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By Rownuk Jahan, Fahmida Zaman & Md. Sarwar Kamal
BGC Trust University, Bangladesh

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Future Impact Prediction of Women Empowerment in Ready Made Garment Industry under Computional Methodology

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I. Introduction

More than 83% of Bangladesh's export earnings achieved from the growing business sector of Bangladesh as garment industry. The ready-made garments (RMG) sector has a marvelous potential than any other business sector in terms of employment and foreign exchange collections to reduce poverty and make direct contribution to the national economy. For our country RMG is a main source of foreign exchange for the last 25 years. As a consequence of a robust market guaranteed by Multi-Fibre Agreement (MFA) under the agreement of Tariff and Trade (GATT) and supportive planes of the Government of Bangladesh (GoB), it is prioritized as high profile in the light of foreign exchange earnings, exports, industrialization and contribution to the GDP within a short period.

In recent years RMG industry helps to increases the Gross Domestic Product (GDP) by 4.39 %. RMG exports reached a handsome figure of USD 19.91 billion in fiscal year 2011-2012 and approximately 81% of national export earnings, which was about 4%-5% of the global total of such exports. In future it will helps to increases the contribution 10% to the country's GDP [1]. RMG products are exported mainly to the developed country like the USA, The UK and other developed countries in the world.

In the context of employment ratio, the RMG industry provides employment about 3.9 million workers in which 3.2 million are women [1]. Major part of the women workers are from rural areas and are illiterate. They do not have any knowledge of human rights, working conditions, environments and labour standards. Despite the marvelous success of the RMG sector, poor services to the workers are big problems to accomplish the normal life and livings. As a result, there is a rising fear in Bangladesh that the readymade garments sector may face a decline in demand.

II. Literature Review

Many researchers have worked on the RMG sectors and its impacts on national economy. From the beginning of this industry poor Bangladeshi women are playing vital role to the prosperity of this industry and national development. It is matter of great sorrow that the salary structure is very poor for them. In comparisons with developed country the Working conditions in the RMG sector in Bangladesh are below standard and do not meet the ILO standards.

Working environments in the RMG sector very often violate international labour standards, and Codes of Conduct [2, 3].

Recruitment systems are highly informal compared to international standards and there are no authentic contracts and appointment letters. As a result they are always in tensed for losing their jobs at any time. The tensions for losing jobs makes them devoted to work under unsatisfactory conditions as well as low salary [4]. According to the [5] Garments workers are devoted to work with excessive hours or double consecutive shifts, generally unhealthy work environment, poor working conditions, wage and gender discrimination. Besides, employers behave the RMG workers as slaves, exploiting workers to earn their profit more and more with greater margins and keep their industry competitive in the face of increasing international competition [5].

Authors α σ : Lecturer, Faculty of Business Administration, BGC Trust University Bangladesh. E-mails : rownukbgc@gmail.com, rafiquek54@yahoo.com

Author ρ : Lecturer, Computer Science and Engineering, BGC Trust University Bangladesh. E-mail : sarwar.saubdcoxbazar@gmail.com

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One true and pathetic matter is that, very tight work schedule, wage penalties, physical and verbal abuse are common. The very common and regular case is that women workers face physical abuse and sexual harassment inside as well as outside the factories, but management does not ensure the security of women workers. Alam [6] has mentioned and urged that regulator measures and its strict implementation and monitoring by the government agency that could overcome work place in security problem of garments workers in Bangladesh.

In the context of working places, work areas are often overcrowded with limited workspaces, causing occupational hazards such as musculoskeletal disorders and contagious diseases. The very regular problems in health and others sides are injuries, fatalities, disablement and death from fire and building collapses are frequent in the RMG sector [7]. One phenomenal example is that the Rana Plaza, Savar Bangladesh has had collapsed and caused huge damaged on the poor garments workers. According to the print media and press, around 1,127 poor workers have died and approximately 2,500 injured people were rescued from the building alive. The Savar tragedy is a symbol of our failure in garment sector safety. The crack in Rana Plaza that caused the collapse of the building has only shown us that if we don't face up to the cracks in our state systems, we as a nation will get lost in the debris of the collapse. The figure 1 below shows the symbol of working areas of Bangladeshi RMG industry. The absence of labour standards monitoring system and ineffective building codes, poor enforcement and Out dated labour laws, and a lack of awareness of labour rights among workers.

Figure 1 : The Rana Plaza collapsed due to the poor building codes and working area. Out dated labour laws, and a lack of awareness of labour rights among workers

Bangladesh is considered to have the child labour problem especially in the RMG sector. In most cases, children often commence work at a very young age; as a result, they are suffering serious injuries and sometimes death in the workplace [8].

Khan [9] advised] that Non Government Organizations (NGOs), civil society, trade unions and other stakeholders should work together to adopt the Code of Conduct (CoC) for a viable and competitive RMG industry. It is the duty for all governments, NGOs, international agencies, buyers and other stakeholder groups promote full compliance with mandatory requirements as specified in the law.

For the first time we have designed a methods that counts the future women empowerments impacts in Bangladesh. The literatures above we have studied that are only subjective measurements as well as survey based analysis. Here we have checked the data set by machine learning approach with clustering techniques. so we can easily measures the impacts of the desired outcomes. On the top of that we have predicts using Markov Chain and Baysian Network systems. This work

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is designed as section 3 contains data collections. Section 4 contains the methods that are proposed for this research activity. Section 5, 6 and 7 contains the techniques of the data classification and clustering. Sections 8 and 9 contain the predictions methods as BN and MC. Results and implementations is described in sections 10 and 11. Acknowledgement is added in next sections before conclusions which is placed as sections 14.

III. Data Collection

We have collected data set from various authorized research body of Bangladesh.

Bangladesh Academy of Science and Indian Academy of Science. Besides we have checked the data set from various sources that are very much authentic sources.

Table 1 : History of garments industry in Bangladesh

Year	No. of Factory	Compound Growth Rate in %
1971	5	-
1977	7	5.77
1981	78	82.70
1983	141	34.45
1984-85	384	65.03
1989-90	759	14.60
1994-95	2182	23.52
1999-2000	3200	7.95
2004-05	4107	5.12
2005-2012	12000	6.77

In the British period there was no garment industry in this part of the Indo-Pak-Sub-Continent. In 1960 the first garment industry in Bangladesh (Then East Pakistan) was established at Dhaka and till 1971 the number rose to give. But these garments were of different type intended to serve home market only. Table 1 above is a brief description of the garments industry development.

In the context of contribution RMG industries have a unique position in the Bangladesh economy. RMG industry is the largest exporting industry in Bangladesh, which achieved phenomenal growth during last two decades. The industry plays an important role in employment generation and in the provision of income to the poor. It also helps in the socio-economic development of the country. The figure below shows the GDP has been examined the following table shows the position.

Table 2 : Growth and trend of garments exports, and contribution to GDP

Year	Garments Exports (Min USD)	Total Exports (Min USD)	Share export	Share to GDP
1984-85	116-	934-	12.42-	-
1989-90	624(40)	1924(16)	32.43(21)	-
1944-95	2228(29)	3473(13)	64.15(15)	5.87
1999-00	4349(14)	5752(11)	75.61(3)	9.23
2004-05	6418(8)	8655(9)	74.15(-1)	10.63(9)
2005-06	7901(23)	10526(22)	75.06(1)	12.64(2)
2006-12	19563(56)	54321(67)	105.05(33)	17.9(3)

Besides this, we have also collected the data set regarding the positions of the positions of Bangladesh. Here we have noticed that Bangladesh has a very good conditions comparing with other countries. However, in the subject of Least Developed Countries (LDCs), such as India, Srilanka, Bangladesh, Cambodia and Haiti, faired very well throughout the year 2005 to till date. In this purpose, a process has been made to check the export data of selected countries during MFA and post MFA to US and EU markets in order to measures the indicative influences of post MFA scenario in Bangladesh as well as other largest garments exporters.

IV. Methodology

Here we have proposed the model as both the combination of statistical and computational process to fulfill the task. The flow chart below shows the details of the research activity of the methodology. We first visits various garments industry in Chittagong regions and collect the opinions from the workers as well as the employers. The workers opined that the situations still now is very difficult for them to work and continued to work. Besides, the employers have different expressions regarding the matter on the environments. We have finished by taking data set on behalf of the research activity. We significantly noticed that, the women workers are very much devoted to their regular work and very much sincere. Though they receive very low wages for their constant hard working and seriousness, they are very responsible for their duties. If the working environments become friendly as well as healthy, the workers will performs better and the outcomes will be more than the current outcomes. We have shown the result of the impact in the result section of this works. This is the key findings of this work.

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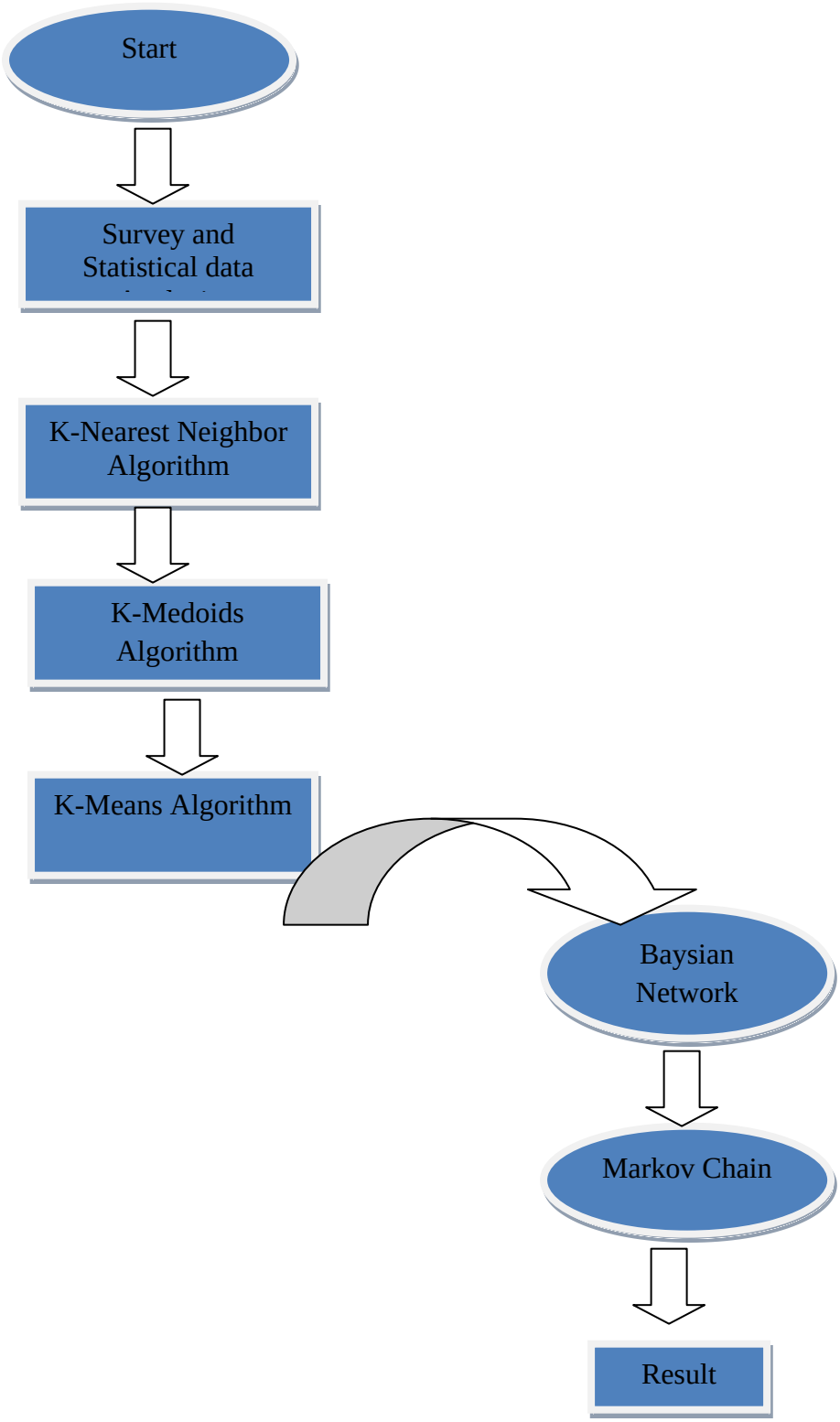

Figure 2 : The overall Methodology

V. K-Nearest Neighbors

The total algorithmic steps are as follows:

1. Parameter selections (int m, int n).

m=0, n=1, 2, 3…….n.

2. Distance calculation

where

$$\sqrt{\sum (q-p_i)^2}$$

i=0,1,2,3……..,n

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3. Short the distances of sample space and marked the closet neighbors in the context of K-th smallest distance.
SHORT NEIGHBORS ($\boldsymbol{S}$, $\boldsymbol{C}$)

Input instances $\boldsymbol{S}$ with $\boldsymbol{n}$ *sample objects* , comparator $\boldsymbol{C}$

Output instances $\boldsymbol{S}$ sorted according to $\boldsymbol{C}$

$$\textbf{if } \boldsymbol{S.length}() > 1$$

Then $(\boldsymbol{S}_1, \boldsymbol{S}_2) \leftarrow \boldsymbol{divide}(\boldsymbol{S}, \boldsymbol{n}/2)$

SHORT NEIGHBORS ($\boldsymbol{S}_1$, $\boldsymbol{C}$)
SHORT NEIGHBORS ($\boldsymbol{S}_2$, $\boldsymbol{C}$)

S← SHORT NEIGHBORS ($\boldsymbol{S}_1$, $\boldsymbol{S}_2$)

4. Similarities assumption : Instances that are close together should have similar values
Minimize

$$\xi(f) = \sum w_{ij}(f_i - f_j)^2$$

Where w_{ij} is the similarity between examples i and j. And f_i and f_j are the predictions for example i and j.

5. Predict the value as follows:

Standard KNN

$$\hat{y} = \arg\max_y C(y, Neighbors(x))$$
$$C(y, D') \equiv |\{(x', y') \in D' : y' = y\}|$$

Distance-weighted KNN

$$\hat{y} = \arg\max_y C(y, Neighbors(x))$$
$$C(y, D') \equiv \sum_{\{(x', y') \in D' : y' = y\}} (SIM(x, x'))$$
$$SIM(x, x') \equiv 1 - \Delta(x, x')$$

6. Find out the best heuristics distance

$$f(n) = g(n) + h(n)$$

Where:

- g(n) is the cost of the best path found so far to n
- h(n) is an admissible heuristic

f(n) is the estimated cost of cheapest solution through.

VI. The K-Medoids Clustering Method

a) Determine k data set arbitrarily

b) For each pair of nonidentified data set h and determined data set i, calculate the total swapping cost TC_{ih}

c) For each pair of i and h,

i. If $TC_{ih} < 0$, i is changed by h

ii. Then assign each non-determined data set to the most similar data set.

repeat steps 2-3 until there is no change.

VII. The K-Means Clustering

Given m the ***m-Means*** algorithm is implemented in 4 steps:

i. Partition objects into m nonempty subsets
ii. Calculate pivotal points as the centroids of the clusters of the new orientation. The
iii. Partitioned each object to the cluster with the nearest pivotal point.
iv. Go back to Step 2, stop when no more new assignment.

VIII. Bayes 'Theorem

Bayes' theorem and conditional probability are opposite to each other. Given two dependent events A and B. The conditional probability of P (A and B) or P (B/A) will be P (A and B)/P (A). Related to this formula a rule is developed by the English Presbyterian minister Thomas Bayes (1702- 61).According to the Bayes rule it is possible to determine the various probabilities of the first event given the outcome of the second event in a sequence of two events.

The conditional probability:

$$P(B/A) = \frac{P(AandB)}{P(A)} \quad (1)$$

The equation (1) will help to find out the probabilities of B after being occurrences of the A. we get the Bayes' theorem for these two events as follows:

$$P(A/B) = \frac{P(A).P(B/A)}{P(B)} \quad (2)$$

If there are more events like A1, A2, and B1, B2.In this case the Bayes theorem to determine the probability of A1 based on B1will be as follows:

$$P(A1/B1) = \frac{P(A1).P(B1/A1)}{P(A1).P(B1/A1) + P(A2).P(B2/A2)}$$

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IX. Markov Chain for Mismatch Selection

The formula for a stochastic process with random variable X is X={ X_t , t∈ T }. Where t= index and it indicate the time. X_t = State of the process .T= Index set constitute by time t.

Suppose n=0, 1, 2, 3….. And m=1, 2, 3…and i_0 ……. i_m ∈E. E= All Possible values that the random variable X_t can assumes. Then

$$\Pr\{X_{n+1} = i_1, \ldots, X_{n+m} = i_m \mid X_n = i_0\} = \Pr_{i_0 i_1} \cdot \Pr_{i_1 i_2} \cdot \ldots \cdot \Pr_{i_{m-1} i_m}.$$

X. Implementation

Here we have predicted the outcomes of the Women empowerment under various circumstances. According to the algorithms of K-Means and K-Medoids Clustering, we have noticed that K-Medoids perform very well and finally the BN and MC the classifications results. We define a threshold value of standard behavior after talking with the key persons of the Garments like Managers, General Mangers and owner of the RMG factories. Based on their opinion we then check this parameter with the K-Medoids Algorithm threshold value. Then we finalized the value is θ=0.24. The flow chart of the process is given below:

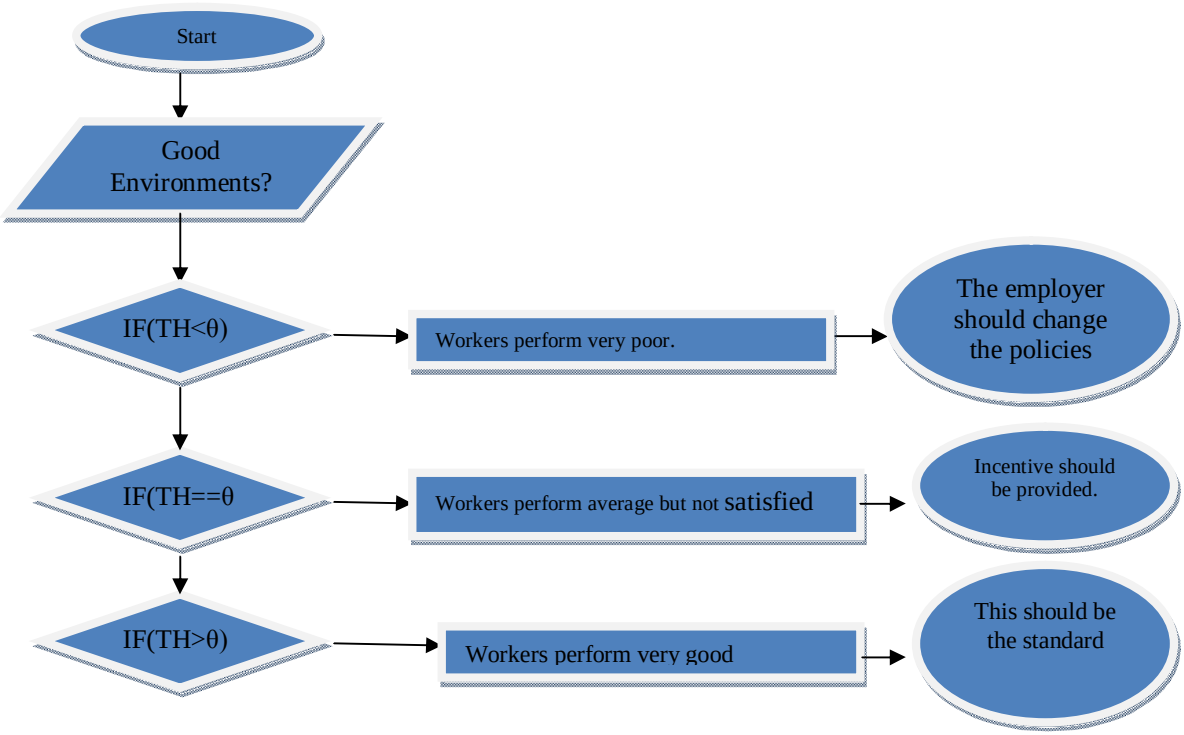

Figure 3 : The suggestion for RMG garments Workers

XI. Result

We have clearly noticed that and talked with the real experts who are responsible for the developments for the garments industry. Consequently, our simulative systems, generates the results that are very much desired to the actual outcomes of the real experts. It will be very much helpful for the policymakers and governmental body to decide regarding the suggestions of our outcomes. We have checked our finding with the Megna Garments as well as KDS garments industry. we have noticed that our system have had results better predictions than the actual or manual calculations.

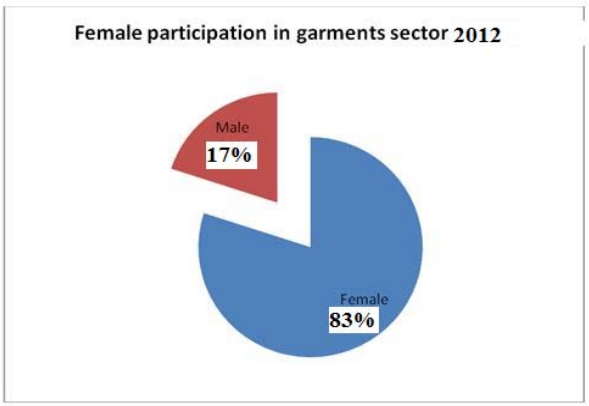

Figure 4 : The predicted result of the women empowerment in Bangladesh

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XII. Conclusions

We have noticed our system will perform the predictions according to the reality of the Bangladesh. If we want better outcomes in RMG industry we should make proper working environments for the women workers. Here we significantly noticed that women are very much satisfied if they get very little incentives. We have considered that if they get allowance for a meal during working hours at day time they have opined that they will perform more sincerely than the anticipated. The method K-Medoids performs better clustering during the data set is large. Markov chain is best while the data set is large. On the other hand Baysian Network is very good for low data set. Here we only talked two garments industry. Mr. Jamsad Alam, An Employee KDS garments industry of Chittagong helps us to examined the resultant of our system. in future we will checked for all data set based on Dhaka and Khulna.

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