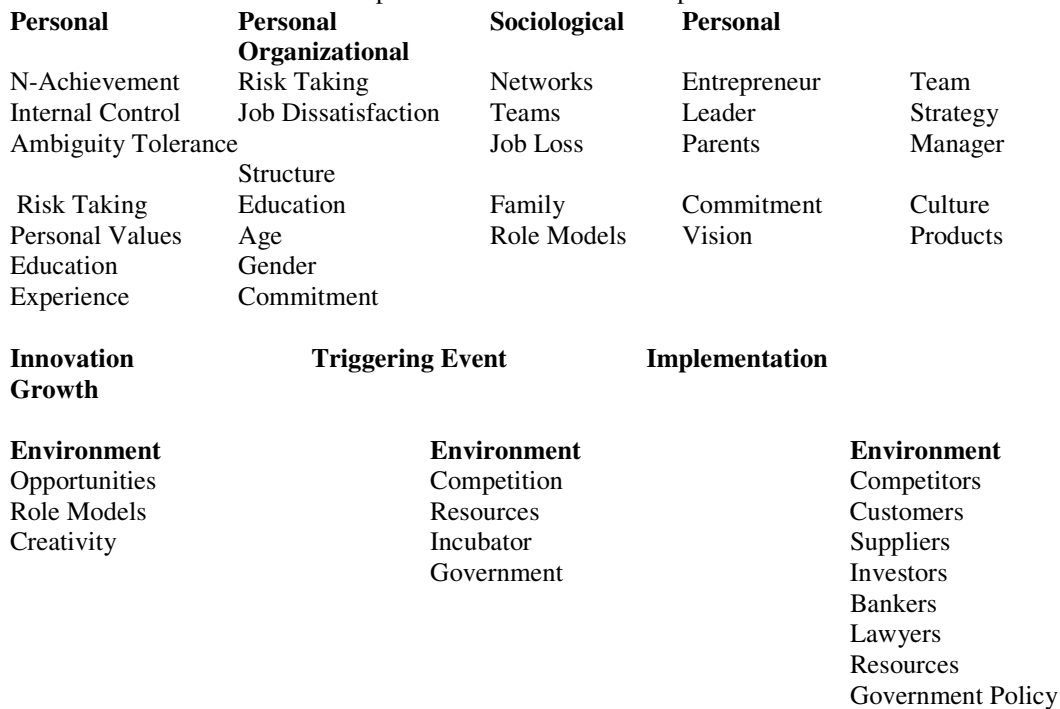
viewpoints. Nevertheless, entrepreneurship development calls for acquiring and using all types of resources in an optimal manner to attain the goals of the enterprise. Finance is considered as one of the important determinants of entrepreneurial performance where as factors of non financial support services play the complementary role in the total process of entrepreneurship development (Chiampon and Kallet 1989, Kuratko and Hodgetts 1995)

**Displacement school** in the macro view theory focuses on group phenomenon. When a group is displaced from the normal society, a sense of isolation develops among them. As a consequence, they become strongly motivated for regaining and improving thier status by involving in the entrepreneurial ventures. This displacement takes place for three reasons: **political, cultural and economic reasons**. The displacement school is somehow similar to the Everett Hagen's status withdrawal concept discussed in Socio-cultural theories for entrepreneurship development. However, developing entrepreneurship among the displaced people of the society requires long time and follows an evolutionary process.

Thus, it is evident that the three schools of thought under macro view theory entrepreneurship development emphasized the need for environmental consideration and assessment, financial / capital supply and management and finally displacement as an important factor for entrepreneurship supply. Hitherto, these three classes of factors spontaneously can not create response from the entrepreneurs, unless the potential individuals are prepared and stimulated in a scientific way to undertake the business establishment in the sectors where facilities are available in terms of financial and environmental consideration.

**Bygrave's Events Model / Approach:** Bygrave (1989) established a model where theoretical and practical concepts have been incorporated to explain the entrepreneurship phenomenon. According to his viewpoints, entrepreneurship is an integrated process by which an individual plans, implements and controls his / her entrepreneurial activities instead of isolated performance of activities. Each step in the process is considered as the event. The factors like initiative, organization, administration, relative autonomy, risk taking and environment affect each of the events in the entrepreneurial process. In outlining his model, Bygrave lends theoretical concepts from basic social sciences and practical concepts from applied sciences. Four distinct events in his model are innovation, triggering event, implementation and growth. In his theory each of the events is again affected by numerous factors. The figure of his model is depicted below:

**Figure 4:** Entrepreneurship Development Model of William D. Bygrave  
Entrepreneurial Event Formation process



**Source:** William D. Bygrave, "The Entrepreneurship Paradigm: A Philosophical Look at its Research

**Methodologies," Entrepreneurship: Theory and Practice, fall 1989, p. 9.**

Bygrave's model gives us the concepts on how entrepreneurship operates within the area of its influencing factors. He described the chronology of different events, all the influencing factors: personal, sociological, organizational and environmental. Although it is an in-depth analysis to explain entrepreneurial process, but nothing is discussed about how supply of entrepreneurial resources in the economy is possible with deliberate and systematic efforts. Fundamental question in the present research is what should be the roles of promotional institutions in entrepreneurship development remains unresolved. His model is qualitatively presented. The method for measuring the factors influencing the events has not been identified in the model and the empirical proof of the application of this model is also absent.

**Jonson's Multidimensional Model:** Johnson (1990) highlighted the entrepreneurship process through presenting a framework of complex multi-dimensional relationships comprising the factors including individual, environment, organization and venture process. Specific factors that relate to each of these dimensions are as follows:

**The individual:** Need for achievement, locus of control, risk-taking propensity, job satisfaction, previous work experience, entrepreneurial parents, age and education.

**The Environment:** Venture capital availability, presence of experienced entrepreneurs, technically skilled labor force, accessibility of suppliers, accessibility of customers or new markets, governmental influences, availability of land or facilities, accessibility of transportation, attitude of the population of that area, availability of support services and living condition.

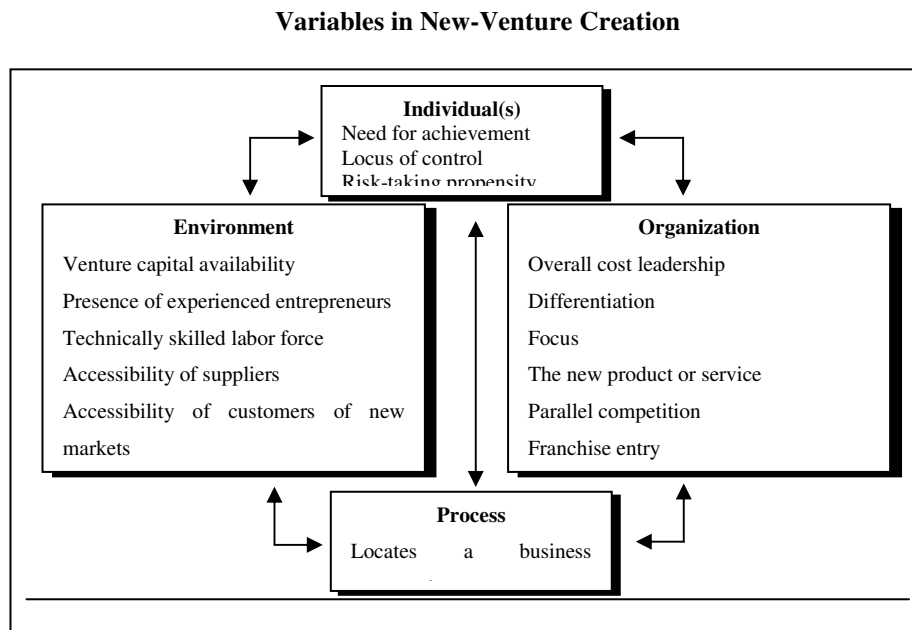
**The Organization:** Type of firm, entrepreneurial environment, partners, and strategic variables such as cost, differentiation and focus, competitive entry wedges.



**The Process:** Locating the business opportunity, accumulation of the resources, marketing of the products and services, producing the products, services, producing the products, building and organization and responding to the government and society (Gartner 1985, P. 502).

Within the process school of thought, this model is aggregate, dynamic and interactive in nature. Instead of segmented description, this model provides combination of the related variables from micro and macro viewpoints and exhibited interactions between the set of variables. Despite an integrative analysis of entrepreneurship, this model only identified availability of land, accessibility of transportation, supporting services as the important set of factors needed in creating the new venture. But other important issues like role of the promotional institutions in supplying or developing entrepreneurship, training as a potent instrument of developing entrepreneurship and role of government in creating and determining the favorable environment for entrepreneurship development appear to be ignored in this model. Another notable limitation is that the term new venture creation and entrepreneurship is not the same and cannot be analyzed in the same manner. Because entrepreneurship is the living multiplying factor and venture creation is non-living process in the economy. Combination of and simultaneous operations of both can ensure that smooth economy. In this model only relevant variables and their interactions have been depicted without showing how these sets of variables could operate.

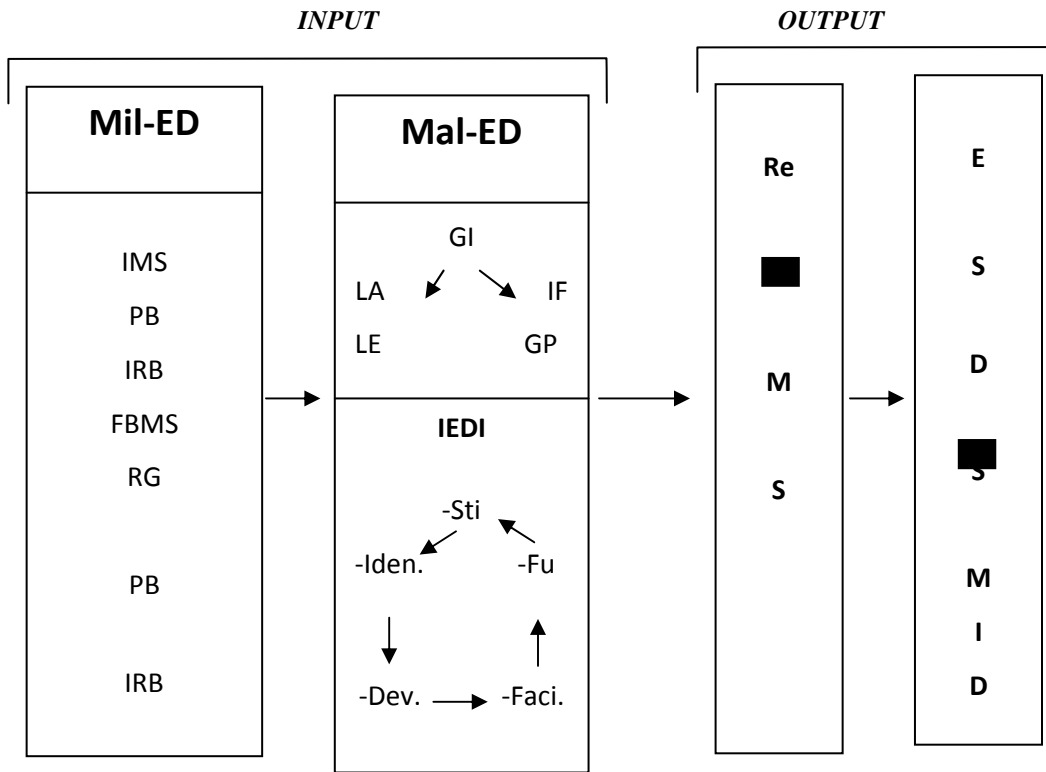
**Figure 5:** Jhonson’s Multidimensional Model for Entrepreneurship Development



**Source:** William B. Gartner, "A Conceptual Framework for Describing the Phenomenon of New Venture Creation." *Academy of Management Review*, October 1985: 702.

**Bhuiyan’s Model:** Bhuiyan (1998) proposed a model for entrepreneurship development involving micro and macro inputs to be converted into outputs in the form of supplying the entrepreneurial resources in the society. According to his model, micro inputs comprise of individual motivational structure, individual background, religious beliefs, family background, and the reference group. Macro factors include government intervention, enactment and enforcement of law, infrastructural facilities and policies of the government. These micro and macro factors work in an integrated manner through stimulation and identification of the potential entrepreneurs, developing them through facilitating programs and follow up for further development. The integrated process results in the output of entrepreneurial supply in the society through re-energizing entrepreneurial motivation culminating into multiplier effect in the economic growth and development of a country.

Figure 6: Bhuiyan’s Model for Entrepreneurship Development



**Mil-ED** = Micro Input for Entrepreneurship Development  
 IMS = Individual Motivational Structure.  
 PB = Personal Background of the individual.  
 IRB = Individual Religious Belief.  
 FBMS = Family Background and their Motivational Structures.  
 RG = Reference Group.

**Mal-ED** = Micro Input for Entrepreneurship Development  
 GI = Government Intervention  
 LA= Enactment of Law  
 LE = Enforcement of Law  
 IF = Infrastructural Facilities  
 GP = Government & Policies

**IEDI** = Integrated Efforts of Development Institutions.  
 Sti. = Stimulation. Iden. = Identification  
 Dev. = Development. Faci. = Facilitation.  
 Fu = Follow-up.

**Re-EMS** = Re-energizing of Entrepreneurs Motivational Structure.

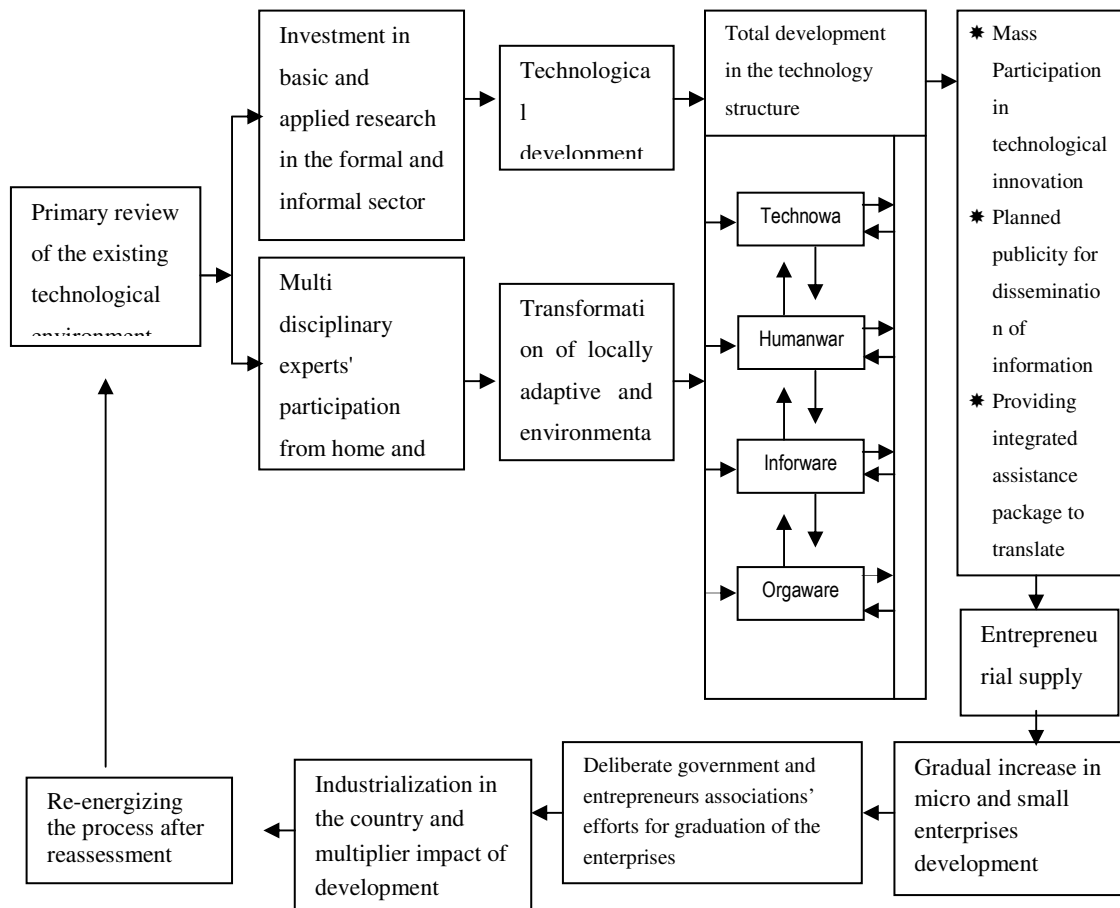
**ESS-MID** = Entrepreneurial Supply in the Society and Multiplier Impact of Development.

**Source:** Bhuiyan, Bashir Ahmed (1998), “Towards a New Model for Entrepreneurship Development”, The Cost and Management Journal, July-August, Institute of Cost and Management Accountants Bangladesh, Dhaka.

However, Bhuiyan's theoretical model is not based on empirical evidences and seems to lack in practical application. Moreover, the process of integrating micro and macro factors for developing entrepreneurial outputs has not been clarified aptly.

**Model of Mamun and Others:** Technology has been considered as one of the important factors for entrepreneurship development. Keeping this in view Mamun, et al. (2000) shows technological development as a tool in the process of entrepreneurship development.

**Figure 7: Model for Promoting Entrepreneurship through Technological Development**



a. Graduation of enterprises in the systematic effort of the promotional institutions by which an established enterprise can increase its operational area and improve its health gradually.

**Source:** Mamun, M.Z., Bhuiyan, Bashir Ahmed, Rab, A. and Islam, M.N. (2000), "Promoting Entrepreneurship through Technological Development: A Proposed Model for Developing Countries", *Advantage South Asia: Opportunities and Challenges for Management Development*, AMDISA, India, Page: 430

This model states that the development process of technology for entrepreneurship promotion constitutes the combination of several interacting and inter-linking variables. These variables include availability of tangible hardware facilities, infrastructure development and supply of appropriate machinery, favorable climatic condition, and software packages (knowledge, skills, and training and education facilities) and are considered as the key determinants to the supply and development of entrepreneurship. This model identifies that shift in the technological structure has direct influence on the process of entrepreneurship development and that are possible only through organized promotional efforts and mass participation in technological innovation. Total technology structure constitutes four factors: techno-ware, human-ware, info-ware and orga-ware. Integrated steps required for entrepreneurship development in the proposed model are: primary review of the technological environment in the existing setup, initiating strategies for technological development, development in the total technology structure, mass participation in technological innovation through sustained promotional efforts, providing assistance to translate the innovative ideas into the enterprise development process and finally advancing the efforts through graduation process for industrializing an economy.

The model is in fact, a new addition in the literature of entrepreneurship development in the context of developing countries. This model has the characteristics of theoretical attraction, systematic presentation and explanation of all the relevant variables in a lucid manner. But this model is completely based on imagination and preliminary idea of the model developers. The application and consequences of application of this model have not been tested through practical experimentations.

**Reorienting the future Models based on the Present Review and Linking the Lessons for Future Development of Entrepreneurship in Bangladesh:** Summary of this section shows that no unanimous solution for entrepreneurship development is possible that may be applied in all the society and for all time. Rather, all the models discussed above have some inherent limitations that have reduced the authenticity and validity of the above models. So, re-look on the issue is the dire necessity in the present study **to provide a complete model with simplistic presentation of all the relevant variables and their causal impact on the phenomenon of entrepreneurship development through proper institutional interaction with balanced assistance package and support services. By considering this insight important lessons for entrepreneurship development in Bangladesh have been derived and have been suggested in the following section.**

#### **Lessons for Entrepreneurship Development in Bangladesh:**

Bangladesh attaches importance on entrepreneurship development for augmenting economic development of the country. In this objective many government and non government organizations are working for entrepreneurship development in different levels. From the review of existing literature and theories regarding entrepreneurship development following lessons may be learned to foster the entrepreneurship development in the country:

1. **Upholding Spirit of Capitalism and Adventurous Spirit:** Bangladesh is blessed with huge youth populations who have hidden potentiality to be entrepreneurs. If they are indoctrinated with positive values, strong will and enterprising spirit and provided with stimulatory and technical training an emerging entrepreneurial class can be developed in the diversified sectors. By providing need based support services emerging enterprises could gain their sustainability thorough continuous operations.
2. **Removing Traditional Beliefs and Dogmatic Orientation by Planned Efforts:** NGOs in Bangladesh can play their role to change the anti-capitalism beliefs, mentality, attitude and rituals of traditional society which are against the achievement motivation and antithetical to the new idea generation. For which various training programs may be designed and training can be provided to the target segment of the people so that they can obtain the quality and skills for organizing, coordinating and undertaking risks and handling uncertainties.
3. **Developing Entrepreneurs through Predesigned Developmental Programs:** Entrepreneurship development is the systematic, well-perceived and deliberative process for

preparing the attitude of potential and would-be entrepreneurs, providing them motivational and technical training, supporting them with financial and material resources, assisting them in starting and managing firms and marketing produced goods and sustaining through the continuous operations in the competitive environment through advisory and other kinds of services. So, government may take the initiative for developing entrepreneurs through predesigned programs for augmenting entrepreneurship supply in the country.

4. **Inculcating Religious Values and Preparing Devotees with Entrepreneurial Orientation:** Muslim intellectuals viewed Islam, as a religion, has guided mankind to become associated with sacred as well as secular economic activities. Islam encouraged innovation based on the direct teachings of the holy Quoran and Hadith (Holy sayings of Prophet Muhammad [sm.]) and the optimal utilization of the available resources in various portfolios. So, Islamic ideology is supportive for entrepreneurship development. . Max Weber found positive relationship between Protestantism and capitalist spirit. Intellectuals from Hindu Religion hold that stratification in their religious practices provides status identity which provides ground for cooperation within subgroups and prospects for entrepreneurship among themselves. Therefore, indoctrinating religious values along with spirit of competition may help for initiating entrepreneurial base in a country.
5. **Government Initiatives for Technological Development and Capital Accumulation:** Positive initiative of government and entrepreneurs themselves for improvements in the technology facilitate process of capital accumulation and utilization of the potentials of human resources to augment the process of the economic development through entrepreneurial supply in a society. Integrated process of technological development includes primary review of the existing technological environment, initiating strategies, development in the total technology structure through shift in the technological components of technoware, humanware, infoware and orgaware, mass participation in technological innovation through sustained promotional efforts, providing assistance to translate the innovative ideas into the enterprise development process and finally advancing the efforts through graduation process for industrializing the country. Technology change can provide benefits in various forms, such as changes in tangible hardware facilities, infrastructure development and supply of appropriate machinery, favorable climatic condition, and software packages (knowledge, skills, and training and education facilities) and these are considered as the key determinants to the supply and development of entrepreneurship.
6. **Providing Flexible Societal Culture that provides Independence to Choose Occupation:** In a traditional society where people are evaluated by their ascribed status, certain people are permitted to accept only particular job, and economic relationships are determined by kinship, politics, religion or other social structures are inimical to the entrepreneurial culture. But when people are evaluated by their achieved status, they are free to choose their occupation and relationship is evaluated by economic achievement are conducive to the growth of entrepreneurship. Solidarity group denial of access to important social networks with better institutional resources represents a prospective sector for the emergence of entrepreneurship development. Flexible social customs and occupational diversity are the favorable determinants. Persons having tendency to assume personal responsibility, moderate risk, seek feed-back on their achievement for improvement and sacrifice the small interest for the sake of big one are the attributes of entrepreneurial occupation. Need for achievement, creativity, tendency to take risk and states in the locus of control are important virtues that need to be developed by members of a society to make them more committed and entrepreneurial.
7. **Providing Integrated Support Services to the Entrepreneurs:** Integrated support package that include stimulatory, supportive and sustaining services play the active role to create supportive industrial atmosphere. Necessary supports in the stimulation stage include framing policy framework favoring the role of small industry, wide publicity of industrial development programs and support institutions. In this stage, awareness is created among the people. At the second stage, prospective entrepreneurs are identified. For identifying prospective entrepreneurs background factors needs to be studied that include age, education,

family background, community, group relationships, honesty, birth order, child rearing practice, and work experience etc.,. Prospective entrepreneurs are to be found in the rural artisan, factory workers, persons having formal training in engineering and technology and graduates in business administration and management. The third stage will focus on developing the entrepreneurs through managerial training programs, counseling on technology and formulating the bankable projects. And at the promotion stage, supporting institutions provide developmental facilities, services and incentives to the entrepreneurs. Finally, follow-up stage reviews the results of previous policies and programs.

- 8. Education and Training as Inputs of Entrepreneurship Development:** Education plays important role for developing entrepreneurial competence, but higher education is not always favorable for entrepreneurship development as in under-developed societies, highly educated people generally run after the highbrow occupation. Providing training to the potential individuals, helping them by providing finance, sheds, water, and other kinds of soft and hard support services may create the avenues for entrepreneurship development.
- 9. Attitude of the Family Members, Reference Groups and Others as Influencing Factors:** Both unique and joint families are helpful for the enterprise development and vice versa based on the situation involved and the attitude of other members of the family. In the same way, community support, attitude of the peer groups, co-workers or reference groups are also important to facilitate the development of entrepreneurs.
- 10. Environmental Favoritism and Financial Assistance as Entrepreneurial Inputs:** According to Environmental school of thought factors in the external environment has direct impact – **positive or negative** - on the entrepreneur's lifestyle and their performance. Major factors in the environment include institutions, values and socio – political framework that strongly influences the development of entrepreneurs. The financial / capital school of thought is based on the needs for seed capital and growth capital of the business. According to this theory, if an entrepreneur is provided with needed capital, it helps to run the enterprise smoothly. So, acquisition and management of finance are the major requisites of entrepreneurship development process in different stages.
- 11. Inputs of Entrepreneurship Derived from Anthropological Theories:** Anthropological approaches to entrepreneurship development provide the concept that entrepreneurs can emerge from migrants, marginal as well as cohesive subgroup. According to Marginal and Tension theory when an individual is forced to live in two societies, he / she tends to possess antagonistic attitude towards particular culture under the influence of tension. Persons falling in between accidental and oriental culture are recognized as marginal men who strive hard for recognition in the new society by involving in business ventures. High level of social cohesion is found in a group of people who are living outside of their society, culture or the country. Inter-group conflict results in intra-group cohesion. When a person of cohesive community starts a business he or she tries to involve others by integrating their cohesive forces concerned with this business.

#### **Conclusion:**

The terms entrepreneurs, entrepreneurship and entrepreneurship development have been changing in respect of meaning, domain of application and scope of practices with the advent of time and improvement of the research results obtained and developed by researchers, academicians, practitioners, and intellectuals in the field. Review of existing entrepreneurship literature and theories help to identify research gap and find out many of the inputs that may contribute to the entrepreneurship development scenario of the country and thereby overall economic development. Lessons learned from the present study have been suggested to apply for augmenting the entrepreneurial supply in the country

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# Frozen Foods: Emerging influential export earning sector for Bangladesh

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## Abstract:

*The main purpose of this study is to analyze the performance of frozen foods in national economy. Frozen Foods farming seeking the development of an export-orientated shrimp industry in remote rural regions of coastal Bangladesh is a fundamentally good decision, one that brings in much-needed foreign revenue and will automatically help to improve local livelihoods, lifting local economies from self-sufficiency into cash economies, which are shared by much of the rest of the world.*

**Key Words:** Shrimp, economy, LDCs, species, fishery

## Introduction:

Agriculture plays a crucial role in generating foreign exchange through increased agriculture export. Primary products and agricultural commodities are the major sources of foreign exchange for developing countries like Bangladesh. The trade experience of developing countries reveals that there has been a steady decline in their share of the world agriculture export. However, the reasons for such a decline cannot be attributed to the trade policies of the developed countries alone, but also to their own policies. The policies of over-valued exchange rates, low producer prices, export taxation, excess industry protection and incentive for import substitution are mainly responsible for poor agricultural performance and retarded exports in most of the less Developed Countries (LDCs).<sup>9</sup> Bangladesh, which has dominantly an agricultural economy, is no exception in this regard. An important sector of economy in Bangladesh, received due recognition only recently because of increasing role in nutrition, income, employment foreign exchange earnings. More over main concern is that where the frozen food and shrimp is viable to go on or not due to its adverse effects on soil, local agricultural fields, local atmosphere, sea level rise and conventional practices of the country. Economic development is often promoted by foreign trade with the help of exports. The export sector plays an imperative role in determining the rate and structural pattern of development of any country.<sup>10</sup> Bangladesh with an agro-based economy is hardly trying to increase her export earnings for improving the balance of payment position in addition to its overall economic condition since eighties with a supportive export policy. But still the number of exportable items is not very significant.<sup>12</sup> Frozen foods is the second largest export sector of the economy. The massive natural resources available in Bangladesh make this sector particularly promising for investors looking to supply in international as well as in domestic markets. The Public sector corporation and the private organizations have setup about 148 numbers of shore based export oriented fish processing plants at Dhaka, Chittagong, Khulna, Jessore, Satkhira, Bagerhat, Cox's Bazar, Chandpur, Kishoregonj, Syihet and Patuakhali.

These plants produces Fresh Water shell On (FWSO), Ser Water shell On (SWSO), Peeled and Deveined (P&D), Peeled and Undevined (PUD), shrimp products under the most hygienic and sanitary condition under the supervision, control and guidance of foreign trained handling & processing experts.

At all levels, USFDA registrations and directives of the European Communities concerning the production and exportation of frozen foods are strictly followed.<sup>3</sup> Export sector appears to have a bright future both in employment opportunity and foreign exchange earnings in the years to come if necessary policies are taken for and appropriate supports are provided with the producer and exporters. Approximately 1.4 million people depends on fisheries as their primary sources of income and another 11 million people are engaged in seasonal or part time fishing and other ancillary activities and out of a total employment of 28 million in Bangladesh, approximately 7%

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is in fisheries. Frozen food & Shrimp production in Bangladesh is increasing gradually through horizontal expansion of the farming area not by the desired vertical expansion.<sup>2</sup> But Frozen food & shrimp farming need not require a heavy investment though it bears a bright and prospective future in the years to come. There exists a high potential of employment prospect and earning from exporting shrimp can be increased several times if only the existing problems relating to its production and marketing activities can be identified appropriately and essential procedures can be taken timely. While several studies have been done earlier to emphasize the prospects of frozen food cultivation and to show the socio-economic consequences of the same. But the study on the area of growth and exporting marketing performance of frozen food is very scant. Bangladesh Frozen Foods Exporters Association (BFFEA) is established in 1984 and approved by the government of the people's Republic of Bangladesh under section 3 of the trade organizations ordinance 1961 ( ordinance No. XLV of 1961 and registered with the register of joint stock companies, Dhaka under the company's Act, 1913 (Act VII of 1913) as a company with limited liability. Bangladesh Frozen Foods Exporters Association (BFFEA) is the only trade body for about the members of Fish processing Plants in Bangladesh. Since its inception the Association has been working to promote and protect the interest of Frozen Food processors, Packers and Exporters in the Country. It also acts as a vital link between the trade bodies and the different Government and Private Agencies. The Association is also devoted to establish and promote contracts with foreign buyers, business association and the chamber of commerce and industries to develop export marketing of Frozen Foods. BFFEA has also been playing a vital role in advising the Government in relevant policy, quality control, packaging, marketing and developing the fishery industries of the Country.<sup>1</sup>

### **Objectives of the Study:**

In the light of development of frozen foods sector in Bangladesh particularly, the major objectives of the study are-

1. To know about the present scenario of frozen food industry
2. To estimate the contribution of frozen food shrimp to the total export earnings
3. To explore the growth of frozen foods in Bangladesh.
4. To provide some recommendations for cultivating frozen food shrimp in Bangladesh.

### **Methodology:**

The present study provides an aggregate overview and qualification profile of the frozen food sector in Bangladesh. Secondary Data were collected through extensive review of literature include different articles, texts, newspaper, various national, international research works & publications of different organizations. The collected data have been analyzed, tabulated & interpreted with the help of statistical tools & techniques.

### **Present Scenario of frozen food industry and export:**

The frozen foods export is the second largest export sector of the country. This export-oriented industry includes the following sub-sectors, which need proper attention for augmentation of production and export earnings.

- Hatcheries
- Sustainable aqua-culture technology
- Feed meals plants
- Processing unit for value-added products & new technology and equipment.

Frozen fish, shrimp production in Bangladesh covers an area of 217 877 hectares, and is focused in two areas on the coastline. 20 percent of national production takes place around Cox's Bazaar in Chittagong in the South Eastern corner of Bangladesh, and the remaining 80 percent close to the Sunderbans mangrove forest in the South West, within the districts of Khulna, Bagerhat, Jessore, Narail, Gopalganj and Noakhali. As a nation, Bangladesh is one of the top ten global prawn producers, supplying roughly 55 percent to the EU and 35 percent to the USA, with the remainder going to Japan. Tropical shrimp has always been an important part of the Bangladeshi diet, especially so in coastal regions, where both marine wild caught and fresh-water shrimp species, cultivated alongside rice crops in paddy fields, have traditionally contributed to a varied

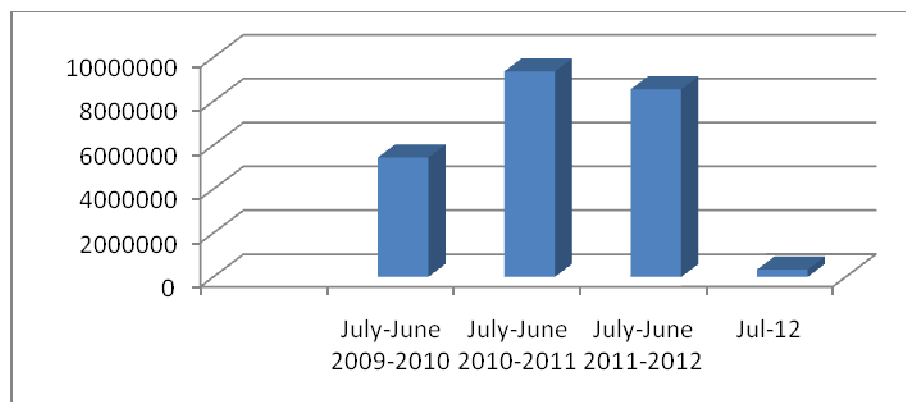
diet in the coastal and riverine areas. These species include harina, chali, bagda, rashna, chamni, chaka and galda shrimp to name a few. With the birth of global trade in tropical shrimp however, land use patterns began to change as urban entrepreneurs, wealthy landowners and transnational banks alike sought to boost profits and Bangladesh's national income. In the early 90s the so-called blue revolution was born. By 2003-4 it was reported that \$378 million were earned from this sector alone, marking it out as one of the most profitable export industries in the country,<sup>16</sup> as black tiger bagda shrimp (*Penaeus monodon*) and sweet-water galda shrimp (*Macrobrachium rosenbergii*), became sought after overseas. Shrimp farming had become big business and tales of enormous profit margins fuelled the expansion. It gradually increases the foreign earnings for the country as a blessing.

Braving economic meltdown throughout the world, the country's frozen food export sector posted a 7.56 per cent growth in the first seven months of the current fiscal over the same period a year earlier. According to the Export Promotion Bureau (EPB); the sector fetched \$ 413.32 million during July -January against 384.27 million during the same period last fiscal. The earning also surpassed the target by 3.48 per cent against 399.42 million strategic target set by the government for the period. Of the total earning during the period, \$302.12 million came from exports of shrimps only. \$82.51 million came from frozen fish; mainly white fish. Industry insiders said the export continued growth because of higher production of fresh water shrimp than the sea fish. The price gap between these two varieties is around five dollars per pound which contributed significantly in increasing the total earning. He told the Independent that the recession hit the export but it was not felt because of high production of fresh water shrimp. Russia has become a new destination for frozen food export, which helped overcome the Euro zone recession fallout. Now, around 7-8 per cent frozen foods are exported to Russia Federation, He hopes that the export to Russia would go up gradually in future. Industry insiders said the overall export from the country would increase this year than previous fiscal but the export target might not be achieved.<sup>6</sup> Fisheries sector has been playing a vital role in the socio-economic development of Bangladesh. The Government promised to raise the production of fish to meet the demand for animal protein as part of attaining food autarky. In order to meet this commitment, a number of projects and programmes have been undertaken to enhance protein supply through increased fish production. These include: Strengthening Community Based Aquaculture, Ensuring Access of Fishermen to the khas Jalmahals, Establishment of Beel Nursery, Release of Fish Fries in the open water, Extension of Gher, Pane and Cage Culture, Habitat Restoration through Re-excavation of Silted Rivers and Innovation of New Technologies through Research and Extension. Total fish production in FY 2009-10 was 28.99 lakh MT, whereas this production was raised to 30.62 lakh MT in FY 2010-11. During the last few years, the production from open water and marine were also satisfactory. Due to expansion of community based fish culture in the open water and conservation of hilsha fishery, the production raised up to around 57 percent in FY 2009-10 in comparison to FY 2003-04. Following table shows the trend of fish production from FY 2003-04 to FY 2010-11.<sup>7</sup>

**Table-01:** Basic information on frozen food industries in Bangladesh, 2011.

1. No of Fish Processing Plants	148
2. Plants Licensed by the GOB	88
3. Fish Processing Plants Approved by the EU	74
4. Quantity of Frozen Food Exported in 2009-2010	129.81 million (Lbs)
5. Shrimp Exported in 2009-2010	108.84 million (Lbs)
6. Fish Exported in 2009-2010	20.97 million (Lbs)
7. Processing Capacity in the Total Plants	3, 00,000 M. Tons
8. Export Earnings from Shrimp 2009-201	Tk. 2,409.40 Crore (348.28 million US \$)
9. Export Earnings from Fish 2009-2010	Tk. 616.53 crore (89.12 million US \$)
10. No of Shrimp Hatchery	130
11. Productions of Shrimp Fly	1200-1500 Crore
12. Shrimp Cultured Land	1, 70,000 Hector
13. Unutilized land for shrimp culture	1, 00,000 Hectare for Brakish water shrimp

Source: [www.bffea.bd.com](http://www.bffea.bd.com)

**Figure-01: Trend of Frozen foods export in Bangladesh**

Source: www.epb.gov.bd

Recently frozen foods trends are fluctuating last couple of years. In July-2012 exportable income was 338.561 million \$ where 2011-2012, 2010-2011 & 2009-2010 exportable income was 5441.271, 9360.89, 8547.049 million \$ respectively. In frozen food sector export target was 726.48 million \$ in July-June, 2011-2012 & where nation can income only 598.42 million \$ which is 4.26% short & comparison with expected target it was 17.63% short.<sup>8</sup> It happens due to in June, 2012 exportable income is 2311.20 million \$ & June 2011 exportable income was 2386.04 million \$. In comparison with 2011, exportable income is 3.14 short in 2012.

**Table -02: Fish production trends in different resources**  
(In lakh metric tonne)

Sector	Area (Lakh hector)	2003-2004	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
<b>1. Inland</b>									
(a) Capture	8.54	1.37	1.40	1.38	1.37	1.37	1.69	1.35	1.45
(i) River & Estuaries	1.78	0.15	0.16	0.16	0.18	0.18	0.20	0.18	0.22
(ii) Sundarban	1.14	0.75	0.75	0.78	0.75	0.78	0.93	0.64	0.82
(iii) Beel	0.69	0.07	0.07	0.07	0.08	0.08	0.09	0.07	0.09
(iv) Kaptai lake	28.10	4.98	6.21	7.18	7.68	8.19	6.17	7.51	7.97
(v) Flood									
<b>Sub-Total (Capture)</b>	<b>40.25</b>	<b>7.32</b>	<b>8.59</b>	<b>9.57</b>	<b>10.06</b>	<b>10.60</b>	<b>9.08</b>	<b>9.75</b>	<b>10.55</b>
(b) Culture									
(i) Pond	3.71	7.96	7.57	7.60	8.12	8.66	10.27	12.98	12.20
(ii) Semi closed water bodies	0.25		--	--	--	--	--	--	0.51
(iii) Baors	0.06		0.04	0.04	0.04	0.05	0.06	0.05	0.05
(iv) Shrimp/Prawn Farms	2.77		1.21	1.28	1.29	1.35	1.49	1.23	1.85
<b>Sub -Total (Culture)</b>	<b>6.78</b>		<b>8.82</b>	<b>8.92</b>	<b>9.46</b>	<b>10.06</b>	<b>11.82</b>	<b>14.26</b>	<b>14.60</b>
<b>Total (Inland)</b>	<b>47.03</b>		<b>17.41</b>	<b>18.49</b>	<b>19.52</b>	<b>20.66</b>	<b>20.90</b>	<b>24.02</b>	<b>25.15</b>
<b>2. Marine Fisheries</b>									
(a) Industrial	0.48 sq.		0.34	0.34	0.35	0.34	0.48	0.45	0.42
(b) Artisanal	nautical mile		4.41	4.46	4.52	4.63	5.63	4.52	5.05
<b>Total (Marine)</b>	<b>-</b>		<b>4.75</b>	<b>4.80</b>	<b>4.87</b>	<b>4.97</b>	<b>6.11</b>	<b>4.97</b>	<b>5.46</b>
<b>Country Total</b>	<b>-</b>		<b>22.16</b>	<b>23.29</b>	<b>24.40</b>	<b>25.63</b>	<b>27.01</b>	<b>28.99</b>	<b>30.62</b>

Source: Department of Fisheries, Ministry of Fisheries and Livestock

**Contribution of frozen food shrimp to the total export earnings:**

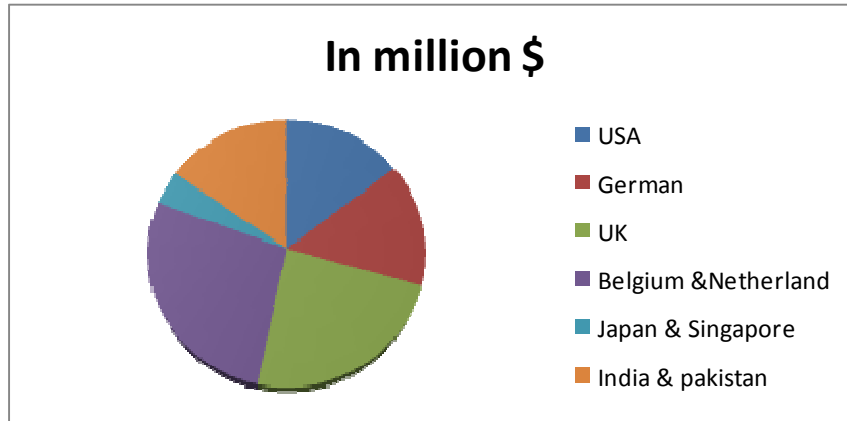
Over the last two decades, shrimp farming has emerged as a major industry in Bangladesh. The impact of the process has economic, social and environmental dimensions. All of these may have serious implications for sustainability, not only of shrimp farming, but of the rural community in the coastal areas of Bangladesh.<sup>13</sup> Problems with quality compliance arise at preprocessing phase at the stage of handling of raw shrimp (harvesting, sorting by size and color, removal of heads and peeling which are often carried out under conditions and facilities that are unsuitable from hygiene perspective) and also at processing stage (absence of high quality water and ice, irregular electricity supply, poor infrastructure and transportation facility) which seriously constrain Bangladeshi firms' ability to pursue modern sanitary practices.

**Table -03: Export from Bangladesh 2007-2008 to 2011-2012**

SL. No.	Item	2007-2008	2008-2009	2010-2011	2011-2012
01.	Oven Garments	36.62%	38.02%	37.11%	39.54%
02.	Knitwear	39.21%	41.34%	40.01%	39.06%,
03.	Frozen Food	3.78%	2.92%	2.73%	2.46%,
04.	Jute goods	2.26%	1.73%	4.86%	2.88%,
05.	Leather	2.02%	1.13%	1.40%	1.36%,
06.	Agri products	1.17%	0.95%	1.50%	-
07.	Engg.products	1.53%	1.80%	1.92%	0.42%,
08.	Footwear	0.11%	0.08%	1.26%	-
09.	Other	13.30%	12.04%	9.21%	-
	Total	100	100	100	

Among the different sector frozen food contributing a lot. Although frozen food export decline due some problem. Frozen food exports have suffered a downturn for a second year as the industry still bears the brunt of global recession that dampened demand and prices. A six-month voluntary ban on prawn exports to Europe and the rampage of cyclone Aila through farming areas weighed on frozen food shipments plummeted from 2009. The recession is over, but not its sequel. Prices fell last year after demand declined in the West. In fiscal 2008-09, frozen food exports plummeted 14.89 percent to \$454.53 million from the previous year after recession cut into demand for the food item. The latest data indicates further deterioration of the sector's export performance. Demand for shrimp and prawn that account for about 85 percent of the frozen foods sector's export earnings is yet to fully recover, although the global economy returns from downturn. The slide in a sector that provides more than 900,000 jobs continues at a time when exporters face various non-tariff barriers on health and safety standards from Europe, one of the main export destinations. Recently, a certification requirement from buyers on crystal violet (dye) has left nearly 200 containers of frozen foods stranded at different ports in Europe. In line with new rules, exporters will have to make sure that fishes contain crystal violet less than 0.5 parts per billion.<sup>14</sup> The exporters expect that the problem will ease soon as the government has started issuing certificates.

**Figure-02: Frozen Foods export from Bangladesh in 2011-2012**



Source: www.epb.gov.bd

**Exploring the growth of frozen foods in Bangladesh:**

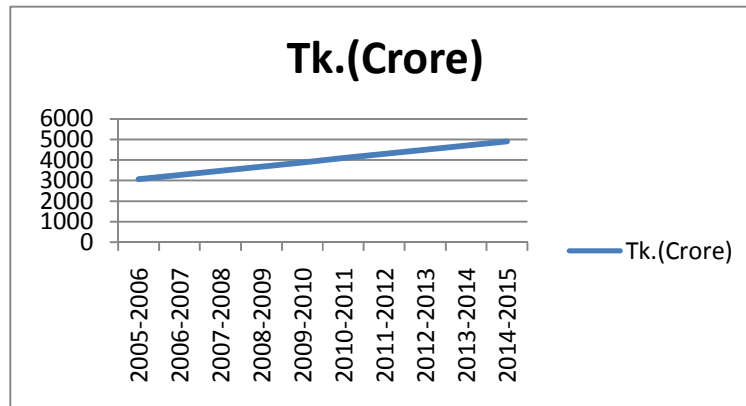
Frozen food is the second largest source of export from Bangladesh which earned as much as Tk. 4731.76 crore in the year 2011-12. Commercial culture of shrimp increased rapidly in the coastal belt of Bangladesh and it went through several stages of transformation. During the last ten years, Bangladesh has earned international credibility by responding to the food-safety and quality requirements of its destinations, mostly, the United States and the European Union countries. Continuous investment has enabled the sector to progress in the teeth of competition from other countries.<sup>5</sup>

**Table -04: Export earnings from Frozen foods**

Year	Product item	TK.(Crore)
2005-06	Shrimp and fish	3200.00
2006-07	Shrimp and fish	3558.78
2007-08	Shrimp and fish	3663.70
2008-09	Shrimp and fish	3127.16
2009-10	Shrimp and fish	3025.93
2010-11	Shrimp and fish	4446.64
2011-12	Shrimp and fish	4731.76

Source: Bangladesh Frozen Foods Exporters Association (BFFEA)

Following a period of strong investment in technology, processes and regulation the frozen foods sector has flourished and earned itself an excellent reputation with trading partners. Exporters have earned credibility and trustworthiness in the global market and are committed to maintaining a competitive advantage in product quality. Continuing investment in technology, marketing and quality remain at the forefront of the industries strategy to meet the challenges of international trade in price, quality, time and service. Fitting a straight line trend to disclose the potentiality of frozen foods.

**Figure-03: Potential growth of Frozen food****Some recommendations for the frozen food industry:**

Mass level of the stakeholders need institutional and industry related education immediately. Activities like training programs, seminars, and trade-fair are still in the initial level and done on small project base. Industry wise expansion of these kinds of activities should be taken into account immediately. Fish and fisheries are an integral part of the life of Bangladeshi. Fish marketing studies are very scanty. Most fish marketing studies are conducted in BAU. Most studies relate to kind of price spread and marketing margin. Few market integration studies exist that are methodologically very shallow (correlation approach). Most studies are done with limited sample. No representative structure-conduct-performance type study exists; supply chain, value chain and price spread type studies are confusing; no existence of studies related to price transmission and price linkage across different market levels. Fish is a natural complement in the diet of Bangladeshi. Fish supplies 58% of animal protein, 13 million people are involved for livelihood, 73% of rural household are involved in freshwater aquaculture and floodplains. Fisheries contribute: 4.64% to the GDP, 23.00% to agricultural GDP, & 5.10% to foreign exchange earnings. Problems including high mortality rate, lack of virus screening facility and the unfair practices should be taken into account for the both operative and strategic level immediately. Enforcement of food safety outside the government should be explored. Following special measures should be taken immediately:

1. Shrimp processing industries or shrimp producer some time face lots of risk like disease problems, raising price of shrimp feed, natural calamities, falling of shrimp price etc. So Government should share the risk with them to ensure the productivity of shrimp industry.
2. Shrimp transportation should be facilitated with modern facilities like insulated & refrigerated carrier van and handling of shrimp with food graded plastic basket.
3. Introduction of quality certification system at all levels of the shrimp and fish based industry to ensure food safety, traceability, environmental sustainability and social responsibility is needed.
4. In Bangladesh electricity supply is not adequate but government should ensure the continuous electricity supply in shrimp processing industries.
5. Quality control measurement standard should be more developed. All local manufacturers or importers of shrimp feeds must ensure and certify on the body of feed bag or package that the feed does not contain any EU and USFDA prohibited antibiotics or other chemicals.
6. Feed manufacturers should be allowed to import duty free essential ingredients that are not locally available.

7. Affordable rate of interest, easy repayment schedule should be introduced for the industry related entrepreneurs.
8. Vocational training centers should be established at aquaculture locations for hands-on training in aquaculture, post-harvest handling and processing.
9. Laboratory should have enough facilities with Modern and sophisticated, machine, instruments & methodology for testing quality parameters of exportable shrimp.
10. Ocean going vessel for the export of shrimp should be available. The ocean going vessel are not available as per it's requirement. Exporter couldn't export Shrimp in due time.
11. Inability to create verity of shrimp product to serve the international and local market lack of exploration of new markets of shrimp industry. There is a lot of demand for shrimp in international and local market but marketers fail to execute this demand. Shrimp production should be enhanced.

### **Conclusion:**

Bangladesh, with a large deltaic flood plain has a long tradition of fishing and shrimp culture. In recent decades, due to an increased international demand, shrimp has become one of the most important export products. In export earnings 85% of this is earned through export of shrimp. The government has declared shrimp cultivation a priority industry and specific support programmers (both technical and financial) have been designed. The discussion that ensured to identify the growth of the industry, develop some intervention strategies that would help to develop a strategic model to achieve an export target. It is therefore quite possible to attain the export revenue target if the abovementioned momentum carries on.

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## Controversies and Criticisms of Nazrul and the Poet's own Defense against Those

Dr. Hossain Al Mamun\*

**Abstract:** *The emergence of Kazi Nazrul Islam (1899-1976) in the literary world impressed everyone with his versatile creative genius, unfathomable rebellious spirit, unapologetic writings and uncompromising voice against colonialism, communalism, imperialism, fundamentalism, and other sorts of exploitation that he explored through every branch of literature. A very popular poet to the common people, Nazrul had to face illogical controversy and harsh criticism from his own community and also from the opponents, personal, political, and literary. On the other hand, in various ways, many attempted to evaluate him as a non-communal poet, as the poet of Islamic renaissance, national poet of Bengal and even some did not acknowledge and appreciate his great contribution to Bangla literature. Besides, some of his writings were proscribed and he was imprisoned by the British government. This study intends to focus on the controversy, criticisms and appreciations of the poet and his confessional art to reply all of these that will help to examine his poetic genius among the contemporaries.*

**Key words:** Controversy, Criticism and Defense.

### Introduction:

The greatness of Kazi Nazrul Islam lies in his poetic and musical talents. He pioneered exclusively new styles, ideas and emotions in a large collection of works constituting the history of society, culture, religion and politics in the colonial period of the Sub-continent. Popularly known as a 'Rebel Poet', Nazrul raised his strong voice and expressed rebellious attitude towards foreign rule, for which the British Raj proscribed many of his books. Simultaneously he had to confront with the enemies from own community and others. Some critiques called him a 'topical poet', 'immature young poet' implying that he did not make any lasting contribution. Considering all these, Nazrul replied in a very plain and simple way through his writings—"I am a mere truant village boy, moreover I don't have anything named learning in me" (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey') and "I am the poet of the present—not a prophet of the future" (Huda, 1997: 372). Categorically Nazrul explored his confessional art through one of his replies to the letters of Principal Ibrahim Khan ('Chithir Uttorey', Pous, 1334 Bangla), an essay—"Rajbondir Jaban Bondi" (Confession of a Political Prisoner) and a poem titled "Amar Kaifiyat" (My Answer). This study examines the controversy and criticism against him and tries to explore how Nazrul confronts and confesses them through his literary articulation, particularly through the above mentioned three pieces.

### Objectives:

The general objective of this study is to show controversy and criticism regarding Nazrul and his articulation of confessional statement, reply or answer are revealed through his different writings. The specific objectives are:

- i) to know the controversy about Nazrul and his writings.
- ii) to know about criticism (positive and negative) against Nazrul and his creations made by different poets and persons.
- iii) to explore Nazrul's confessional art through his dimensional literary pieces.

### Methodology:

This paper is based mainly on content analysis. The data are taken from both primary and secondary sources, which are simply qualitative in nature. Primary source refers to the author's own writings, whereas the secondary source refers to the works done by the others on the author. A number of relevant books, research articles and some web sites have been used as the secondary sources for collecting data which have been analyzed and presented through logical interpretation.

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### **Controversy, Criticism and Confessional Art of Nazrul:**

Nazrul lived in discordant times. Religious communalism was on the rise, fuelled by elements in the British government. Muslims felt alienated in the majority Hindu culture. There were a number of Hindu-Muslim riots during independence when the Empire was divided into two parts on religious lines. Through all these, Nazrul remained committed to be non-communal, writing both *Shyama-Sangeet* in praise of Kali and *Hamd* songs, in the praise of Allah. In later years, his liberal views on religion came under attack from the Muslim. (Banglapedia) His feeling, appeal, answer, explanation and confession to the Muslims are found in the following passage:

I feel that the Bengali Muslim society is much poor psychologically, though not financially. I have received the title *kafer* (infidel) that the Muslim society has given me. I cannot remember if I have ever complained about its unjustness. But I have felt shy that I am not that much worthy to be ornamented with such a title. In spite of that I have been placed in the row of Hafiz- Khayyam and Monsoor. Moreover, at the present fanatic days my Muslim identity has been a crime to some Hindu people - how much non-communal I am. I do not deny that the first storm of rebukes came from my own society i.e. the Muslim society; though it does not mean that the Muslims did not appreciate me at all. All the thorns of depreciation have gone underneath by the deep love and warm welcome of the Muslim young friends. Maybe, I did not get the blessing from the seniors, but I got the love and hearty garlands from the youths. Many Muslim authors will debate on your term 'Muslim Literature'. Does it mean literature by Muslim people or literature having Muslim feeling? If it is real literature, it will be for all nations. ...I do not believe that poetry can be created on religious belief, neither on Islam.

...I am a small poet, I have praised this greatness of Islam through a lot of my write-ups. But the tone of it could not supersede poetry...I believe that if the objective exceeds poetry then it hampers poetry. (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey')

On the other hand he addresses the Hindus in the following passage:

No one will believe the existence of human blood in my veins if I deny my indebtedness to the affection and love from the Hindu writers and public. Though due to envy some bad Hindu and Brahma writers are speaking ill and a few orthodox Hindu-shabha men are publicizing bad rumours about me but their number is very few. Their envy is completely communal or personal. I would not blame the whole Hindu society for these few devilish activities. (Ibid)

Nazrul hated fanaticism and became a great advocate of Hindu-Muslim unity. He wanted people to be liberal in religion. He devoted many works to expound upon the principle of human equality. In 1920, Nazrul expressed his vision of religious harmony in an editorial in *Joog Bani*:

Come brother Hindu! Come Musalman! Come Buddhist!  
Come Christian! Let us transcend all barriers, let us forsake  
forever all smallness, all lies, all selfishness and let us call  
brothers as brothers. We shall quarrel no more. (Nazrul Islam, Web)

Considering both Hindus and Muslims on the same track, Nazrul comments: "I do agree, this poor country will attain no development if we fail to eradicate disrespect to each other in both the Hindus and Muslims. And I also know that only through literature this disrespect may be eradicated" ((Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey').

He gives emphasis on Hindu-Muslim harmony to build Bangla literature:

Bangla literature is a foster daughter of Sanskrit, if not its own daughter. So Hindu ideas are so intermingled with it that if it is excluded, half force of Bangla language will diminish. None can think to exclude Greek mythology from English literature. Bangla literature is the joint product of both Hindus and Muslims.

...I believe in the unity of Hindus and Muslims. So, I use Muslim-words to hurt their prejudice, or use the name of Hindu gods and goddesses. (Ibid)

In 1924, Nazrul married Promila (Ashalata Sengupta), daughter of Srijukta Giribala Debi, second wife of the late Basantakumar Sengupta, Nayeb of Tripura state. Promila was 14 and Nazrul 23 at the time. After the death of her husband, Giribala had no other alternative but to take shelter in the house of her husband's younger brother Indrakumar Sengupta with her only daughter Promila in Comilla. The marriage triggered hostile criticism at that time but Nazrul cared little. (Rahman, "Kazi Nazrul Islam: The Rebel Eternal", Weekend Independent) As a result, Nazrul's works began intensely attacking social and religious dogma and intolerance. (Newworldencyclopedia, Kazi\_Nazrul\_Islam)

Besides this successful marriage, Kazi Nazrul Islam used to cherish deep love for Fazilatunnessa. (Rahman, op.cit.) Critics say Nazrul's love for women persuaded him to compose many love songs. Some of them are: Uchaton mon ghorey royna piya moor, Aami chirotorey durey chole jabo tobu amarey deboona bhulitey, etoo jol o kajol chokhey, pashani anlo bolo ke, cheyo na sunoyona ar cheyo na ae noyon pane, alga koro go khopar badhon dil ohi mera fos gayi, keno ano phoolo-door aji bidai bela. These songs have everlasting appeal. (Ibid)

Nazrul witnessed the age of British colonialism, post-first world war society and crises, the non-cooperation movement led by Mahatma Gandhi, the Khilafat movement by Mohammad Ali and Shawkat Ali, Chitta Ranjan Das, home-rule movement, anti-British movement by the Congress and the Muslim League, the crisis in the Hindu-Muslim relationship and the like. All these significantly played their role in shaping Nazrul's poetic mindset. (Alam, "Nazrul's Poetry History and Post Colonial Approach") The British rule of India influenced Nazrul to take an active part through his writings in the *Swadishi* and *Khilafat* movement. He was imprisoned by the British government for one year of hard labor for his writing "Andamoyeer Agamaney," which appeared in the *Dhumketu*. British authority proscribed Nazrul's five important books—*Yougabani* (Published in October 27, 1922 and proscribed on November 23, 1922), *Bishner Bashi* (Published in August, 1924 and proscribed on October 22, 1924), *Vanger Gan* (Published in August, 1924 and proscribed on November 11, 1924), *Pralay Shikha* (Published in 1923 and proscribed on September 17, 1930) and *Candrabinidu* (Published in September 1931 and proscribed on October 14, 1931). (Huque, 2000: 7)

Needless to say, such writings could not but attract hostile attention from the British Government. The final crunch came with the publication of a poem addressed to the goddess *Durga* invoking her to appear in the most terrible and destructive aspect and descend in a mad dance to destroy the vile oppressive rule of the foreigners, which resulted in the poet's being promptly arrested on the charge of sedition. Nazrul Islam read out a dignified statement in court defending his sacred right as a poet to speak out the truth without fear, the truth with which God entrusted the poets. This defense later published as a booklet will remain a memorable piece in our literature. (Ibid)

As an anti-colonial poet Nazrul used his spirited language to present his discourse of rebellion to the colonized nation. He declared himself to be a tool of expressing the truth in *Rajbondir Jabanbondi* (Statement of a political prisoner). (Alam, "Nazrul's Poetry History and Post Colonial Approach") He says, "The royal translator appointed by the king has translated the message in royal language, has not translated from the spirit. In his translation, treason is revealed as his objective is to please the king; and in my writing truth, vigour and spirit are expressed." (Ibid)

Even a melodramatic tone is noticed in another courtroom of the Raj at his trial on charges of sedition. On the day of his hearing Kazi, later the national poet of Bangladesh, emphasised the gulf between what he called the king's law and God's law, between justice and Justice. ("The art of oratory, and the great speeches of modern India", Web) He thundered:

...I'm a poet, sent by God to speak the unspoken Truth, to give form to the formless creation. The message is the revelation of the Truth, the message of God. That message may be judged seditious in a state-court, but in the court of Justice, that message is not against Justice, not against Truth....I'm the shower of Truth, tears of God. I have not rebelled against a mere king, I have rebelled

against injustice. I know and I have seen - I'm not alone standing convicted in this court today. Standing behind me is the beautiful Truth, God Himself. Throughout ages He stands quietly behind His soldiers of Truth turned political prisoners. (Ibid)

**Nazrul replies to British raj considering his abilities:**

My ability is small, but during the last eight years I have been roaming through the towns and villages with the farmers and labourers. I have written, talked, sang through the paths like the minstrels. I do not have money, but I know you will not-who ever others will-blame me that I have ever hesitated to spend my capability. The government has been much interested in me for all my services to my country and society. My most circulated books have been banned. Some days ago the police has notified me that if my recently published book *Rudromongol* (The Violent Good) is sold more, they will arrest me for sedition. If I speak out in the same tone of the sage Whitman: "Behold, I do not give a little charity, When I give, I give myself." (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey')

"The Rebel" which has ever since popularly stuck to his name and which in retrospect can be considered as a key-note poem. It is rare in the history of any literature that a single poem could have so much impact as to establish its author not only as a major poet, but also as an undying literary force. (Web) On 30 August, 1922 the Kolkata-based English daily *Amrita Bazar* wrote: "The editor (Kazi Nazrul Islam) has already made his mark as a powerful poet and some of his recent poems, particularly the 'Bidrohi', are among the most well-known in Bengali literature..." (Das. "Nazrul...in the eyes of Benoykumar") Benoykumar says: "The 'I' in the poem 'Bidrohi' is not the poet Nazrul himself; rather it is the person who reads the poem" (Ibid). Thus 'Bidrohi' attains a new dimension, without question. He discovers the root of the self of Nazrul's 'Bidrohi' in the Atharva-Veda: "Mighty am I, 'Superior' (uttara) by name, upon the earth, conquering am I, all-conquering, completely conquering every region" (Ibid).

But in 1933, *Shoniberer Chithi* opened a new chapter of Nazrul criticism. Rafiqul Islam writes:

A large number of Nazrul's writings were satirised and published as parodies between the monsoon of 1333 bangla year and autumn of 1334 bangla year. In the first issue of monthly *Shoniberer Chithi*, Modhukor Kanjilal wrote a poem 'Tomader Proti' (To You), which was a satire of Nazrul's famous poem 'Bidrohi' (The Rebel). (Islam, "Tagore and Nazrul", Fall 2010-11: 13)

Following this kind of criticism Nazrul wrote to Ibrahim Khan:

My young friends have imprinted the victory mark of Vidrohi (The Rebel) permanently on my forehead. Many have mistaken it as the disgrace mark, but I have not. Have I protested against the truth, the beauty as I have sung about the sorrow, the beauty? I have rebelled-rebelled against injustice, against oppression-against everything that is false, impure and backdated. I have rebelled against deception in the name of religion, against superstition....I do agree, discipline is necessary to build up something. But destruction needs no rules. I destroy because I want to build up-my destruction is not for the sake of destruction. I destroy as soon as I can in the hope to build up early-I struck down all the old and obsolete....My rebellion is not of something that my mind wants, it is of the expression of my pleasure to be freed from everything from the Omniscient God. (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey')

Nazrul Islam was essentially non-Tagorean because of the basic difference in thought and manner. He never pretended to be learned or sophisticated. With him it was the heart that mattered most. Emotional poetry with all its glow, sincerity and simple charm, spontaneity and passion, abounding in vitality and vigour made Nazrul's poetry unique and enchanting. (Ibid) Like Walt Whitman, he could say:

Friend, this is no book; who touches this touches a man, full blooded  
vibrant, fearless yet tender as the dew ashed flower. (Ibid)

For two decades Nazrul Islam almost equaled Tagore as a literary power although he retained and afterwards, wrote of his deep reverence for the *Guru Dev*, who also showed his affection for the young genius and blessed his virile attacks on the drowsiness of his people. But, the hostility of the *Shoniberer Group* against Nazrul Islam had an element of Hindu-Brahmo communalism according to some scholars, but its roots were in personal jealousies of some writers against the poet and also some other's idolatrous loyalty to the literary ideals of Rabindranath Tagore. (Mitra, 2007: 301) While Tagore and Nazrul continued confidently with the unfolding of their respective individual, distinct, and unique genius, they themselves remained irrespective of certain disagreements or conflicts of opinion, most fundamentally, mutual admirers. (Kamal, "The Rebel Within Us: An Introduction") Their works continued to emerge as seminal contributions to the broader, more varied and shared context of Bengali literature, opulent with its at least a thousand-year-old heritage. They bestowed several attributes onto each other. (Ibid) Nazrul's dedication of *Sanchita* to Tagore is just one such example. In it Nazrul addresses Tagore as 'Bishwa-kabi-samrat' (World-poet-emperor). Tagore, on the other hand, welcomed Nazrul's arrival on the Bengali literary horizon by addressing him as 'a comet.' In his benediction written for Nazrul's bi-weekly publication, *Dhumketu* (The Comet), Tagore wrote:

Come, O Comet,  
build a bridge of fire  
across darkness.  
On today's fortress of distress  
hoist your flag of victory.  
So what if the night's forehead  
is marked with an ill-omen  
come, awaken those laying half-asleep  
with your flash! (Ibid)

In 1923, when Nazrul went on a hunger strike for 40 days to protest against the ill treatment of political prisoners by the jail authority, Tagore sent a telegram to Nazrul, "Give up hunger strike, our literature claims you" (Ibid). Nazrul himself was in jail, serving a one year term on charges of sedition. Tagore also dedicated his song-drama, *Bashanta*, ('Spring'), to Nazrul. In turn, Nazrul, in his 'Tribute of Tears' to Tagore on his eightieth birthday, wrote (Ibid):

While others regarded me as a mere manifestation of awe,  
you saw in me disconsolate cries... You alone realized that  
I was a Comet shooting away from your orbit of light. The  
flame of fire thus became a Falgoon (spring) flower, and the  
flute of fire a flute of strains in the hand of Brindaban's  
Youth (Krishna)... The wave of fire that swelled up in me  
has been turned by your touch into lunar light... On your  
birthday, let me narrate the story of my own new birth.  
The soft, sweet, soothing touch from your magnificent self  
of beauty and delight has covered my mount of fire with flowers  
all over. All my burning has been satisfied... I have now  
forgotten that I was a Poet. I am but a lotus blown in your  
blaze, O Sun! (Rahman, 1966: 20)

Rabindranath Tagore called him 'Dhumketu,' 'The Comet,' Mahatma Ghadhi described his poem as, 'The song of the spinning wheel' and 'Nazrul is the ultimate spirit of the spinning wheel and freedom runs through his vein.' (Banglapedia)

Some critiques called Nazrul a 'topical poet' or 'immature young poet'. (Mukherjee, 2000: 85-86)  
Nazul's artistic reply:

I don't know the concrete definition of art, if I know I don't believe.  
A true artist feels troubled to obey that art will be most beautifully expressed  
when 'art will sustain if this is created or art will perish if that is created' and  
likewise formulas are maintained. I know the school of classic will get furious

and their pen will turn into arrows if they hear it. The true picture has turned so by this time. Even then writers of the new wave must say this today. (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey')

Some critics cannot locate universality in Nazrul's poems. Nirod C Chowdhary says, "To me he seems to be very playful, undisciplined and hollow" (Alam, "Nazrul's Poetry History and Post Colonial Approach"). Chinua Achebe rejects this notion: "As though universality were some distant bend in the road which may take if you travel out far enough in the direction of Europe and America, if you put adequate distance between yourself and your home" (Ibid). Nazrul's spiritual quest would lead him to his self-realization of universal unity, a vision so prophetic. (Kamal, "The Rebel Within Us: An Introduction") In 'I Sing of Equality' Nazrul wrote:

I sing of equality  
in which dissolves  
all the barriers and estrangements,  
in which is united  
Hindus, Buddhists, Muslims, Christians.  
I sing of equality. (Ibid)

**Nazrul gives his detailed answer on critical literary issues raised by his critics:**

I feel sorry to consider them as my enemy even though people say so...I haven't seen God, but I've seen human. I believe that this dusty, corrupt, helpless, sorrowful people will control the earth one day, unwrap all the mysteries and bring down the heaven...I am not exaggerating at all. I can visualize myself in the diamond tears of them. If I fail to do anything, I wish that I can at least cry heartily with them.

Moreover, nearness has a cruelty. There is no disgrace in moonshine, the moon has its own disgrace. The moon soothes our eyes from far, but none will possibly be happy after going to the dead surface of the moon. The sun-ray that enters our homes through the windows gives light but our eyes are hurt with it. I adore the sun and the moon,... (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey')

Then he asked them some questions:

Every time they have been criticized as crazy people. And they are larger in number. They always shout even at the time of cry that 'that cry in not very artistic, cry again artistically and dancingly'. For this criticism to sorrow by the lifeless gatekeepers of art the great poet Whitman was also grouped in the non-poets. My condition is nothing better than to swallow the pillow. When I write *Sorbohara* (The Proletariat) they say it's no poetic at all. When I write *Dolonchanpa* (The Yellow Flower), *Chhayanot* (The Raga Chhayanot) they say that they are silly. What will that meaningless sounds matter? What loss would be if I did not write it? (Ibid)

Nazrul answers:

They say lyrics must be about love and war. There is no war in our country (except the Hindu-Muslim war); so if one writes poems about the suffering of humanity, it becomes 'ugly-rebellious feeling' to them. The present day writers write about it because it is easy to get praise, they say.

Possibly no poet can tolerate such comments: 'My poetry is not poetic, I am not a poet'. So those who were appreciating man's suffering are now creating lifeless beauty. ...Consequently what they wrote were full with ugly-rebellious feelings but will anyone say that they were not poems? (Ibid)

Besides, being rebellious Nazrul was very much concerned about the social, economic and political system of the country, which is the reason of poverty and misery. He had a deep concern for his people and this is reflected in his poems. ("Nazrul Islam", Web) His poem 'Daridro' (Pain or Poverty), shows his pain for the people of his country:

O poverty, thou hast made me great.  
Thou hast made me honoured like Christ  
With his crown of thorns. Thou hast given me

Courage to reveal all. To thee I owe  
My insolent, naked eyes and sharp tongue. (Ibid)

Nazrul asks some questions to the then society:

What do you say? I myself am in favour of the surgeon. The society will throw its hands and legs, will speak ill; but those who do not have that capacity to bear it, they need not try to work for social welfare. So, time and again I am calling the brave and devoted youths. This purification is possible only by them. They do not hanker after fame, they don't beg honour. (Nazrul's Letter to Principal Ibrahim Khan-'Chithir Uttorey')

Along with unending criticism, Nazrul got appraisal from some very important literary and political genius. Rabindranath Tagore, Mahatma Gandhi, Subhas Chandra Bose, Sharat Chandra Chattopadhyay, Mohitalal majumdar, Jasim Uddin, Abbas Uddin and many other contemporary writers and critics were admirers of Nazrul's works, his political vision and rebellion. In this regard it is very important to consider the comment of Buddhadeva Bose on Nazrul:

Nazrul, is a loud poet; his poetry is boisterous...Nazrul's gift is rather like Byron's, gorgeous, but undependable: the same raw violence; that interminable, almost involuntary flow; that carefree and even careless workmanship; and above all, that thinness of thought-substance. What Goethe said of Byron is literally true of Nazrul: "The moment he thinks, he is a child." (Bose, 2000: 65-66)

Nazrul Himself has explained, denied and defended all the criticisms against him within a single poem—'Amar Kayfiyat' (My Explanation) that provides a summary of this study:

বর্তমানের কবি আমি ভাই, ভবিষ্যতের নই 'নবি'।  
কবি ও অকবি যাহা বল মোরে মুখ বুঝে তাই সই সবি!  
কেহ বলে, তুমি ভবিষ্যতে যে  
ঠাই পাবে কবি ভবীর সাথে হে!  
যেমন বেরোয় রবির হাতে সে চিরকালে বাণী কই কবি ?  
দুষ্টিছে সবাই, আমি তবু গাই শুধু প্রভাতের ভৈরবী ! (Islam, ১৯৯৩: ২৯২-৯৫)

I'm a poet of the present,  
not a 'prophet' of the future.  
A poet or no-poet-whatever  
you all me, I humbly accept.  
Some predict: "You'll have a place  
among the great poets of the future!  
Where are the eternal messages like the one's  
flowing out of the writings of Rabi?"  
They criticize me. Yet I go on singing  
only my Bhairabi motes of dawn! (Kamal, 1999: 372-74)

Nazrul didn't consider him as a prophetic poet in future. He just wanted to be a poet of the present. He showed his restrained against harsh criticisms either logical or illogical. He proclaimed good for the humanity in near and later future.

He further said with some more lines:

পরোয়া করি না, বাঁচি বা না বাঁচি যুগের হুজুগ কেটে গেলে।  
মাথার উপরে জ্বলিছেন রবি, রয়েছে সোনার শত ছেলে  
প্রার্থনা ক'রো - যারা কেড়ে খায় তেত্রিশ কোটি মুখের গ্রাস,  
যেন লেখা হয় আমার রক্ত-লেখায় তাদের সর্বনাশ ! (Islam, ১৯৯৩: ২৯২-৯৫)

I don't care whether or not a survive

beyond the current trend.  
Rabi shines overhead  
and there are hundreds of talented children.  
Pray-that those who rob  
thirty-three crore mouths their morsels of food  
meet their doom in my writings in blood! ((Kamal, 1999: 372-74)

Ultimately Nazrul rebelled against the bad rulers and the oppressors. He demanded the termination of the evil forces through his fierce writings.

**Conclusion:**

This paper begins with the creations of Nazrul and the criticisms and controversies found against them and ends with how Nazrul defended all those through his confessional art. Considering the above discussion and demonstration, it is found that faced with evil forces like inequality, oppression, colonialism, tyranny, hypocrisy of all kinds—religious, moral or political greed, fanaticism, violence, racism, communalism, sorrow, alienation from nature from ourselves, from life's unifying essence and global existence on the brink of termination, annihilation, collapse etc, Nazrul aesthetically produced through his writings—humanity's indomitable and conscientious striving for equality, freedom, empowerment, justice, renewal of nature, idealism, romance, love, a vision of unity and community of co-existence and peace. He confessed through his experiences. He decided to contribute with songs of joy and sorrow, distribute himself among others, survive among all alive. All These are his vow, his devotion, and his austerity. Thus, we get Nazrul as a universal poet through his artistic confessional creations that give him uniqueness among his contemporaries to the present day literary world.



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# Solutions of Interval Valued Fuzzy Relation Equation

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## Abstract

Interval valued fuzzy sets play a very important role in the fuzzy set theory. It has a wide range of application field. In this present study, the fuzzy relation equation  $x \circ A = b$  is solved, where  $A$  is an interval valued fuzzy  $m \times n$  matrix over  $I = [0, 1]$ ,  $b$  is an interval valued fuzzy  $n$ -vector over  $I$  and the operation  $\delta$  is Max-Min operation of matrices. The solution  $x$  is an interval valued fuzzy  $m$ -vector over  $I$ . Computer function scripts in MATLAB are developed to facilitate computations.

**Keywords:** Interval, Matrix, Fuzzy relation equation, Maximum solution, Minimal solutions, Chain of solutions.

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## 1. Introduction

Sanchez(1984) introduced the notion of fuzzy relation equation. Since then a host of researchers have studied and contributed to the theoretical aspects of this topic. Most of important contribution have been made by Higasi and Klir(1984), Lettiery and Liguori (1985), Pappies and Sugino(1985). Interval valued fuzzy relation equation was studied by Wagenknecht and Hartmann(1987), Wang and Chang(1991). Two papers [3] and [4] were published by Mitra and Khan (1999) on existence of solution and solution of fuzzy relation equations, respectively. The present study is an extension of the papers[3, 4].

## 2. Preliminaries

Let  $N_k = \{1, 2, \dots, k\}$  be an index set and  $I = [0, 1]$ . Suppose  $P = \{p_i, i \in N_m\}$  is an  $m$ -set,  $Q = \{q_j, j \in N_n\}$  is an  $n$ -set and  $\mathcal{I}$  is the set of all intervals over  $I$ . Suppose  $A: P \times Q \rightarrow \mathcal{I}$  is an interval valued fuzzy relation from  $P$  to  $Q$ , which is an  $m \times n$  matrix  $A = (A(i, j))$ , where each  $A(i, j)$  is an interval  $[a_{ij}(l), a_{ij}(r)]$  with  $a_{ij}(l), a_{ij}(r) \in I$ . In many situations, the information available may be such that it is possible to locate the uncertain values inside a compact (closed and bounded) interval  $K = [\underline{k}, \bar{k}]$  of  $\mathcal{I}$ , Kaufman and Gupta(1985) called such an interval as *interval of confidence*.

**Definition 2.1** Kaufman and Gupta(1985)  $\forall K \in \mathcal{I}$ ,  $K = [\underline{k}, \bar{k}]$  is called *generated interval* if  $\underline{k} \leq \bar{k}$  with  $\underline{k} \neq \bar{k}$ . Again  $\forall K \in \mathcal{I}$ ,  $K = [\underline{k}, \bar{k}]$  is called a *degenerated interval* if  $\underline{k} \leq \bar{k}$  with  $\underline{k} = \bar{k}$ .

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**Example 2.1(a)**  $[.1, .5]$  is a generated interval and  $[.2, .2]$  is a degenerated interval. Observe that  $[.2, .2] = \{.2\}$ .

**Definition 2.2** Kaufman and Gupta(1985) There is a partial ordering in  $\mathcal{I}$  denoted by  $\preceq$  and defined as:  $\forall K, L \in \mathcal{I}$  with  $K = [\underline{k}, \bar{k}]$ ,  $L = [\underline{l}, \bar{l}]$ ;

$$K \preceq L \Leftrightarrow \underline{k} \leq \underline{l} \text{ and } \bar{k} \leq \bar{l}$$

$$K \prec L \Leftrightarrow K \preceq L \text{ and } K \neq L.$$

### 3. Forming Interval Valued Fuzzy Relation Equation

Consider a 1-set  $\{R\}$ , where  $R$  represents the *Rainy Season* in Bangladesh,  $S = \{h, c, t, s\}$  is a 4-set, where  $t, h, c, s$  stand for symptoms: *temperature, headache, cough* and *stomach trouble*.  $D = \{V, T\}$  is a 2-set, where  $V$  is for *Viral Fever* and  $T$  is for *Typhoid*.

In the Rainy Season of 2012, one team of Rover Scouts was given assignment to conduct a survey on the intensity of each symptom of  $S$  as part of their social service program. For each symptom, six Rover Scouts went to work in six different localities. Each Rover Scout was asked to go to at least 50 people and submit his findings in percentage. The grade for a particular symptom was taken as  $r \times 0.01$ , when a Rover Scout found that  $r\%$  people of that Rover Scout's group under investigation were suffering from that symptom. When all people of a Rover Scout's group under investigation were found to suffer from a symptom, the Rover Scout gave grade 1 for that symptom. Thus for every symptom, we got six grades. For a particular symptom, with the minimum and the maximum grades we got the interval grade [minimum grade, maximum grade]. In this way we got an interval valued fuzzy relation  $x : R \times S \rightarrow \mathcal{I}$  represented by the following  $1 \times 4$  interval valued matrix or interval valued 4-vector :

$x$	$t$	$h$	$c$	$s$
$R$	[0.3, 0.6]	[0.6, 0.8]	[0.6, 0.7]	[0.2, 0.8]

Another team of Rover Scouts was asked to survey about the intensity of the diseases *Viral Fever* and *Typhoid* among different groups of people suffering from each symptom of  $S$  just after the first survey. The grades were calculated in the same way as was done in the first survey. The result is represented by fuzzy relation  $A : S \times D \rightarrow \mathcal{I}$  and corresponding matrix:

$A$	$V$	$T$
$t$	[0.4, 0.8]	[0.2, 0.4]
$h$	[0.7, 0.9]	[0.1, 0.3]
$c$	[0.7, 0.9]	[0.2, 0.4]
$s$	[0.2, 0.3]	[0.3, 0.4]

Now we form an interval valued fuzzy relation equation  $x \circ A = b$ . Here  $x : R \times S \rightarrow \mathcal{I}$  and  $A : S \times D \rightarrow \mathcal{I}$  are obtained by survey. So from the equation we get an interval valued fuzzy relation  $b : R \times D \rightarrow \mathcal{I}$  which represents the intensity of *Viral Fever* and *Typhoid* in the *Rainy Season* of 2012 in Bangladesh. This is made with respect to the symptoms: *temperature, headache, cough* and *stomach trouble*. Here  $b$  is an  $1 \times 2$  interval valued fuzzy matrix (or interval valued fuzzy 2-vector). But if  $A$  and  $b$  were known, then to find  $x$  is not a trivial job. The present study is undertaken with a view to finding  $x$ .

#### 3.1 Splitting Interval Matrix

For any  $m \times n$  interval matrix  $A$  over  $\mathcal{I}$ , we can get two  $m \times n$  matrixes over  $I$ : left matrix  $A_l$  and right matrix  $A_r$  by splitting  $A$ .

**Definition 3.1.1** Suppose  $A = (A(i, j))$  is an  $m \times n$  interval matrix over  $\mathcal{I}$ , where  $\forall i \in N_m$  and  $\forall j \in N_n$ ;  $A(i, j) = [a_{ij}(l), a_{ij}(r)]$ . Then  $Al = (a_{ij}(l))$  and  $Ar = (a_{ij}(r))$  are two  $m \times n$  fuzzy matrices over  $I$ .

**MATLAB function script 3.1.1(a)**

```
%Splitting Matrix M= [Ml Mr];
%Interval Matrix M is input
%Ml and Mr are the outputs;
function [Ml, Mr] = IMatrix(M)
    format('bank');
    [m n]=size(M);
    i=1:n/2;j=2*i-1;
    Ml=M(1:1:m,j);
    i=1:n/2;j=2*i;
    Mr=M(1:1:m,j);
End
```

**Example 3.1.1(b)**

```
>> A=[.4 .8 .2 .4; .7 .9 .1 .3; .7 .9 .2 .4; .2 .3 .3 .4];
>> [Al Ar]=IMatrix(A);
>> Al
Al =
    0.40    0.20
    0.70    0.10
    0.70    0.20
    0.20    0.30
>> Ar
Ar =
    0.80    0.40
    0.90    0.30
    0.90    0.40
    0.30    0.40
```

**Example 3.1.1(c)**

```
>> x=[.3 .6 .6 .8 .6 .7 .2 .8];
>> [xl, xr]=IMatrix(x)

>> xl
xl =
    0.30    0.50    0.60    0.20

>> xr
xr =
    0.60    0.80    0.70    0.80
```

#### 4. Max-Min Composition of Two Matrices

The usual matrix composition addition – multiplication operation is adopted. In Fuzzy Mathematics,  $S$ - $T$  composition is taken as tool, where  $S$  is an  $s$ -norm and  $T$  is  $t$ -norm. It is to keep the results within the fuzzy territory. In the present work  $s$ -norm  $Max$  and the  $t$ -norm  $Min$  are kept fixed.

**Definition 4.1** *Higesi and Klir (1984)* If  $P$  is an  $m \times n$  matrix and  $Q$  is an  $n \times r$  matrix, then  $P \circ Q$  is called *Max-Min composition* (or simply, circle composition) of  $P$  and  $Q$ . If  $P \circ Q = R$ , then  $R$  is an  $m \times r$  matrix where  $R(i, k) = \bigvee_j (P(i, j) \wedge Q(j, k))$ .

The *Max-Min* composition of two matrices can be realized by MATLAB function script. For the present work *Mitra and Khan (1999)* program is adopted.

**Example 4.1(a)**

```
% xl and Al found in 3.1 are the inputs
% bl is the output
>>bl=circ(xl,Al);
>>bl
bl =
    0.60    0.20
```

**Example 4.1(b)**

```
% xr and Ar found in 3.1 are the inputs
% br is the output
>>br=circ(xr,Ar);
>>br
br =
    0.80    0.40
```

**4.2. Fuzzy Relation Equation Over  $I = [0, 1]$**

From this point the work is done on split fuzzy vectors and split fuzzy matrices which are over  $I$  as shown in section 3.1. Here  $I_m$  denotes set of all fuzzy  $m$ -row vectors over  $I$  and  $M_{m,n}(I)$  denotes set of all fuzzy  $m \times n$  matrices over  $I$ . For  $u \in I_m$ ,  $P \in M_{m,n}(I)$  and  $v \in I_n$  the following fuzzy relation equation is considered:

$$u \circ P = v \quad (1)$$

If  $u$  and  $P$  are known, then  $v$  can easily be calculated. In present problem  $P$  and  $v$  are known and  $u$  is not known. One may try to solve it by applying  $P^{-1}$ , but it is not possible as  $P$  is not invertible. It may so happen that a solution does not exist and if it does exist, it may not be unique. Let us first discuss about the existence of the solution. The set of all solutions of equation (1) is denoted by  $S$ .

**5. Existence of Solution of Fuzzy Relation Equation Over  $I = [0, 1]$**

Since the fuzzy vectors  $u, v$  and the fuzzy matrix  $P$  are over  $I$ , so for existence of solutions of equation (1), we adopt the steps done in [3,4] and thus we get the maximum solution.

**5.1 Maximum Solution**

Considering  $Al$  from Example 3.1.1(b) and  $bl$  from Example 4.1(a), we want to calculate  $\hat{x}l$ . Considering  $Ar$  from Example 3.1.1(b) and  $br$  from Example 4.1(b), we want to calculate  $\hat{x}r$ . We claim that  $\hat{x}l$  and  $\hat{x}r$  are the maximum left and right solutions. For this purpose we adopt the following MATLAB function scripts: *sigma*, *xistar* and *xstr* as done in [4]. Thus we get

**Example 5.1(a)**

```

% Al found in 3.1.1(b) and bl found in 4.1(a) are the inputs
% xlhat is the output
>> [xlsigmaxlhat]=ustar (Al',bl);
>>xlhat
xlhat =
    1.00    0.60    0.60    0.20

```

Verification of whether  $\hat{x}l \circ Al = bl$  or not.

```

>>circ(xlhat, Al);
>>ans=
    0.60    0.20

```

The result matches with  $bl$ . This shows that  $\hat{x}l$  is a left solution. It is observed that  $xl$  is not same as  $xl$  of Example 3.1.1(c) though  $Al, bl$  are same as in previous case, It establishes that there are more than one solution. Moreover in [4], it is theoretically proved that the solution obtained in this process is the maximum solution. It is now checked with any vector  $x = [1 \ 0.6 \ 0.6 \ 0.4]$  greater than  $\hat{x}l$ , which was chosen randomly.

**Example 5.1(b)**

```

>> x=[1 .6 .6 .4];Al=[0.4 0.2;0.7 0.1;0.7 0.2;0.2 0.3];
>>circ(x,Al)
ans =
    0.60    0.30

```

It can be seen that the output is not equal to  $bl$ . We checked with several random 4-vectors over  $I$  greater than  $\hat{x}l$  and found that none satisfied the equation  $xl \circ Al = bl$ . Thus the theory stating “ $\hat{x}l$  is the maximum solution of  $xl \circ Al = bl$ ” in [4] is checked.

Calculation of  $\hat{x}r$  :

**Example 5.1(c)**

```

% Ar found in 3.1.1(b) and br found in 4.1(a) are inputs
% xrhat is the output
>> [xrsigmaxrhat]=ustar(Ar',br);
>>xrhat
xrhat =
    1.00    0.80    0.80    1.00

```

In the same way as done in 5.1(b) that  $\hat{x}r$  is the maximum right solution is checked.

**5.2 Minimal Solution**

After getting the maximum solution, it has now become certain that there are solutions. Therefore one can search for other solutions. For this purpose MATLAB function scripts: *j-function*, *J-set*, *T-set*, *zeros* and *minsol* is followed as done by [4].

### 5.2.1 Computation for Left Minimal Solution:

Considering  $Al$  from Example 3.1.1(b) and  $bl$  from Example 4.1(a),  $xl\_$  is computed.

#### Example 5.2.1(a)

```
>>Al=[.4 .2; .7 .1; .7 .2; .2 .3];bl=[.6 .2];
>>xl_=minsol(Al',bl);
>>xl_
xl_=
[0.20    0.60    0.00    0.00]
```

Now it is checked whether  $xl\_ \circ Al = bl$  or not.

```
>>xl_=[.2 .6 0 0];Al=[.4 .2; .7 .1; .7 .2; .2 .3];
>>circ(xl_,Al)
ans =
    0.60    0.20
```

The answer matches  $bl$ , which means that  $xl\_$  is a left solution.

In [4], it is theoretically proved that the solution  $xl\_$  obtained following this process is a minimal solution of  $xl \circ Al = bl$ . It can be checked by an example. For which consider a vector  $xp=[0 \ 0.6 \ 0 \ 0]$  chosen randomly which is smaller than  $xl\_$ .

```
>>xp=[0 .6 0 0];Al=[.4 .2; .7 .1; .7 .2; .2 .3];
>>circ(xp,Al)
ans =
    0.60    0.10
```

The answer is not equal to  $bl$ . We checked with several random 4-vector over  $I$  smaller than  $xl\_$  and found that none satisfied  $xl \circ Al = bl$ . Thus the theory stating “ $xl\_$  is a minimal solution of  $xl \circ Al = bl$ ” in [4] is established.

Again According to theoretical argument of [4], any 4-vector  $x$  over  $I$  such that  $xl\_ < x < \hat{x}l$ , is also a solution of the fuzzy relation equation  $xl \circ Al = bl$ . For checking this we consider  $x$  randomly, so that  $xl\_ < x < \hat{x}l$ .

Suppose  $x = (0.8, 0.6, 0.3, 0.1)$ . Then we see that

```
>>x=[0.8 0.6 0.3 0.1];Al=[0.4 0.2; 0.7 0.1; 0.7 0.2; 0.2 0.3];
>>circ(x,Al)
ans =
    0.60    0.20
```

Here the answer matches with  $bl$ . We checked with several 4-vectors  $x$  with  $xl\_ < x < \hat{x}l$  and found that they satisfy  $xl \circ Al = bl$ . Thus we can make a comment that every  $x$ , such that  $xl\_ < x < \hat{x}l$ , is a solution of  $xl \circ Al = bl$ . All these left solutions form a chain. Equivalently every member of the chain with least member  $xl\_$  and greatest member  $\hat{x}l$  is a solution of the fuzzy relation equation  $xl \circ Al = bl$ .

### 5.2.2 Computation for Right Minimal Solutions:

Considering  $Ar$  from Example 3.1.1(b) and  $br$  from Example 4.1(b),  $xr\_$  is computed.

**Example 5.2.2(a)**

```

% Ar found in 3.1.1(b) and br found in 4.1(b) are inputs
% xr_1,xr_2 are outputs
>> xr_1
xr_1 =
    0.80    0.80    0.00    0.00

>> xr_2
xr_2 =
    0.40    0.80    0.00    0.00

```

**Remark:** Here we see that there are two right solutions.

Now we check whether  $xr\_1 \circ Ar = br$  or not.

**Example 5.2.2(b)**

```

% xr_1, xr_2 are Inputs
% Ar found in 3.1.1(b) is input
>> xr_1=[0.80    0.80    0.00    0.00];
>> Ar=[.8 .4;.9 .3; .9 .4; .3 .4];
>> circ(xr_1,Ar)
ans =
    0.80    0.40

>> xr_2=[0.40    0.80    0.00    0.00];
>> circ(xr_2,Ar)
ans =
    0.80    0.40

```

Here the answers match with  $br$ . Thus  $xr_1$  and  $xr_2$  are right solutions of  $xr \circ Ar = br$ .

As done in the case of left solution, we can make comment that the solutions obtained in this technique are minimal right solutions. Again any 4-vector  $x$  over  $I$  with  $xr_1 < x < \hat{x}_r$  is also a solution of the fuzzy relation equation  $xr \circ Ar = br$ . It is also true for any 4-vector  $x$  on  $I$  with  $xr_2 < x < \hat{x}_r$ . In both the cases the solutions form chain. Equivalently, every member of the chain with least member  $xr_1$  and greatest member  $\hat{x}_r$  is a solution of the fuzzy relation equation  $xr \circ Ar = br$ . Similar case for  $xr_2$ .

**5.3. Formation of Interval**

In section 3.1 we have split matrix over  $\mathcal{S}$  into two matrices over  $I$ . In this section we shall combine two matrices over  $I$  to form matrix over  $\mathcal{S}$ .

**MATLAB function script 5.3.1**

```

% xlhat found in 5.1(a) and xrhat found in 5.1(c) are the inputs
% xhat is the output
function [xhat] = CombIMatrix(xlhat,xrhat)
    format('bank');

```



```

[m n]=size(xlhat);xhat=[xlhat; xrhat];
R=xhat';xhat=R;
disp('xhat=');
for i=1:size(R,1)
disp([' ' num2str( R(i,:)) , '']);
end
end

```

**Example 5.3.1(a)** To form  $\hat{x}$  with the help of  $\hat{x}_l$  and  $\hat{x}_r$ .

```

% xlhat found in 5.1(a) and xrhat found in 5.1(c) are inputs
% xhat is the output
>> [xhat]=ComblMatrix(xlhat,xrhat);
xhat=
[1 1][0.6 0.8][0.6 0.8][0.2 1]

```

**Example 5.3.1(b)** To form  $x_{_1}$  with the help of  $x_{l\_}$  and  $x_{r\_1}$

```

% xl_ and xr_1 are inputs
% x_1 is output
>> xl_=[0.20 0.60 0.00 0.00];
>> xr_1=[0.80 0.80 0.00 0.00];
>> [x_1]=ComblMatrix(xl_,xr_1);
x_1=
[0.2 0.8] [0.6 0.8] [0 0] [0 0]

```

**Example 5.3.1(c)** To form  $x_{_2}$  with the help of  $x_{l\_}$  and  $x_{r\_2}$ .

```

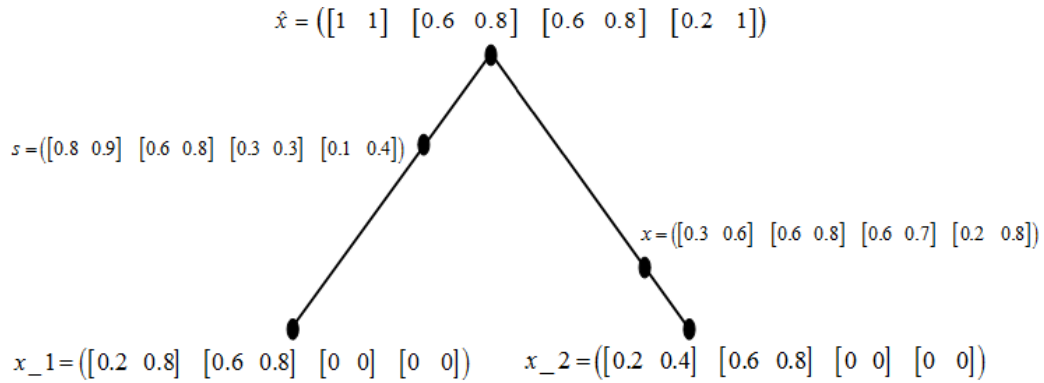
% xl_ and xr_2 are inputs
% x_2 is output
>> xl_=[0.20 0.60 0.00 0.00];
>> xr_2=[0.40 0.80 0.00 0.00];
>> [x_2]=ComblMatrix(xl_,xr_2);
x_2=
[0.2 0.4] [0.6 0.8] [0 0] [0 0]

```

**Remark:** In 5.2.1 we obtained one chain of left solutions and in 5.2.2 we obtained two chains of right solutions. After formation of intervals with left and right solutions we get a poset of interval valued solutions having one maximum member  $\hat{x}$  and two minimal members  $x_{_1}$  and  $x_{_2}$ , which have formed two chains.

## 6. Conclusion

At the beginning, it is assumed that the interval valued fuzzy relation equation  $x \circ A = b$ ,  $x$  and  $A$  are given (actually prepared by survey) and  $b$  is calculated. Next it is assumed that  $A$  and  $b$  are given, and  $x$  is to be calculated. One maximum solution  $\hat{x}$  and two minimal solutions  $x_{_1}$  and  $x_{_2}$  were found. It is theoretically proved and checked with examples that all the interval valued 4-vectors lying in the two chains are solutions of the interval valued fuzzy relation equation  $x \circ A = b$  (as shown in the following figure):



By comparing the corresponding intervals of the 4-vectors according to Definition 2.2, we observe that the interval valued 4-vector  $x$ , which was found by survey, also lie in the chain with  $x_2$  as minimum element and  $\hat{x}$  as maximum element.

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