

# DHĀRANA

Vol.11, #2  
(July - December 2017)  
ISSN 0974-0082

INTERNATIONAL JOURNAL OF BUSINESS FROM BHARATIYA VIDYA BHAVAN'S  
M. P. BIRLA INSTITUTE OF MANAGEMENT, BENGALURU

05-12 A Cuboid Model for Coverage Processes

T.V. Srinivas, T. Srivenkataramana,  
T.V. Raju, N.S. Viswanath

13-20 Issues in Negative Association Rule Mining with  
Business Analytics Perspectives

Rupal Sethi & B. Shekar

21-25 BREXIT: Talent Challenges for Recruitment and Retention

C.G. Sumithra

26-31 Glimpses of Brexit and Forthcoming Eventualities

Rohini G. Shetty

## Synopsis : Ph.D. Thesis

32-41 The Disinvestment Programme in India -  
Impact on Efficiency and Performance of Disinvested  
Government Controlled Enterprises (1991 - 2010)

Anjana Mani

42-56 The Application of Total Quality Management  
(TQM in Not for Profit Organizations (NPOs) – with Special  
Reference to The Akshaya Patra Foundation in India

S.R. Sandhya Rani

## Book Review

57 CAREER RULES

N.S. Viswanath

M P BIRLA INSTITUTE OF MANAGEMENT, BENGALURU

आ नो भद्रा : क्रतवो यन्तु विश्वत : ।  
“Let Noble Thoughts Come To Us From Every Side”  
- Rig Veda 1-89-1

## IN PURSUIT OF EXCELLENCE



Dr. K.M. Munshi, a man of letters and a veteran freedom fighter, started the Bharatiya Vidya Bhavan with the objective of spreading Indian Art, Culture and Education in 1938, with the blessings of Mahatma Gandhi. Bhavan publishes invaluable literature that deals with our heritage. It also runs educational institutions not only to teach General Science and Humanities, but also to impart specialised education in management, art, music, dance, drama, Veda and Sanskrit.

In the last seven decades, Bhavan has grown from strength to strength. The founder's avowed thinking was to make Bhavan a unique organization that serves the cause of Indian Art, Culture and Education. Today Bhavan serves through 122 Kendras in India and 8 Kendras abroad. It administers 395 educational institutions that have over 200,000 students, and has also published 2000 titles.



**DHARANA** a bi-annual journal, published in January and July, every year, by M. P. Birla Institute of Management, # 43, Race Course Road Bengaluru 560 001, India  
Phones: +91-80-2238 2798, 4277 2000  
E-mail: [nsv@mpbim.com](mailto:nsv@mpbim.com)

### Disclaimer

Views expressed in the articles are those of the author(s) only. All articles in this journal have undergone a blind review process.

### Submissions

Prospective authors should follow the guidelines provided at the end of this issue while preparing the manuscripts.

### Copyright

Contents of this journal are the copyright of M. P. Birla Institute of Management, Bengaluru, whose permission is necessary for reproduction in any form, in whole or in part.

# DHĀRANA

**INTERNATIONAL JOURNAL OF BUSINESS FROM BHARATIYA VIDYA BHAVAN'S  
M. P. BIRLA INSTITUTE OF MANAGEMENT, BENGALURU**

Vol.11, #2 (2017) ISSN 0974-0082

## **Patron**

**N. Ramanuja**

Chairman - Bharatiya Vidya Bhavan, Bengaluru Kendra

email: [itsramanuja@yahoo.com](mailto:itsramanuja@yahoo.com)

## **Editor-in-Chief**

**N.S. Viswanath**

Director & Principal

Bharatiya Vidya Bhavan's

M. P. Birla Institute of Management

Bengaluru

[nsv@mpbim.com](mailto:nsv@mpbim.com)

## **Joint Editor-in-Chief**

**B. Shekar**

Professor of Decision Sciences &

Information Systems Area

Indian Institute of Management

Bengaluru

[shek@iimb.ernet.in](mailto:shek@iimb.ernet.in)

## **Editors**

**K.L. Ramadas**

Professor of Marketing

Bharatiya Vidya Bhavan's

M. P. Birla Institute of Management

Bengaluru

[profklr@gmail.com](mailto:profklr@gmail.com)

**B.V. Pushpa**

Asst. Professor

Bharatiya Vidya Bhavan's

M. P. Birla Institute of Management

Bengaluru

[pushpabv75@gmail.com](mailto:pushpabv75@gmail.com)

## **Assistance**

## **Subscription:**

**Praveena V. Savadi**

Designed by CanvasX, Bengaluru • Printed by Sadguru Screens, Bengaluru

## **Editorial Board**

### **Ashok Gupta**

Professor of Marketing  
Ohio University, Athens, Ohio, USA  
professororgupta@yahoo.com

### **Bhashyam A.T.**

Director Academics  
B. P. Birla Institute of Management, Mysuru  
atbhashyam@yahoo.com

### **Bisaliah S.**

(Former Vice-Chancellor,  
University of Agricultural Sciences, Bengaluru)  
Professor Emeritus of Economics  
Bharatiya Vidya Bhavan's  
M. P. Birla Institute of Management, Bengaluru  
sbisaliah@yahoo.com

### **Chandra Akkihal**

Professor Emeritus of Economics  
Marshall University, Huntington, USA  
akkihal1@yahoo.com

### **Dinesh Kumar U.**

Professor of Quantitative Methods & Information Systems  
Indian Institute of Management Bengaluru, Bengaluru  
dineshk@iimb.ernet.in

### **Jishnu Hazra**

Professor of Production & Operations Management  
Indian Institute of Management Bengaluru, Bengaluru  
hazra@iimb.ernet.in

### **Lingaraj B.P.**

Professor Emeritus  
Department of Management & Marketing  
Indiana University-Purdue University Fort Wayne, Indiana, USA  
babilin@gmail.com

### **Manjulika Koshal**

Professor of Production & Operations Management  
Ohio University, Athens, Ohio, USA  
koshal@ohio.edu

### **Narahari Y.**

Professor  
Department of Computer Science & Automation  
Indian Institute of Science, Bengaluru  
hari@csa.iisc.ernet.in

### **Narappanavar S.R.**

Professor Emeritus of Economics  
Karnatak University, Dharwad  
shrinish\_r\_n@yahoo.co.in

### **Prabhakar K.V.**

(Former Vice-Chancellor, Gulbarga University, Gulbarga)  
Professor of Marketing  
Bharatiya Vidya Bhavan's  
M. P. Birla Institute of Management, Bengaluru  
prabhakar\_sarojini@rediffmail.com

### **Rajindar Koshal**

Professor Emeritus of Economics  
Ohio University, Athens, Ohio, USA  
koshalrk@yahoo.com

### **Ramesh Kumar S.**

Professor of Marketing  
Indian Institute of Management Bengaluru, Bengaluru  
rkumar@iimb.ernet.in

### **Renukanya C.K.**

Professor of Economics  
Mahajan Post Graduate Centre  
University of Mysore, Mysuru  
ckrenukanya@hotmail.com

### **Srivenkataramana T.**

Director, Brindavan College, Bengaluru  
Professor Emeritus of Statistics  
Bangalore University, Bengaluru  
madhavi.tv@accenture.com

### **Subhash Sharma**

Dean, Indus Business Academy,  
Bengaluru & Greater Noida  
re\_see@rediffmail.com

### **Uday Tate**

Professor of Marketing  
Marshall University, Huntington, USA  
tateu@marshall.edu

## EDITORIAL

The present edition has two distinct research papers, one of them aiming at developing a cuboid model for making an assessment of total quality in health care area. This paper examines the issue of quality from a three dimensional perspective. It enables an administrator to evaluate a health care programme. Another paper is on negative association between attributes which will have implication on buying decisions. The paper examines the issue of choice from aggregate data perspective aimed at analysis of business issues.

Two papers are on Brexit and its fallout. The first paper examines challenges of identifying, recruiting and retaining talents in the Brexit world. Another paper is on possible eventualities of Brexit nations after the referendum in UK.

There are two synopses of Ph.D. theses. The first one is on efficiency and performance of disinvestment in public enterprises in India between 1999-2010. The second synopsis is on the ramifications of TQM for a Not for Profit Organization (NPO).

All these documented papers will provide insights into various aspects of the economy, business in particular. The readers would find reading of every paper extend horizon of knowledge boundaries.

*Editor-in-Chief*



# A Cuboid Model for Coverage Processes

T.V. Srinivas<sup>1</sup>, T. Srivenkataramana<sup>2</sup>, T.V. Raju<sup>3</sup>, N.S. Viswanath<sup>4</sup>

---

## Abstract

This paper introduces the concept of a coverage process. It proposes and analyses a cuboid model for coverage processes seeking multi-dimensional expansion. The WHO view of Universal Healthcare is used as a seed to first develop a cube model. The conditions for optimum coverage are derived. The model is then generalized into a cuboid and some of its mathematical properties are investigated. The model has applications in areas like universal insurance, multiple financial inclusion campaign, immunization drives and service quality. This model is forerunner for intrinsic link between organization's objectives with that of service quality delivery for effective relationship between clients & the organization.

**Key words and Phrases:** Coverage rate; Cuboid model; Geometric mean; Impact factor; Linear, Geometric and Continuous changes; service quality, Total Service Quality (TSQ) & Universal healthcare.

---

## 1. Introduction

The performance and outreach of growth processes are to be evaluated from time to time. This is true of field of education, economic development, public healthcare, insurance and so on. Several parameters jointly determine the coverage of the targeted population by these programs. The improvements in these measurement parameters are attempted simultaneously through awareness programs and policy directions. We propose a geometric model for this situation and analyze it mathematically, deriving several interesting

properties, which have policy implications. The rest of the paper is organized as follows. Section 2 introduces the concept of coverage and proposes a geometric cube model, along with examining its properties. Sections 3 and 4 discuss area of application and a generalization to k dimensions. The final section offers a discussion.

## 2. Concept of coverage

Growth studies often consider coverage of a target population from several standpoints. The progress on each of these fronts is measured in terms of a coverage parameter. Some examples are in the following table.

---

1. Research Scholar of Manipal University 2. Professor Emeritus in Statistics & Former Director, Canara Bank School of Management, Erstwhile Bangalore University 3. Director R.V. Institute of Management, Bengaluru 4. Director & Principal, M.P. Birla Institute of Management, respectively.

**Table 1:** Programs and Parameters

Sl. No.	Base	Parameters	Program
1	Child Health	Proportion of children covered	Immunization
2	Primary Education	Proportions of enrollment, dropout	Universal child education
3	Human Development	Per capita income, Longevity of life, Literacy rate and Quality of life	Programs related income generation, healthcare and Universal education
4	Public Healthcare	Proportions of population, costs and covered ailments	Public sector and PPP healthcare models
5	Maternity Health	Proportion of women covered in child-bearing group, maternity and infant mortality rates	Maternal healthcare packages and related schemes
6	Nutrition for School Children	Proportion of school children covered, Quality and Nutrition value of food	Mid-day meal schemes

In each of the above situations, it is convenient to visualize that a geometric figure is created, which is desired to be *covered optimally*. Thus, with a single parameter there will be a *line segment* and optimization implies a push in just one direction. With two parameters, a rectangle will be created in two dimensions, with the parameters as occupants of the axes. The optimum *coverage* occurs when the *area* of the rectangle is *maximized*, for a given perimeter. This occurs when the rectangle turns into a *square*, calling for equal paced push in both the directions. In the three parameter case, a cube is formed, with the parameters along the three directions. We analyze this case mathematically at some length now. Then consider the *Yeshasvini Health Scheme* of the Karnataka Government, which is a PPP model of health cost coverage for selected ailments and for specified types of expenses for enrolled members of co-operative societies. The scheme can be easily fitted into the framework developed, with the following three parameters viz. Proportion of

1. population covered (p1)
2. medical expenses covered (p2)
3. health package covered (p3)

The first parameter is to be improved through awareness drives/ campaigns, while the other two are fallouts of policy decisions.

Working with proportions has a specific in-built

advantage that they lie in the interval  $[0, 1]$ , and hence finally create a geometric figure with each side of length unity. As a result, the figure has length/ area/ volume of magnitude one unit.

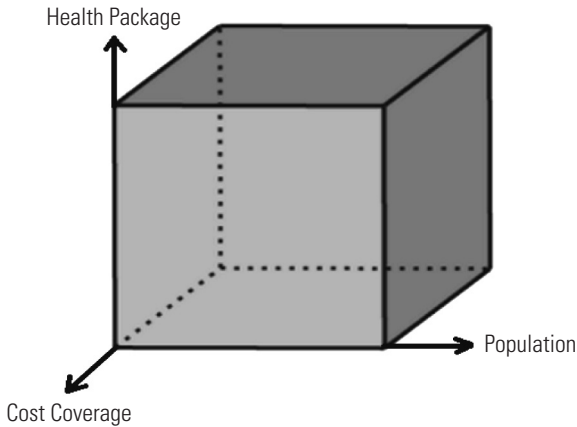
We propose a cube model for three-factor coverage situation of Yeshsvini scheme, starting with the definition of Universal Health Coverage of the WHO, as the seed.

### **2.1 Universal Health Coverage: WHO view**

The WHO describes Universal Health Coverage (UHC), aimed to be achieved by the year 2030, as a state where *the health needs of all the citizens are met without any of them experiencing financial hardship*. It displays UHC as a cube with three dimensions – population coverage, service coverage (health package, availability) and cost coverage. It is hoped that this cube is filled up step by step in a phased manner through commitment, consensus and participatory leadership. Each of the three axes must show progressive increments by overcoming electoral populism, personal preferences of medical personnel and hindered flow of public finance. The costs may be covered *via* tax-funding or social insurance. Relevant factors must be integrated into the package design. The healthcare divide must be bridged. The next phase of Indian Economic Revolution (started in 1991) is expected to occur from the services sector (and not manufacturing), which includes health services.



## 2.2 The UHC cube for Yeshasvini scheme



**Figure 1:** Cube Model for Yeshasvini Scheme

Consider this as a hollow standardized unit cube, that is the maximum in each of the three dimensions (population, health package and cost coverage) is *unity*. As the rates move along the axes, the hollow of the cube gets filled up. Denote the currently reached proportions by  $(p_1, p_2, p_3)$ , so that the filled up volume is

$$V_3 = p_1 p_2 p_3$$

... (1)

This is a good indicator (*impact factor*) of the level (proportion) of health coverage accomplished in the target population, the maximum being clearly unity. This occurs when  $p_1 = p_2 = p_3 = 1$ .  $V_{max}$  has 1 as its value. In general, the volume gets maximized, for given  $\sum p_i = q$ , when  $p_1 = p_2 = p_3 = q/3$ . This represents equal values for the three proportions. This is also the point where the geometric mean of the  $p_i$  equals the arithmetic and harmonic means. The above result also shows the importance of balanced progresses in each of the three aspects. Alternatively, even if one of the progress directions is *unsatisfactory*, the entire coverage picture becomes murky.

Moving on with this scenario, the correct *average* progress is NOT the arithmetic mean

$$A_3 = (p_1 + p_2 + p_3) / 3$$

... (2)

but rather the geometric mean

$$G_3 = (p_1 p_2 p_3)^{1/3}$$

... (3)

which is nearly zero when *any one* of the proportions is near zero. For instance with 10%, 20% and 40% coverage in the three directions the overall coverage is 20%. But if the 10% coverage is reduced to just 1%, the coverage percentage is now  $100 (0.0008)^{1/3}$  or less than 10%. A coverage of even 40% in one of the directions is hardly able to lift up the overall coverage percentage. Thus what matters most for *optimum* effectiveness is an *equitable coverage* in the three directions. For instance, a 10% coverage in each of the three fronts results in an overall coverage also of 10%, which is better than the percentage triplet (1, 20, 40). This shows the collective role of the three realized directional proportions. The rate  $G_3$  represents the rate at which the cube gets occupied.

For *continuously varying proportions*, the rates of change in the occupied portion of the cube are given by the *partial derivatives* of  $V_3$  with respect to the parameters  $p_1, p_2$  and  $p_3$ . These are respectively given by  $p_2 p_3, p_1 p_3$  and  $p_1 p_2$ . The overall penetration of the program can be measured in terms of the filled up content of the cube *viz.*  $V_3$ , which may be therefore termed as *Total Impact Factor* (TIF). This is maximized, as already mentioned, when the parameters progress at equal pace. Eventually, the hollow cube gets filled up to signal 100% coverage by The Scheme. A generalization of the cube model to  $k$ -dimensions will be considered in section 4.

### Budget allocation for optimum coverage

The filled up volume of the cube is  $V_3 = p_1 p_2 p_3$  which is maximized, for given  $p_1 + p_2 + p_3 = C$ , ( $0 \leq C \leq 3$ ) when  $p_1 = p_2 = p_3 (= C/3)$ . This is geometrically akin to a rectangle of given perimeter reducing to a square when the area of the figure is to be maximized. This calls for equal paced increases in the  $p_i$  for optimum coverage, as mentioned earlier.

Let us now consider the situation with a fixed and given budget  $C_0$  which is to be optimally allocated to the three components in order to maximize the resulting coverage. Let  $X_i$  denote the allocation to dimension  $i$  for  $i = 1, 2, 3$ . Then the constraint is

$$X_1 + X_2 + X_3 = C_0$$

... (4)

and the objective is to work out the allocation in order to achieve optimal coverage.

The coverage, measured by  $p_i$  in direction  $i$ , clearly depends on the allocation  $X_i$ . Thus

$$p_i = f(X_i) \quad \dots (5)$$

which represents the functional form of dependence. We examine two particular choices for  $f(X_i)$ .

(a) Proportionality with  $X_i$  or  $p_i = K_i X_i$

Then

$$V_3 = p_1 p_2 p_3 = (K_1 X_1) (K_2 X_2) (K_3 X_3) \quad \dots (6)$$

where the  $K_i$  are the constants of proportionality. In order to have optimal coverage, we now have the condition

$$(K_1 X_1) = (K_2 X_2) = (K_3 X_3) \quad \dots (7)$$

subject to the constraint (4).

Substituting for  $X_2$  and  $X_3$  in (4) in terms of  $X_1$  from (7) leads to

$$\begin{aligned} X_1 + (K_1/K_2) X_1 + (K_1/K_3) X_1 &= C_0 \\ \text{or } X_1 [1 + (K_1/K_2) + (K_1/K_3)] &= C_0 \\ \text{or } X_{1\text{opt}} &= [(K_2 K_3) / (K_1 K_2 + K_1 K_3 + K_2 K_3)] C_0 \end{aligned} \quad \dots (8)$$

It may be noted that the constants of proportionality ( $K_i$ ) can be different for the three directions. This allows flexible relations between improvement and cost implication.

The expressions for optimum  $X_2$  and  $X_3$  are similarly written down. It is easily verified that the budget constraint (4) is satisfied. Also for  $K_1 = K_2 = K_3 = 1$ , we get equal allocation of the budget.

(b) Proportionality with  $\sqrt{X_i}$

The improvement is often much slower than the increase in the budget provision. Thus we may take

$$p_i = f(X_i) = K_i X_i^p \text{ for } i = 1, 2, 3 \quad \dots (9)$$

Though any  $p > 0$  may be considered, a choice of  $p$  as a fraction is quite realistic. A good choice is, therefore,

$p = 1/2$ , so that the coverage improvement is taken to be proportional to square root of the allocation, and

$$p_i = K_i \sqrt{X_i} \quad \dots (10)$$

Model (10) incorporates a damping effect on the improvement. For example, in order to double the coverage rate one has to raise the budget allocation four-fold.

For optimal growth now we have the condition

$$K_1 \sqrt{X_1} = K_2 \sqrt{X_2} = K_3 \sqrt{X_3} \quad \dots (11)$$

subject to the constraint (4).

A straight forward recasting leads to

$$X_{1\text{opt}} = [(K_2^2 K_3^2) / (K_1^2 K_2^2 + K_1^2 K_3^2 + K_2^2 K_3^2)] C_0 \quad \dots (12)$$

The expressions for  $X_2$  and  $X_3$  are similarly written, noting the cyclic pattern.

## Remarks

(1) In practice the constants  $K_i$  are to be assessed or estimated empirically.

(2) In the model (5) for  $p_i$  no provision for an intercept (constant) term is made since  $p_i = 0$  for  $X_i = 0$  or without a budget provision there is no growth!

(3) Other choices for  $p$ , including different values of  $p$  for the different directions can also be made. The budget allocations may be worked out algebraically in such cases. Here we get the optimal condition as

$$K_1 X_1^p = K_2 X_2^q = K_3 X_3^r, \text{ subject to the constraint } X_1 + X_2 + X_3 = C_0$$

However this entails the need for assessing three constants of proportionality and an equal number of indices  $p, q$  and  $r$ .

(4) The square root cost function is especially convenient since it bypasses assessing the indices  $p, q$  etc. and at the same time allows coverage to be adequately slower than the budget enhancement. In fact, such a function is known to be robust as a cost model.

(5) Typically the  $K_i$  are quite small as  $p_i$  are just

proportions. Also the  $X_i$  may be expressed in larger monetary units like crores of rupees.

### 3. Areas of applications

These typically include situations where 'coverage' is dependent upon or measured in terms of several factors like the proportion of

1. target population reached
2. geographical area covered
3. facilities provided from a master-list
4. claims/ court cases cleared within a stipulated time etc.

Such examples are plenty in the problems in universal education programs, insurance schemes, healthcare facilities, mass drives of cleanliness, immunization, literacy and so on. It may be noted that India has launched a Universal Health Care project in the year 2010, with the aim of providing affordable, easily accessible healthcare *for all its citizens*, which has three clear dimensions. The model facilitates for making assessment of Total Service Quality in an organizational setting. The vision, mission, objectives of an organization can be organically linked to its performance in terms of meeting expectations of clients (consumers) of the organization. There is, however, need for a generalized setting of the model to expand its use in measuring organizational performance.

### 4. A generalization: Cuboid model

This concept of measuring net resultant effectiveness can be generalized to any multi-parameter program (for instance the Yeshasvini scheme) in a straight forward manner. With  $k$  measuring parameters, we can conceptualize the achieved coverage as a *subset* of a  $k$ -dimensional *cuboid*. Again the scenario of optimum penetration will call for equal progress rate in each of the directions. This is a position where the three mean rates (arithmetic, geometric and harmonic) coincide. This geometric argument establishes the following result:

***In a coverage model with  $k$  rate parameters  $p_1, p_2, p_3 \dots p_k$ , the optimum (maximum) coverage level is attained, for a given  $\sum p_i$ , when the parameters move at equal pace.***

The content of the above cuboid is given by the product

$$V_k = (p_1 p_2 p_3 \dots p_k) \dots (13)$$

In general, average coverage rate will be the geometric mean of the component rates given by

$$G_k = (\prod_{i=1}^k p_i)^{1/k} \dots (14)$$

where the  $p_i$  are the coverage parameters (rates). This is the rate at which the *cuboid* gets filled up. Ultimate goal is to reach the roof of the cuboid, that is fill it up to the brim, when the hollow cuboid would have become solid. The average rate  $G_k$  is, as to be expected, sensitive to smallness of the  $p_i$ . As a property of geometric means, when each component rate increases uniformly by a factor of  $r$ ,  $G_k$  also goes up by this factor.

The cuboid model is apt for coverage processes over a span of time.

#### 4.1 A new service quality model

The cuboid model can be envisioned to provide an abstract framework for tracing the coverage of *service quality*. In the health sector setup, the dimensions could be empathy for the patient, warmth of doctor-patient relation, adherence to ethical practices, nursing skill and so on. This will pave way for a multiplicative effect of the factors, a consequence of which is the suitability of a geometric average as a summary. Sensitivity to low values of factors is an disadvantage with this measure. However the applicability of this model has to be supported by empirical evidence, unlike in the case of measurable physical coverage rates. This provides a promising opening for further work.

#### 4.2 Effect of change in parameters

It is of interest to examine the effect of parameter variations on the content  $V_k$  of the cuboid. Let us consider three types of change - *incremental*, *geometric* and *continuous*, separately.

##### a) Linear change

Assume that there is an incremental change  $d_i$  in  $p_i$ , so that  $p_i$  is to be replaced by  $(p_i + d_i)$ , other parameters

remaining unchanged. Then the consequent change in the cuboid content given by

$$C_{k1} = (V_{k1} - V_k) / k$$

$$= [(p_1 + d_1) \prod_{i=2}^k p_i] - [\prod_{i=1}^k p_i]$$

$$= d_1 \prod_{i=2}^k p_i$$

... (15)

This is simply the product of  $d_i$ , the incremental change in  $p_i$ , and the other rates. Also the change relative to  $V_k$  is

$$RC_k = \text{Change in content} / \text{Initial content}$$

$$= C_{k1} / V_k$$

$$= d_1 / p_1$$

... (16)

The new geometric mean becomes

$$G_{k1} = (p_1 + d_1)^{1/k} (\prod_{i=2}^k p_i)^{1/k}$$

$$= (1 + d_1 / p_1)^{1/k} G_k$$

and relative to  $G_k$  it is

... (17)

The generic expressions are obtained by replacing 1 with  $i$  in the above results.

Similarly, when two parameters  $p_1$  and  $p_2$  get incremental changes of  $d_1$  and  $d_2$  respectively, the content will change by

$$C_{k2} = (p_2 + d_2 + p_1 + d_1) \prod_{i=3}^k p_i$$

$$= d_2 \prod_{i=3}^k p_i + d_1 \prod_{i=3}^k p_i + p_1 p_2 \prod_{i=3}^k p_i$$

... (18)

so that the change relative to  $V_k$  is now

$$RC_{k2} = C_{k2} / V_k$$

$$= [(p_2 + d_2 + p_1 + d_1) \prod_{i=3}^k p_i] / (p_1 p_2 \prod_{i=3}^k p_i)$$

$$= (d_2 / p_2) + (d_1 / p_1) + (1 + d_1 / p_1 + d_2 / p_2)$$

... (19)

Likewise, the new geometric mean relative to  $G_k$  is

$$RG_{k2} = G_{k2} / G_k$$

$$= [(1 + (d_1 / p_1) + (d_2 / p_2) + (d_1 d_2 / p_1 p_2))]^{1/k}$$

... (20)

The generalization of (19) involves higher order terms in the  $d_i$  while (20) can be generalized in the obvious manner.

## b) Multiplicative change

In this case evaluating the expressions for the change in cuboid content etc. is straight forward since  $V_k$  itself has a multiplicative structure. Thus when  $p_i$  changes to  $r_i p_i$ , the change in  $V_k$  is

$$C_k^* = r_i V_k - V_k$$

$$= (r_i - 1) V_k$$

... (21)

The change relative to  $V_k$  is  $(r_i - 1)$ .

When multiplicative changes occur in both  $p_i$  and  $p_j$ , the change in  $V_k$  works out to be

$$C_k^{**} = (r_i r_j - 1) V_k$$

... (22)

and the factor of change is  $(r_i r_j - 1)$ , and so on. Thus a simultaneous multiplicative change in all the parameters will lead to the content change of

$$(r_1 r_2 \dots r_k - 1) V_k$$

... (23)

relative change factor being  $(r_1 r_2 \dots r_k - 1)$ . Also the changed geometric average is

$$G_{kk} = (\prod_{i=1}^k r_i)^{1/k} G_k$$

... (24)

so that the change relative to  $G_k$  is

$$RG_{kk} = (\prod_{i=1}^k r_i)^{1/k}$$

... (25)

which is nothing but the geometric mean of the change factors.

Generalization to more than three dimensions can also be obtained to provide a cuboid model with optimal budget allocation. For instance, under square root cost function and with  $s$  dimensions the optimum cost allocation works out to be

$$X1_{opt} = [(\prod_{i \neq 1} K_i^2 + \prod_{i \neq 2} K_i^2 + \dots + \prod_{i \neq s} K_i^2) / \prod_{i \neq 1} K_i^2]^{1/2} C0$$

etc. which has a cyclic pattern.

### c) Continuous change

Since the  $p_i$  are proportions which lie in the interval  $[0, 1]$ , it makes sense to take that these are continuous parameters. Then the rate of change of  $V_k$  are simply the *partial derivatives* of  $V_k$  with respect to the  $p_i$ . Thus the rate of change with respect to  $p_1$  is

$$\partial V_k / \partial p_1 = \partial (\prod_{i=1}^k p_i) / \partial p_1 = \prod_{i=2}^k p_i$$

and the change relative to  $V_k$  becomes  $1/p_1$ . Likewise, the rate for simultaneous changes in both

$p_1$  and  $p_2$  becomes

$$\partial^2 V_k / \partial p_1 \partial p_2 = \prod_{i=3}^k p_i$$

with a relative change of  $1/(p_1 p_2)$ . These changes are positive. The expressions lend themselves to straight forward generalization. In the passing, we may note that these results can be obtained for a change in  $p_1$  from (17) and (18) by taking  $d_1 = 1$ . However this does not carry forward. This is true for change in one parameter at a time. This does not generalize for cases of simultaneous changes in the parameters.

For a comparability with the geometric change case, we have to choose  $r_i = (1 + 1/p_i)$ ,

$r_1 r_2 = (1 + 1/(p_1 p_2))$  etc. in the continuous case.

### 4.3 The direction of change

A change can be an increase or a *decrease*. In the case of cuboid content, this will depend on the *sign* of the

first factors in (17), (20), (24) and (25), since the  $p_i$  are positive. In brief, a *sufficient* condition for the changes to be positive is that  $d_i > 0$  for the linear case, though this condition may not be always necessary. The case  $d_i = 0$  implies a situation of no *change*. Thus, as long as the first factors in the expressions are positive, the growth thrust will be positive even if some of the  $d_i$  slip down marginally.

For geometric changes in the factors, a sufficient condition for positive changes is  $r_i > 1$ . Again, this is not *necessary* to keep all the first factors in the expressions positive. Thus a dip below 1 in some  $r_i$  can still maintain a positive thrust in  $V_k$ . The case of every  $r_i$  being 1 corresponds to the scenario of no change.

Finally, every  $d_i$  being positive or every  $r_i$  exceeding unity ensures increase in the average change, though these conditions may not be *necessary*.

### 4.4 Remarks

The case of a cube obtains when  $k = 3$

The linear and multiplicative cases are algebraically equivalent in the sense that  $(p_i + d_i) = p_i (1 + d_i/p_i)$ , which may be taken as  $p_i r_i$  with  $r_i = (1 + d_i/p_i)$ . However the two cases have been treated above separately in order to get explicit forms for clarity of presentation.

In practice, nobody has a direct control over the changes in the parameters, since they are to be *induced* through proactive measures like stepping up the awareness drive, streamlining the delivery systems or realigning the policies.

A positive thrust in each of the  $k$  dimensions, with equal importance given, is a safe policy for practice.

### 4.5 Necessary and sufficient conditions

a) With incremental changes  $d_i$  in  $p_i$ , a necessary and sufficient condition for overall positive increase in the cuboid content is

$$\prod_{i=1}^k (1 + d_i/p_i) > 1 \quad \dots (26)$$

This also ensures an increase in the geometric mean coverage.

b) With geometric coverage rates in  $p_i$  the necessary and sufficient condition can be expressed as

$$\prod_{i=1}^k r_i > 1 \quad \dots (27)$$

It can be easily verified that every  $d_i$  being positive implies condition (26), but not *conversely*. A similar statement can be made about each  $r_i$  exceeding 1 and the condition (27).

## 5. Discussion

In a coverage set up, the factors may be envisioned as forming the dimensional axes of a geometrical figure. The number of dimensions may be *one, two, three* or *more than three*. Geometrically, these will respectively create a line segment, a square, a cube or a cuboid. Without loss of generality and in order

to allow compatibility, we may take the sides to be of unit length, since any proportion lies between 0 and 1. The coverage process starts with a blank/hollow figure, which gets filled up as the coverage improves. The process eventually terminates when the figure is completely filled up.

The cuboid model gives a clear basis for a coverage process and for analyzing its behavior. The results obtained here explain mathematically the conditions for an increase in overall coverage as well as establish the fact that optimum coverage occurs when all the rates increase at *equal pace*, creeping along the respective axes. This property has important policy implications in several fields.

## References

1. <http://www.yeshasvini.kar.nic.in/> 1. - retrieved on 30-Nov-14 at 10.34 PM
2. *World Health Atlas* 2011 of WHO.

# Issues in Negative Association Rule Mining with Business Analytics Perspectives

Rupal Sethi<sup>1</sup> and B. Shekar<sup>2</sup>

---

## Abstract

Association Rule mining literature is witnessing a shift of focus from generating positive rules to the discovery of negative rules. A review of previous literature on negative rule mining that incorporate objective and subjective interestingness measures has been done. Then, an extension, to Fuzzy Set Concept for generating and mining negative rules is made. This work also presents unaddressed issues in mining of both positive and negative rules. Business applications that gain useful insights from both positive and negative rules have been highlighted.

**Keywords:** Association Rule Mining; Item sets, Negative Association Rules; Fuzzy Set Concept; Interestingness; Business Applications.

---

## Introduction

An Association Rule (AR) is an implication of the form " $X \rightarrow Y$ ", where  $I$  is a set of items and  $X \subseteq I$ ;  $Y \subseteq I$ , and  $X \cap Y = \phi$ . One such rule would be: Bread  $\rightarrow$  Butter. This rule says customers buying bread are likely to buy butter as well. AR Mining has been applied to broadly two types of data: transaction data and quantitative attribute data. The transaction datasets comprise items that are associated together through an event such as market basket or web log analysis. For example, the rule Bread, Jam  $\rightarrow$  Butter is obtained from transaction data.

Quantitative attribute data consists of variables that are either binary or categorical in nature. Quantitative association rules are generated by partitioning these categorical or binary variables (Srikant and Agrawal 1996). One such example would be  $\langle \text{Age}=30-40 \rangle$ ,  $\langle \text{Gender}=Female \rangle \rightarrow \langle \text{No. of cars}=2 \rangle$ .

Contrary to positive AR, there are negative rules as another category of ARs (Brin, Motwani & Silverstein 1997). These depict relationship between items that are in conflict like people who buy Pepsi do not buy Coke. Thus, negative ARs identify items that a customer

---

<sup>1</sup> Research Scholar, Fellow Programme in Management, IIMB, Bangalore 560 076.

<sup>2</sup> Professor, Decision Sciences and Information Systems Area, Indian Institute of Management Bangalore, Bangalore, 560 076, India.  
email:lshek@iimb.ernet.in



is not likely to buy whenever he buys a certain set of items (Savasere, Omiesinski & Navathe 1998). A typical negative AR is represented as “ $X \rightarrow \neg Y$ ”. Similar to positive AR, negative AR can also be formed using both transaction data ( $Baby\ Soap \rightarrow \neg Facewash$ ) and quantitative attribute data ( $\langle Age=20-30 \rangle, \langle Married=Yes \rangle \rightarrow \neg \langle Days\ of\ purchase=Weekday \rangle$ ).

Generation of quantitative ARs requires partitioning of attributes. Partitioning of categorical variables often leads to information loss. In order to minimize this information loss, fuzzy set concept is used in the literature (Kuok, Fu and Wong 1998). However, past work is limited to applying fuzzy set concept in pruning positive ARs. This paper addresses the issues pertaining to generating negative rules using fuzzy sets. An attempt to erudite various business applications that may benefit from such analysis is elucidated.

*Organisation of the paper:* In Section 2 we present the previous literature on negative association rules. State-of-the-art objective and subjective interestingness measures that are used for generating negative rules are described. The Fuzzy set concept for positive ARs in Section 3 and expand on it for mining negative ARs is provided. Throughout, some issues that crop up in mining negative rules are highlighted. In Section 4, three major business applications that benefit from using knowledge gained from mining positive and negative ARs: Market Basket Analysis, Customer Relationship Management and Credit Scoring are given.

## 2 Negative Association Rules

### 2.1 Background and Motivation

The concept of negative association rules is still nascent in the field of data mining. There have been some attempts to develop algorithms for generating negative association rules. The discovery process is a difficult task since the search space for negative rules is too large. Absence of itemsets cannot be programmed and even if it is, that leads to generation of millions of negative rules that may not be of use to the manager. Hence, the objective is to find only “interesting” negative association rules that can be acted upon by the managers. The de facto interestingness measures used for generating positive association rules are

*support* and *confidence* (Agrawal and Srikant 1994). These measures in the Apriori algorithm (Agrawal and Srikant 1994) prune the itemsets based on the threshold for frequency count. Unlike positive association rules, negative rules cannot be generated by a Apriori algorithm since they involve absence of items. Thus, researchers have modified the Apriori algorithm for negative rules using different interestingness measures like correlation and expectation. There have been attempts to use subjective interestingness measures like unexpectedness for generating negative rules.

The inception of the idea of negative implications was given by Brin, Motwani and Silverstein (1997). They extended the support-confidence framework by necessitating the use of correlation coefficient in generating interesting rules. They argued that support and confidence cannot highlight the negative relationship between two sets of items, while correlation gives the strength as well as direction of relationship. Consider the example of milk and jam.

The following transaction frequency table has been made from a hypothetical transaction dataset:

	Jam	No Jam	
Milk	5	4	9
No Milk	6	3	9
<b>(Total)</b>	<b>11</b>	<b>7</b>	<b>36</b>

**Table 1:** Frequency table for milk and jam

Consider the itemset: (Milk, Jam)

We generate rules using Apriori with thresholds minsupp= 10%, minconf= 50%

$$\text{Support} = P(\text{Milk and Jam}) = \frac{5}{36} = 0.14$$

$$\text{Confidence} = \frac{P(\text{Milk and Jam})}{P(\text{Milk})} = \frac{5}{9} = 0.56$$

Since *support* and *confidence* of this itemset are greater than the thresholds, the rule  $\text{Milk} \rightarrow \text{Jam}$  is generated.

However, if we calculate the correlation coefficient between milk and jam, we get an altogether different

$$\text{Correlation} = \frac{P(\text{Milk and Jam})}{P(\text{Milk})P(\text{Jam})} = \frac{5}{(9)(11)} = 0.05$$



Thus, milk and jam are indeed negatively correlated implying that people, who buy milk, *do not* buy jam. This relationship is not captured in the support-confidence framework. Thus the rule  $Milk \rightarrow Jam$  is misleading in the absence of information on correlation between itemsets.

## 2.2 Objective Interestingness Measures

### 2.2.1 Correlation and Lift

The concept of negative correlation by Brin et al (1997a) led to a stream of research in negative association rules. However, the authors do not use the original measure of correlation (Pearson 1895) but rather use *lift* (Brin, Motwani, Ullman and Tsur 1997b) as a proxy to it. One of the problems with lift is that it doesn't consider the complement forms of itemsets. As a result of which, negative rules of the form  $A \rightarrow \sim B$  or  $\sim A \rightarrow B$  cannot be formed.

The work by Brin et al (1997a) on negative implications was extended by Antonie and Zaiane (2004). They used Pearson's correlation coefficient as a measure of negative association. They provide an algorithm that extends the support-confidence framework from the Apriori with a sliding correlation coefficient threshold. The algorithm checks for minimum support and confidence first, and then checks for correlation. If the correlation is positive and greater than a threshold ( $t$ ), positive ARs are generated. On the other hand, if the correlation is negative and greater than the threshold in magnitude, negative ARs of the form  $A \rightarrow \sim B$  or  $\sim A \rightarrow B$  are generated.

The algorithm used by Antonie and Zaiane (2004) generates both positive and negative association rules using a single threshold value for support, confidence and correlation. Although, this approach saves time and space, we are not sure if it still generates *interesting* negative rules. Also, even if the algorithm is able to generate both types of rules, one fails to see the link between positive and negative rules. Both the types are independent of each other and no common knowledge seems to emerge from them.

Another issue with this algorithm is that it is restricted to just two items, one as an antecedent and other as a consequent. This assumption makes the problem

quite naïve. If we consider more than two items in the itemset for candidate sets, we need to establish the correlation between different combinations of items. For example, consider (milk, jam, butter) as a candidate itemset. For a rule to be generated from this itemset, one need to have a positive correlation between items falling on either side.

If the negative rule is  $Milk, Butter \rightarrow \sim Jam$

Milk and Butter should have a high positive correlation and (Milk, Butter) should have a high negative correlation with Jam. Considering this case of correlation among and across itemsets, one single value for correlation threshold might not suffice.

So far, negative rules have been generated using two objective measures: lift and Pearson's correlation coefficient. As stated earlier, Brin et al (1997a) used lift as a proxy for correlation. The reason for this substitution has not been cited by the authors but considering the complexity of Pearson's coefficient, one can understand the conceptual notion the paper tried to bring in. However, we should realize the difference between both the measures in assessing negative relationships. Also, one can look at other better measures that can be used for identifying negative relationships between items.

$$Lift = \frac{P(AB)}{P(A)P(B)}$$

$$Pearson'sCorrelation\ \rho = \frac{Covariance(A,B)}{sd(A)\ sd(B)}$$

On simplification,

$$\rho = \frac{P(AB) - P(A)P(B)}{\sqrt{P(A)\ P(B)P(\bar{A})\ P(\bar{B})}}$$

Focusing on numerators, Lift only takes into account the frequency of occurrence of both items together, while Pearson's correlation calculates the difference between co-occurrence and independent occurrence. Thus, Pearson's correlation coefficient gives a proper measure of negative relationships.

### 2.2.2 Alternate Interestingness Measure

Since we are aware that Pearson's correlation coefficient is complex in calculations because of

the denominator, we provide alternative measure of objective interestingness that captures the negative relationship similar to Pearson's coefficient. *Change of Support* (CS) is a measure of interestingness that was formulated by Yao and Zhong (1999) but has not been studied that much by researchers in association rule mining.

$$CS = P(B/A) - P(B) \\ = \frac{P(AB) - P(A)P(B)}{P(A)}$$

Clearly, CS is similar to  $\rho$  as far as the numerator is concerned. CS is better in terms of complexity and intuition.

### 2.3 Subjective Interestingness Measure

Another approach to generating negative rules is by using the taxonomy of the dataset. A rule is interesting if it deviates from the manager's expectation based on previous belief. The previous belief is usually stated in terms of a priori probabilities based on knowledge of the problem domain (Savasere Omiecinski and Navathe 1998). This concept is termed as *unexpectedness*. The major assumption based on the taxonomy of the data is called the uniformity assumption. It states that items that belong to the same parent in a taxonomy are expected to have similar types of associations with other items. In other words, siblings in a taxonomy are *substitutable*. For example, if Chips are bought with Pepsi, one would expect Chips to be bought with Coke as well. If the actual support of Chips and Coke is less than the support of Chips and Pepsi, then Chips and Coke generate a negative association rule.

Savasere et al (1998) define negative rules as consisting of items that are not likely to be bought along with the purchase of a set of items. One of the conceptual questions we would like to pose here is the difference between the notion of not buying item A given the purchase of item B vis-à-vis the notion of buying item B decreasing the likelihood of buying item A. Although both notions look the same, there is a deeper meaning attached to the latter. The first definition can be applied to any set of two unrelated items A and B. However the second definition restricts to two related items. Consider the following:

Form 1:  $Pen \rightarrow \neg Milk$

Form 2:  $Tea \rightarrow \neg Coffee$

According to form 1, a person is not likely to buy milk when he buys pen. Here, the rule makes perfect sense because pen and milk are quite unrelated. On the contrary, form 2 says that when a person is buying tea, he is less likely to buy coffee. The second form has a notion of causality as well as substitution. This paper talks about form 1 accompanied with the knowledge of taxonomy. Hence there are less chances of rule generation involving unrelated products. However one must be careful before giving a generic definition for negative rules.

The uniformity assumption made by Savasere et al (1998) stating that taxonomy consists of siblings that are substitutable, needs further probing. Two fundamental questions arise: 1) What do we mean by substitution here? and 2) Based on the application what is the level of granularity of the taxonomy that should be exercised?

Savasere et al (1998) do not define the meaning of substitution in the context of their paper. The concept of substitution should be linked to a function that specifies the level of information reusability. Substitution can be, at the level of brand (Colgate vs. Pepsodent Toothpaste), application-specific (flowers vs. chocolates), seasonality-driven (ice-cream vs. hot chocolate) or at a more abstract level (desktop vs. laptop). Thus, restricting to siblings can lead to over or under representation of negative rules. Savasere et al. do not restrict the uniformity assumption to siblings alone, but span across siblings, parents and children in three ways.

Buckles, Yuan and Zhang (2002) adopt an approach similar to that of Savasere et al (1998). They also use the concept of locality of similarity in defining sibling rules from the taxonomy. Sibling rules are a pair of positive association rules where both the siblings are expected to be related to the same consequent. For example, if  $Pepsi \rightarrow Chips$  is a rule that is generated through Apriori, then  $Coke \rightarrow Chips$  should also be generated. If the confidence of  $Coke \rightarrow Chips$  is less than the expected confidence (equal to  $Pepsi \rightarrow Chips$ ), then a negative rule  $Coke \rightarrow \neg Chips$  gets generated.

Domain knowledge being present in the taxonomy makes this also a subjective approach for generation of negative rules. Buckles et al (2002) assert that the criterion for a negative rule utility is its relationship to a valid positive rule. This idea of linking positive and negative rules through a taxonomy is indeed useful for managers for making strategic decisions. However, the same question arises here also - what level of substitution are we seeking? As one moves to greater abstract level up the hierarchy every item is substitutable by another. Hence, there needs to be a function defined for substitution of items that appear in negative rules. This paper is an attempt to extend the definition of substitution and use it for linking positive and negative association rules.

### 3 Fuzzy Set Approach

Kuok, Fu and Wong (1998) argue that fuzzy set concept is better than the discrete interval method (Srikant and Agrawal 1996) since it provides a smooth transition between member and non-member of a set while partitioning. Such an approach of fuzzy sets results in fewer boundary elements getting excluded while partitioning the quantitative attributes.

A positive AR is defined using fuzzy sets (Kuok et al 1998) as follows.

*X is A → Y is B*

X and Y are quantitative attributes, and A and B are fuzzy sets corresponding to X and Y respectively.

Two interestingness measures that use fuzzy sets are employed for generating positive ARs. *Significance Factor* gives the number of records supporting the itemset and also their degree of support.

$$\text{Significance } \langle X, A \rangle = \frac{\text{Sum of the votes satisfying } \langle X, A \rangle}{\text{Total Number of records}}$$

Votes satisfying set  $\langle X, A \rangle$  signifies the degree of membership of each record having attribute X lying in fuzzy class A. This measure is similar to *support* as it reflects the support for the itemset relative to the entire dataset

The interestingness measure is called *Certainty Factor*. Kuok et al (1998) use two methods to calculate *Certainty*

*Factor*, but do not link the information gained from both the methods. We try to address this gap by separating the two methods as two distinct objective interesting measures for the positive AR.

The first method to calculate *Certainty Factor* uses *Significance*.

$$\text{Certainty } (X, A \rightarrow Y, B) = \frac{\text{Significance of } \langle X, A \rangle}{\text{Significance of } \langle Y, B \rangle}$$

Here  $Z = XUY$  and  $C = AUB$

This is similar to confidence for positive AR.

$$\text{Confidence } (X \rightarrow Y) = \frac{\text{Support of } XUY}{\text{Support of } X}$$

The second method uses Pearson's correlation coefficient. Since fuzzy rules are different from positive rules, calculation of expectation of antecedent and consequent is a little different. The vote of a record is zero if its membership function is less than a user specified threshold.

#### 3.1 Generating Negative ARs using Fuzzy Sets

The two methods in Kuok et al (1998) present contrasting results for the same fuzzy rule. Consider *Salary, High → Balance, Low*. The *Certainty Factor* using *Significance* is positive (0.364) highlighting the fact that the consequent is 36.4% significant relative to the antecedent in the entire dataset. Contrary to this, *certainty factor*, ( $\rho = -0.96$ ), presents an entirely different picture. It shows that High Salary is strongly negatively correlated with low balance, implying that the rule should not be formed. Instead a negative rule should get generated *Salary, High → ~ Balance, Low*.

$$\text{Confidence } (X \rightarrow Y) = \frac{P(XY)}{P(X)}$$

$$\text{Correlation } (X \rightarrow Y) = \frac{P(XY) - P(X)P(Y)}{f(P(X)) f(P(Y))}$$

Hence, we argue that the second method is an additional measure of interestingness similar to the addition of correlation to the support-confidence framework by Brin et al (1997). This fuzzy correlation measure may be used to generate negative fuzzy rules. We also recommend

that the thresholds used for both *Certainty factors* should be different as they give different relationships between itemsets. Identical thresholds, as mentioned by Kuok et al. may generate misleading rules.

We summarise our observations on *Certainty factor*.

- i. *Certainty factor* based on *significance* and that based on *Correlation* portray different relationships between itemsets. Hence they should be considered as two different objective interestingness measures for fuzzy rules.
- ii. *Significance-based Certainty factor* is similar to *confidence* as it measures the support of consequent relative to the antecedent of a rule.
- iii. Fuzzy Correlation (coined by us) measures the positive or negative relationship between the antecedent and the consequent and hence may be used to generate negative fuzzy rules based on a new threshold given by the user.

### 3.2 Applying Fuzzy Sets to Transaction Data

We also point out one of the extension from the work of Kuok et al (1998). As mentioned earlier, fuzzy set concept is applied to quantitative attribute data such as age, gender or salary. There has been no attempt to apply fuzzy concept to transaction datasets.

AR Mining literature typically generates rules from purchase transactions that do not mention quantities of items purchased. For example, buying bread and jam together and buying 3 loaves of bread and 1 bottle of jam, are quite different in interpretation.

In order to apply fuzzy concept to market basket, we need to convert the transaction into quantitative attributes. Consider the transaction set in Table 2 converted into quantitative attributes given in Table 3. We define a fuzzy set for the entire market transaction data as follows.

$F = \{\text{High, Medium, Low}\}$

Here High (H), Medium (M) and Low (L) represent quantities of items purchased by customers in each transaction. H is quantity 4-5 units, medium is 3 units and low is 1-2 units.

T.Id	Bread	Butter	Jam
T1	3	-	5
T2	4	2	3
T3	3	3	-

**Table 2:** Transaction set with quantities

T. Id	Bread			Butter			Jam		
	H	M	L	H	M	L	H	M	L
T1	0	1	0	0	0	0	1	0	0
T2	1	0	0	0	0	1	0	1	0
T3	0	1	0	0	1	0	0	0	0

**Table 3:** Quantitative representation of transaction data

T1: <Bread, Medium>, <Jam, High>

T2: <Bread, High>, <Butter, Low>, <Jam, Medium>

T3: <Bread, Medium>, <Butter, Medium>

We need to define a membership function for fuzzy sets H, M and L.

Let us consider the following fuzzy rule for which the membership votes are given in Table 4:

Bread, Medium  $\rightarrow$  Jam, High

Bread, Medium	Jam, High
0.9	0.9
0.5	0.3
0.9	0

**Table 4:** Membership votes for antecedent and consequent of the rule

$$\text{Significance} = \frac{0.81 + 0.15 + 0}{3} = 0.32$$

$$\text{Certainty} = \frac{0.32}{2.30} = 0.14$$

$$\text{Correlation} = \frac{0.32 - (2.3)(1.2)}{(2.3)(1.2)} = -0.88$$

This rule has 32% significance, 14% certainty and 88% negative correlation.

As a consequence negative rule Bread, Medium  $\rightarrow$  ~ Jam, High gets generated.

The fuzzy approach opens a battery of issues.

- i. It is not possible to have a uniform fuzzy set space across the entire transaction space. How does one handle it?
- ii. How does one define the fuzzy operators apart from the typical fuzzy union,... thus leading to meaningful interestingness-based understanding of fuzzy ARs?
- iii. Do the fuzzy ARs themselves need any further augmentation?
- iv. How does one handle multiple fuzzy sets in a single transaction?

#### **4. Business Applications of Negative ARs**

AR Mining methods are useful across a variety of business applications. The data obtained from these business applications can contain both transactional and quantitative in nature. Interesting positive and negative rules can give important insights to managers and may enable in knowledge discovery about customer behaviour.

##### **4.1 Market Basket Analysis**

Market Basket Analysis (MBA) has the objective of individuating products, or groups of products, that tend to occur together in similar baskets (Giudici 2005). The data is mostly transactional in nature, representing baskets of each customer. The knowledge obtained from MBA may be used to reorganise a supermarket's layout for promotional campaigns and bundling of frequent products and new product development. MBA may also be used in e-commerce environments, where real-time modelling of an individual customer and personalized feedback is valuable (Apte, Liu, Pednault & Smyth 2002). Information from negative relationships among products may be used for clustering similar customers based on their purchase patterns. This leads to useful information that has potential to address managerial issues such as customer segmentation, personalization, forecasting and change detection. The more interesting the mined ARs, the more robust and

accurate the solutions are ; thus promising significant economic payoff in the business world.

##### **4.2 Customer Relationship Management**

Swift (2001, p.12) define CRM as an "enterprise approach to understanding and influencing customer behaviour through meaningful communications in order to improve customer acquisition, customer retention, customer loyalty, and customer profitability". Data mining techniques such as AR Mining, Classification and Prediction are used for extracting and identifying useful information and knowledge from enormous customer databases for making different CRM decisions (Berson et al., 2000). These customer databases usually comprise quantitative attributes such as demographics, age and loyalty card details. As such, the application of data mining techniques in CRM is worth pursuing in a customer-centric economy (Ngai et al 2011). Interesting positive and negative ARs can be used to build a model for predicting the value of a future customer (Wang et al., 2005). These rules can be applied to classify customers into loyal clients or those who abandon a company for competitors (Giudici 2005).

##### **4.3 Credit Scoring**

Credit scoring uses data mining techniques to evaluate the credit reliability of individuals who ask for credit when buying goods or services (Giudici 2005). Banks, Investment companies and Credit card organisations scan the customer database often comprising quantitative attributes to analyse customers' creditworthiness. The probability of loan repayment may be analysed using positive or negative ARs thus classifying creditors into two classes of risk: good and bad. This approach is similar to CRM where the past behaviour of an individual is scored in order to plan a future action.

#### **References**

1. Agrawal, R., & Srikant, R. (1994, September). Fast algorithms for mining association rules. In Proc. 20th int. conf. very large data bases, VLDB (Vol.1215, pp.487-499).
2. Agrawal, R., Imieliski, T., & Swami, A. (1993). Mining association rules between sets of items in large databases. ACM SIGMOD Record, 22(2), 207-216.



3. Antonie, M. L., & Zaïane, O. R. (2004). Mining positive and negative association rules: an approach for confined rules. In Knowledge Discovery in Databases: PKDD 2004 (pp.27-38). Springer Berlin Heidelberg.
4. Apte, C., Liu, B., Pednault, E. P., & Smyth, P. (2002). Business applications of data mining. *Communications of the ACM*, 45(8), 49-53.
5. Brin, S., Motwani, R., & Silverstein, C. (1997a, June). Beyond market baskets: Generalizing association rules to correlations. In ACM SIGMOD Record (Vol.26, No.2, pp.265-276). ACM.
6. Brin, S., Motwani, R., Ullman, J. D., & Tsur, S. (1997b, June). Dynamic itemset counting and implication rules for market basket data. In ACM SIGMOD Record (Vol.26, No.2, pp.255-264). ACM.
7. Dong, G., & Li, J. (1998). Interestingness of discovered association rules in terms of neighborhood-based unexpectedness. In Research and Development in Knowledge Discovery and Data Mining (pp.72-86). Springer Berlin Heidelberg.
8. Giudici, P. (2005). *Applied data mining: statistical methods for business and industry*. John Wiley & Sons.
9. Kuok, C. M., Fu, A., & Wong, M. H. (1998). Mining fuzzy association rules in databases. *ACM Sigmod Record*, 27(1), 41-46.
10. Mannila, H., Toivonen, H., & Verkamo, A. I. (1994, July). Efficient algorithms for discovering association rules. In KDD-94: AAAI workshop on Knowledge Discovery in Databases (pp.181-192).
11. Ngai, E. W. T., Hu, Y., Wong, Y. H., Chen, Y., & Sun, X. (2011). The application of data mining techniques in financial fraud detection: A classification framework and an academic review of literature. *Decision Support Systems*, 50(3), 559-569.
12. Padmanabhan, B., & Tuzhilin, A. (1999). Unexpectedness as a measure of interestingness in knowledge discovery. *Decision Support Systems*, 27(3), 303-318.
13. Savasere, A., Omiecinski, E., & Navathe, S. (1998, February). Mining for strong negative associations in a large database of customer transactions. In Data Engineering, 1998. Proceedings., 14th International Conference on (pp.494-502). IEEE.
14. Shaw, G., Xu, Y., & Geva, S. (2009). Interestingness Measures for Multi-Level Association Rules. *Proceedings of ADCS 2009*, 27-34.
15. Srikant, R., & Agrawal, R. (1995). Mining generalized association rules (pp.407-419). IBM Research Division.
16. Srikant, R., & Agrawal, R. (1996, June). Mining quantitative association rules in large relational tables. In *Acm Sigmod Record* (Vol.25, No.2, pp.1-12). ACM.
17. Yuan, X., Buckles, B. P., Yuan, Z., & Zhang, J. (2002). Mining negative association rules. In *Computers and Communications, 2002. Proceedings. ISCC 2002. Seventh International Symposium on* (pp.623-628). IEEE.

## BREXIT: Talent Challenges for Recruitment and Retention

C.G. Sumithra\*

---

### Abstract

The Brexit verdict has shaken the world economy by and large. There is a lot of uncertainty in UK and EU from economic perspective. Irrespective of the referendum, it is a question mark on the relations between UK and EU. The changes visualized immediately after Britain voted in favor of Brexit, was the currency impact, changes in banking and financial system and skilled labor being affected because of downsizing. Top companies are taking decisions on how to manage the turmoil of this world event. This paper tries to give a bird's eye view on the talent perspective of UK and consequences there on. It rides through some of the issues like global talent issues, talent issues at Britain and its consequences on India too.

**Keywords:** (EU-European Union, UK – United Kingdom, US- United States of America, IT- Information and technology, ITes- Information and Technology enabled services, KSA – Knowledge, skills, Abilities)

---

### Introduction

A talented workforce is the key for gaining successes in organizations. When, talent gap widens in a country the International business companies may shift their base line operations to some other country where talented workforce are available. As of now London is one the most popular world's investment destination with a population of around 8.7 million people. The demographic details state that 40% of the population are born in foreign countries and others have been

there because of higher education system, which is the boon to UK. London's critical masses of talented people are from around the globe. One of the certain reasons is the business environment, specifically with respect to immigration policy, that enables global talent to work and study in London. The next point to mention is its encouragement for tourists from all over the world to visit and that ensures welcome to foreigners.

On Thursday, June 23, 2016 a majority of British in the UK decided that the country would leave the European

---

\* Professor, Bharatiya Vidya Bhavan's M.P.Birla Institute of Management, Bengaluru 560 001.

Union with 52% of the British voted for Brexit and 48% voted to remain with EU. None really can visualize the consequences of the so-called “Brexit” (British exit). But governments, economists, investors, major businesses, and financial institutions all fear that the economic impact could be profound, triggering a significant slowdown in the British and European economies, and even perhaps a cascading effect on the other country economies too. This paper throws some light into the current scenario of workforce and tries to identify the gaps with respect to the competent talent and puts forth some anticipated problems in the very near future.

### **Global Talent Issues**

The global labor market is changing unprecedently with the technology lifting high up. The scenarios are different from developed countries like US and other Asian countries. Earlier McKinsey quarterly had reported of talent crunch in the entire globe because of highly volatile business environments. The Forbes top ten companies of the globe employ 10%-25% of the workforce. The recent picture notifies that hot jobs turn cold almost as fast as a product's life cycle changes. Each and every type of industry moves around this treadmill as something is called obsolete for tomorrow. Business today operates across international borders, which necessitates a search for global talent with diverse competency (KSA) to keep abreast with the ever changing time and technology.

### **Existing Talent Gaps in UK**

Emma Parry and Lynette Harris (2011) mention about the dynamics that is happening at the workplace with increasing number of older workforce which may block the new entrants into the premises. In common with the other EU countries, UK also has ageing workforce. (2011) National Statistics Data (NSD) portrays that workforce employed are aged between 50 & 64 years. As a result of this, employees who are still in 50's club are expected to continue for further 10-15 years.

The UK Pension Act of 2007 states that by 2018 the State Pension Age (SPA) will be equally in place for men and women from the age of 66 onwards. It also reiterates that they will have to take up jobs as long as possible, out of economic necessity. Hutton Report

(2011) mentions about virtual closure of occupational pension schemes in private sector. Default Retirement Age (DRA) is changing based on specific grounds.

The Chartered Institute of Personnel and Development (CIPD) and Chartered Management Institute (CMI) (2011) research into age management reports, UK employers are still unprepared for the impact workforce demographics will have on their businesses (Macleod, Worman, Wilton, Woodman and Hutchings (2010). The survey portrays some recruitment and skill shortages in the labor market. The three types of gaps are Managerial positions; need based professional positions and technical positions. In addition as per the law of the land by default retirement age is 65. As a consequence of this, there are very few opportunities for new entrants into the organization.

The labor force survey also reveals an important piece of information that it takes a longer tenure for reemployment. Due to heavy economic pressures irrespective of statutory retirement age, people continue to take up jobs. Moreover, another major challenge is that higher number of older workforce may result in greater generational gap issues at workplace. There are issues about replacement with the required skill sets is uncertain, so most of the companies retain the older talents. Despite other unemployment issues, economic pressures, skill shortages are inevitable in the UK labor market.

In addition to these details Investors in People (IIP) published report (2015) 60% of the UK workforce not happy with the current jobs and there is only ten 10% rise in the new job seekers category.

“As the economy gains pace, ‘Investors in People’ is warning British businesses they need to invest in their people or face a potential exodus of talented staff.” (IIP online survey report 2014). Paul Devoy head of ‘Investors in People’ concludes the report by giving a “wake-up call” for businesses.

### **Talent Issues of Brexit**

Needless to say, employees affect employers and scenarios seemingly predicts of sweeping change which may happen with talent hiring and retention too. There are some important areas to be looked into. They



are immigration, employment law, economic impact, political impact, supplementary sectors impact and talent pipeline getting hard.

- **IMMIGRATION** – Immigration policy of UK of hiring international workers is unclear with long-term situations. The status quo policy upholds skilled foreigners who are allowed to work and stay in the country indefinitely. On the other hand, will EU citizens be subjected to same employment rules or changes may be permissible? The CIPD report states that European citizens who are currently employed will be either granted UK citizenship or they may have to return to their respective countries. On the other side of the continuum, Man Power Foundation reports state that, there may be critical labor shortage in construction industries as the movements may be curtailed.

When the new policy regime comes to force, British Expats who are in Europe in turn will also be sailing in the same boat. The hard fact is that, European employers who are looking for talented hire has always been hiring British or British educated. The silver lining here; will the employers be able to hire the same kind of talents or will they leverage with the current trade partners, is that question to ponder about?

- **EMPLOYMENT LAW** – The employment law has many facets, one of them are Agency Workers Regulations Act 2010, states that employers should treat staff equally with the regular employees in terms of pay, benefits and working conditions which are a part of an EU directive and are not rightly being utilized by the British employers. In another case EU regulations states that expats are eligible for 28 days of paid vacation in a year. There are some reports, which states that EU employees are not getting that benefit. This can be viewed in another angle, if the employment laws are extensively protecting employees; it is hard for the employer to discipline the employees. If this is the situation now, what may be anticipated by the future changes?
- **ECONOMIC IMPACT** - Experts foresee Brexit will have damaging effect on the UK economy and may have cascading effects on the other economies

too. First noticed impact after the referendum was, falling of Pound Sterling continuously for the first time since 1985. It has jolted the global currency markets. In addition to that, the long-term effects on the UK labor market as most of unskilled jobs are handled by the EU expats. Sources point out that, UK as a host of millions of foreign workers, with very less percentage of unemployment rate and wages growing steadily since 1990. However, a research study from the London School of Economics concluded that “immigration has had no negative impact on employment or wage growth in the UK”.

On the other hand, departing from the EU may aggravate skill gap in Britain, as it is a daunting task for the British to find right competent professionals for certain key positions at multinational companies especially in the domain of banking and finance and key high end IT enabled services sector. Recent reports state that the major companies like Airbus, HP, Microsoft, JP Morgan, Citigroup etc., are planning to permanently downsize their operations from London.

- **POLITICAL IMPACT** – Brexit may bring in umpteen number of policy changes both from the EU and Britain. It may bring in serious consequences for employers as well as employees with conditions of work, tax, working hours etc., These may also bring in lot of regulations in immigration policy. Moreover another repercussion may be Scotland breaking away from Britain to join the EU. The aftermath may lead to issues in trade, labor problems, economics etc.
- **SUPPLEMENTARY SECTORS IMPACT** - Startups, entrepreneurs, investors are blinking at the movements of the economy. "All of this may put London's leading position in Europe in the tech industry in jeopardy". "This decision definitely takes some of the momentum out of the European tech growth story." These are some of the views expressed by the experts. This referendum will increase the current skill gap of Britain as many immigrants have significantly contributed to the British economy by establishing umpteen numbers of startups.

London is one the world's leading tech hub, now it is deemed to be under risk as it would exit the EU. The sectors that are largely affected by Brexit are construction, financial services, travel and tourism and healthcare as these industries were majorly dependent upon immigrant's population for their business. In addition to these a point to be noted here, majority of the population from European Union are particularly from EU 14 countries are largely employed more in financial sector. Moreover, it is expected that especially in construction sector one in three vacancies may go unfilled as the new law of immigration would affect expats. Reports as of now state that only just 6% of organizations have a genuine skills shortage vacancy in Britain.

- **TALENT PIPELINE BECOMING HARD** - Social tension itself is another important factor which may not allow some people to apply for UK Visa. There is a probability that Brexit might affect the universities and research sector too. As far as the science, technology and research sectors are concerned, most of the funding comes from the EU, so there is certain amount of risk involved, this may create a brain drain and the top talent would look up to other countries where they would get permanent assignment.

Banking, insurance, engineering and communication companies are already thinking of relocating their business. Linda Holbeche Professor at Cass Business School said "If these companies leave, not only skill gap but, UK may simply be left with a massive GDP gap". In addition to these, after effects of 2008-09 recession had jolted the productivity sector with negative consequence. The important point to be considered here is, the proportion of population who have recently migrated to UK are young, highly talented are also regularly paying taxes and contributing for the movement of the economy. In addition to these, another point will equally have impact would be, if the movements between the EU countries and UK are curtailed, it would be more difficult for the UK citizens, who may plan to go abroad for higher education and also to gain experience and skill sets.

At the outset, another important area to be considered

is the apprenticeship which was a major cost saver to most of the companies, as they had tie-up with universities and educational institutions in providing either a part-time job or on the job training, so that both the parties are benefitted. More over some businesses who may not have the intention to hire, but might as well would have used apprenticeship programs so their risks are reduced and they would have the fresh cream of the talent from universities.

Recent reports uphold by stating that Berlin is eyeing of the top tech talent who would exit UK. International companies, people are scouting for next destination a question mark.

### **India's talent impact for Brexit**

Although, by this world event India will have an impact but not much say reports. However, Britain is the third largest investor in India, after Singapore and Mauritius and it ranks 12th in the bilateral trade. Indian rupee had not suffered much but pound- sterling exchange rate is low as compared to earlier times. Many IT companies from India serve EU markets from their headquarters in London and skilled IT workers would be placed on onsite projects in Britain. This was an opportunity for easy movement for talent gets more nurtured in the foreign environment. Aftermath, these IT and ITES companies may have to look into new destinations. Britain hosting 800 Indian companies employing 110,000 individuals in the country, had a deeper partnership with India what may be happening next is uncertain. A percentage of Indians have utilized this opportunity, to study in Britain have increased, reports Times of India, Bangalore edition.

India's leading Business house the Tata's has predicted a major impact as they were the highest investor in the UK. Majority of the business is in UK, may have cascading effect on the employees India and in Britain. In addition to these, the top institutes like IITs and IIM's two percentile of students would look into Oxford University, London School of Business, London School of Economics and other Universities for pursuing their masters also job offers at UK, as it is India's second favorite destination after US. Is there a chance for reverse brain drain to India or not? Still situation may take two to three years at least get some answer or understand the trend.

## **Conclusion**

UK's decision of leaving the EU has placed a big debate on the repercussions as Britain is the key world economic destination. The offshoot of Brexit has placed many economists, financial experts in a perplex situation and their predictions has remained as a ray of hope only. The key discussion has given a wider angle look into the talent supply chain consequences for Britain. It is clarifying that major talent hub will have a big impact on the job perspective in EU and UK. To conclude, the impact of Brexit would be how different country economies are able to balance and sail through this turbulent time in a smoother manner.

## **Select Bibliography**

[www.investorsinpeople.com](http://www.investorsinpeople.com)  
[www.acas.org.uk](http://www.acas.org.uk)  
[www.cebglobal.com](http://www.cebglobal.com)  
<http://www.itpro.co.uk/>  
[www.cgma.org](http://www.cgma.org)  
<https://woodfordfunds.com>  
[www.global-counsel.co.uk](http://www.global-counsel.co.uk)  
[www.indiatimes.com](http://www.indiatimes.com)  
<http://blogs.nasscom.in>

## Glimpses of Brexit and Forthcoming Eventualities

Rohini G. Shetty\*

---

### Abstract

Britain's 'Black Friday' is a past. With Brexit becoming official on 24th June, 2016, Great Britain was embroiled in conflict, campaigns, public debates and mass speculation about the future of the United Kingdom (UK) and its relationship with Europe.

This paper attempts to offer glimpses of Brexit with answers to several basic questions such as - What is Brexit and why did Britain leave the European Union? What are the consequences of Brexit and whether it is good or bad for India, which had strong trading ties with Britain considering the fact that it was a gateway to all of Europe?

A month thereafter since the referendum; interestingly, many Britons were in the process of seeking a second referendum or a redo on the voting exercise after going through an experience of what is termed the "buyer's remorse" due to the volatility and uncertainty at the global stock markets and the devaluing of the pound besides prompting several changes, majorly in the area of trade and employment.

Is a second referendum possible or should Britain just go forward and work hard to make Brexit a roaring success, as the Prime Minister, Ms. Theresa May said – Brexit is Brexit and we must respect people's decision.

**Keywords:** *Brexit; Brexiteers; Black Friday; Trade Impact; Uncertainty; Regrexit.*

---

### The European Union

The European Union or EU as it is often referred to, is a benign partnership in the economic and political arenas constituting 28 countries of Europe. The union came into existence to basically build and foster economic co-operation. The good thought behind this was that

countries with strong trade relations are generally amiable and less likely to be hostile thereby, avoiding going to war with one another ensuring global peace and prosperity in the long run. EU from then on, has become one entity or one market with free movement of raw material, finished goods, labour, technology etc.,

---

\* Rohini G. Shetty is Assistant Professor at M P Birla Institute of Management. She can be contacted at [rgs\\_mys@yahoo.co.in](mailto:rgs_mys@yahoo.co.in)

giving the feel that all the member states belonged to one nation. The common currency to use came to be known as the euro and was used by 19 member countries of the Union. It was ensured that all members had a common set of rules to follow covering a wide range of areas such as transport and communication, consumer and human rights and business as well as the ecological environment. It was interesting to note that it even included simple and mundane things such as payment of mobile phone charges etc.

### **The Meaning of Brexit**

A term used as a short form of stating that United Kingdom (UK) is making an exit from the European Union (EU). It is the coming together of the two terms, *Britain* and *Exit* to get "Brexit" which literally means, Britain is severing all ties from the EU to attain a separate status as an individual nation.

### **Britain's Desire to Leave the European Union**

U.K. is fast approaching a vote out on its membership of the 28-country European Union after almost four decades of being a part of it. UK like France and Germany has also been a net contributor to the union and its well-being. Why then does Britain desire to leave the union?

Free trade and Globalization are said to benefit both the manufacturer and consumer by removal of all barriers to trade and movement of goods; labour; investments etc. and unify regulations and trade globally besides providing a wide choice for consumers. But then, this benefits only a few and made the lives of almost everyone else more expensive and complex and often, less secure with people who make rules less accountable and very often burden one nation for everything, at the expense of all others. Britain, it seems thought it was always at the receiving end taking up all the burden without much payback and hence considered it better to sever ties with the union than be a part of it.

### **Vote for Leave the European Union**

This was a referendum wherein almost everyone of voting age participated (23rd June, 2016) to arrive at a decision for UK to leave the EU. The referendum turnout was 71.8%, with 30 million plus people franchising their voting rights. The Leave EU vote clearly won with

a majority of 52% as against 48% voting to stay with EU.

### **The UK Voting Pattern**

England's vote for exit from the union was 53.4% as against 46.6%, so also the vote of Wales with Leave EU getting a majority of 52.5% while Stay with the Union was pegged at 47.5%. It is interesting to note that both Scotland and Northern Ireland backed the Stay with EU group. (62% as against 38%) and (55.8% as against 44.2%) respectively. All people who supported Stay with the EU termed the day as "*Black Friday*", as the results of the final vote was announced on a Friday with Britain finally breaking free from the EU.

### **Post Brexit**

Theresa May had come out in full support for Britain to remain with the Union. But since she became Prime Minister and after David Cameron, her fellow campaigner, had to give up office stated that she respects the decision of the citizens and their vote. She also added that she would now work towards making Brexit a success by extending full cooperation.

### **The Treaty of Lisbon**

This Treaty, formerly known as the "*Reform Treaty*" is an international agreement to bring the required amendments to the two treaties that underlie the constitutional basis for the formation of the EU. On 13th December, 2007 the signatures of all the members of the union was attested and the treaty came to be enforced on 1st December, 2009.

Britain has to invoke an agreement called the **Article 50 of the Lisbon Treaty** which gives both the EU and UK a duration of two years to come to an agreement regarding the conditions of severance. According to prime minister, Ms. May, the Brexit kick-off process will not begin immediately and may take some time so, things will remain blur and uncertain as to the type of deal Britain is going to seek from EU on several important issues, especially those concerning trade and immigration.

### **The Three Brexiteers**

The entire responsibility for Brexit will come under a new Government Department, led by veteran

Conservative MP and Leave Union Campaigner **David Davis**, ably assisted by Former Defence Secretary, **Liam Fox**, as the new International Trade Minister and **Boris Johnson**, as the Foreign Secretary. The three men, dubbed as the Three Brexiteers will play a pivotal role in all negotiations and forging new international agreements with EU, although the final decision will be made by Prime Minister Ms. May.

The government had no emergency plan before the referendum, hence hiring skilled negotiators to manage the complex negotiations with the union was given high priority. A withdrawal from the EU with Britain getting the best deal possible is what everyone is looking forward to under the leadership of Ms. May.

### **Duration for Britain to Leave the EU**

Once Article 50 has been triggered, the duration for the negotiations and step by step withdrawal may take about two years for the formal severance of relationship. It is expected that things will begin to take shape by December end, 2018. How Brexit will pan out is the big question as Article 50 (2009) is put to action for the very first time. But, the fact remains that exit terms will need a nod from all 27 member parliaments, which may take time as all issues need to be debated before any decision is arrived at by the member states. However, till then, the EU laws will remain intact in the UK as of now and it shall continue to stand by all the EU treaties but may not involve itself in any of the decision-making processes.

### **Value of the Pound Post Brexit**

The Pound Sterling has lost value against the dollar since Brexit. The pound had always held its value for a long time. Now, the British pound worth around \$1.32, has inched down to its lowest value observed since 1985. The value against the euro has also come down. For much of 2015, the pound had a value between €1.35 - €1.45. The year 2016 saw the pound sterling weaken against the euro dropping in value following Brexit to about €1.20. It is premature to state anything as of now, regarding its impact on the weakening of the economy.

### **Dramatic Drop in UK Economy after Brexit**

A "dramatic deterioration" was visible in economic activity immediately after Brexit. The two important

sectors of manufacturing and service saw a fall in output and orders, but exports increased, driven by the weak pound sterling. The survey of 650 services companies as sample constituents was done from across several industries like transport, business services, computing and hospitality to name a few.

### **Current Status & Aftermath of Britain's "Black Friday"**

Jonathan Portes, of the National Institute of Economic and Social Research in the U.K has said that - "To actually define who has the right to stay and who does not will be a really a difficult task, both legally and administratively ". The Leave Union campaigners had reassured much before the referendum, that all Europeans in UK could continue to stay back, but experts opined other-wise saying - "Everyone here can stay" is a good beginning to soothe frayed nerves, but definitely not a law that one could administer. So, is an application mandatory to obtain a Permanent Residence Card (PRC) to stay and work in the UK, if not, is one taking a huge risk with their future? This was a pertinent question on the minds of most European employees working in UK.

British employers issued a warning that Brexit may prompt hiring freezes and job losses. They said they would plan to freeze recruitment and 5% were expected to fire staff. Nearly two-thirds of firms polled stated that the outcome of the referendum could be hugely negative for business. It was clear that one in every five respondents of the polls conducted was considering moving at least a few of their operations outside UK, if not all. A case in example was that of *HSBC* which wanted to move its operations to Paris while *Rolls Royce* also planned to move operations to some other European destination; so also, *JP Morgan* and *BMW* who were seriously thinking of a move out to some other European destination. In fact most global players in business had serious thoughts on the issue of conducting business operations in UK, post Brexit as almost all aspects of business seemed unclear.

### **Status of EU Citizens Living in UK**

The British government denied giving guarantee or even provide any security to EU nationals currently living in the UK. The status of residence and employment was



uncertain. UK was clear that without a reciprocal pledge from all EU members with regard to British Nationals living all across the continent, it cannot make any decision on the said issue. The negotiations on Brexit was very likely to impact the right to residence for both British and European nationals.

### **Status of UK Citizens Working in the EU**

As of now an "Equivalent Retaliation" strategy seems to be in place for both the UK and the Union regarding the status of its citizens. It is quite obvious that the deal struck between UK and the EU will decide the status of UK citizens overall. However, if the UK government imposes restrictions on work permits for Europeans, then all the other countries could be reciprocating by asking Britons to apply for fresh visas to stay and work in their respective locations in Europe.

### **EU Citizens Seeking Employment in UK**

Much depends on the decision of the UK government, introducing the system of work permits. Currently all non-EU citizens are given limited entry as skilled workers where shortages in terms of skills are anticipated. While all rights remain unchanged and intact as of now, Brexit officials have said that EU migrants coming to the UK with Brexit happening may be turned down if and when there is a trend indicating an upward surge in new arrivals to UK. A harsh message is there on the wall for all to see as restrictions may be introduced. UK also wants to watch the trend before committing on the stay and work permit for EU nationals".

The Union rules guarantee visa-free movement for all citizens across its 28 member states. With Brexit, free movement could come to a grinding halt, leaving passport holders of the Union in Britain in a dilemma. However, legal experts are of the opinion that things will not change instantly. While none envisage anyone having to leave before the two-year period," some changes are definitely expected.

### **Should Employee Opinions be Sought?**

Employee opinions can level the playing field between two opposing voices - inform the corporate view and help management explain it to wider stakeholders and interested parties in government and media. The very act of engaging employees once in a lifetime decision

can surely make them feel valued and involved. Firms should engage employees on Brexit much as they do on benefit plans, training programs, opportunities for advancement and work culture, using transparency to build an essential employee asset – *Trust*. They should compare responses across divisions / regions / teams replacing tedious interviews and interpretation with real time, automated and anonymous analytics. Giving employees a voice on a crucial matter as this, is a mark of respect and the most inclusive way to help a Board find a majority view with which to explain to wider audiences exactly where they stand.

### **Brexit - Vulnerable Sectors and Countries**

The Vulnerable sectors identified as of today are finance, transportation, Information Technology and the Mineral industry. However more sectors may come under the "trade bleak blanket" in the near future as everything seems hazy at present. Nations having notable trade ties with the UK are vulnerable and may experience serious economic impact. Some of the EU markets with very high volume of trade ties with UK are **Germany; Netherlands; France; Ireland and Belgium**. The largest trading partner in terms of volume is Germany, while Ireland is the most dependent on UK trade in terms of imports and exports.

Countries that may bear the maximum brunt of Brexit in order of vulnerability according to ***The Atradius economic research, 2015 are as follows -***

**1.} Ireland:** A small but open economy, Ireland hugely depends on UK for the 14% exports and 34% imports as cross-border transactions. However, Brexit may benefit Ireland with large inflow of FDI as foreign investors seek some access points to the Union.

**2.} Netherlands:** UK's second largest trading partner is Netherlands both in terms of volume and proportion of exports and imports. It has big investment ties with UK and is also a very popular destination for investors from the Dutch land and vice-versa.

**3.} Germany:** Talking of Germany, it is the largest trading partner in the EU in terms of volume. Brexit would eliminate no. of benefits for the German industry, more so in the popular automotive sector. Interestingly, Germany is also Union's largest economy with relatively

low dependence on UK trade, hence it exhibits the least economic vulnerability and may not be deeply impacted as such.

### **Economic Warnings about Brexit**

The pound fell against the dollar alongside a fall in the share prices that was observed, in the aftermath of Brexit. Britain also lost its top AAA credit rating, meaning the cost of government borrowing is now going to be higher in the coming days. However, a month after Brexit, share prices in the UK recovered which was a great solace for its economy. The UK economy has certainly withstood the aftermath shock of the Brexit vote. While, most data gathered was before the leave union gig, the intelligence gathered data since 23rd June vote shows no clear evidence of any sharp general slowdown in economic activity despite increased uncertainty.

### **Uncertainty following Brexit**

**1.} Drawback:** The major drawback of Brexit is that nothing, whatsoever is planned or mapped out about the future action post Brexit. With no sound plans in place. Britain's future relationship with the EU remains a big question mark. Will Britain be allowed easy access of to the European markets? Would trade barriers hinder trade relations? Will any agreements be forged with the EU regarding movement of goods, capital and labour? Key questions such as the above remain unanswered by those strongly advocating Brexit. Increased uncertainty in general are definitely spooking the financial markets across the globe. The Global financial market volatility is expected with pound depreciating against many of the major economies, including India which cannot remain immune to whatever is happening.

**2.} Investments:** India is the second biggest source of Foreign Direct Investment for Great Britain at present. The historic and cultural ties between the two nations has made UK a gateway for India to the rest of Europe. Indian companies with units in the UK could sell their products to all of Europe under the European free market system. UK may now lose its charm as a destination for Indian FDI like it was earlier. Having said that, Britain will certainly attempt to woo Indian companies to invest like earlier by providing big incentives like tax breaks, tax holidays, easy regulations, simple terms

and conditions and off course attractive financial incentives.

**3.} EU Partnership:** India must build trade partnership with other EU nations to access the huge EU market. As aforementioned, Brexit has caused India to lose its easy route to Europe. This may compel India to bridge gaps and forge new ties with other countries of the EU, which could augur well in the long run. India is already trying to establish trade negotiations with Netherlands, France, Germany and a few other European nations, albeit in a small way. India's top FDI destination at present is the Netherlands and the ties with it may get stronger and more stable as well as established in the future.

**4.} Commonwealth:** After severing ties with the EU, fresh trading partners and a new source for capital and labour may need to be identified by UK which could look towards the Commonwealth countries. Here, it may to strengthen the existing alliances in addition to forge new ones. Britain will need talented / skilled labour, and India could be the perfect destination with its English-speaking population for this. With migration from mainland Europe drying up no sooner than later, Britain will surely look towards India and accommodate migration from it as well as other Asian countries, which will surely suit Indian interests.

**5.} Overseas Study -** Britain is a highly popular destinations for most foreign students wanting to pursue education abroad. With Brexit, UK universities will no longer oblige only European students with scholarships and may favour non - EU citizens, thereby, freeing up slots as well as education funds for Asian and Indian students and scholars. More Indians will thus, be able to travel to the UK for pursuing higher studies and gain knowledge in some of UK's best universities and education centres.

**6.} Ties with EU:** India as a strategic partner for UK in terms of trade may soon be a reality as Brexit will help accelerate the process. Europe needs to counterbalance United States of America and China geopolitically and would need to hedge against a slowing down China for its economic interests. Precisely for this very reason, Europe would be looking at the fastest-growing major economy in the world and would need to quickly resolve



all pending trade issues with India in order to develop a stable and lasting relationship.

**7.} Employment** - With Brexit, governance surrounding employment and job opportunities are likely to face uncertainty for several weeks, months or even a few years. Some EU regulations are to be untangled from the web to arrive at a feasible option. Hints are already floating in the press that on leaving the Union, the UK may become a member of the European Economic Area (EEA). Interestingly, both Norway and Iceland are already a part of the EEA and with UK following suit, it may mean benefit for all concerned, besides reducing hassles for citizens seeking employment.

**8.} European Economic Area** - If UK does join the EEA as being suggested by many, members of EEA have rules allowing employees to apply to their home state for a social security exemption certificate, known as the Portable A1. This will allow employees coming to the UK to continue to pay social security in their home state rather than UK NICs. Likewise when UK employees go to an EEA country with a Portable A1 certificate they will be able to continue to pay UK NICs instead of the local social security. This in general could benefit all the citizens.

### **Regrexit: Britons Clamour for a Brexit Vote Rejjig - Could that have happened?**

Majority of Britons who voted for Brexit experienced some uneasiness in the wake of the consequences and run down observed in the economic activity of Britain, post Brexit. Some however continued to suggest that Britain will be able to absorb the aftershock, calling it a temporary phase which will settle down with time. The vote to leave union had some profound changes with Wall Street suffering its worst pounding in the last 10 months or also sending the pound to a three-decade low against the dollar. Interestingly, more than 1.5 million people had signed a petition on the House of Commons website seeking to have the vote re-run less than 24 hours after the voting results had come out, clearly airing their disapproval of Brexit. Interestingly nearly 60 percent of Londoners wanted to remain in the EU as against only 40% wanting to leave.

### **Conclusion**

Brexit is Brexit and that's it. Britain is all set and ready

to take on the responsibility to confront the bleak or bright future because of Brexit. The pros and cons of Brexit have focused largely on two major issues – ***Economy and Immigration***. It is impossible to state whether or not what happened is for the good or bad thus providing scope for ample speculation.

The value of the pound slipped leading to strong reverberations throughout the global markets. In fact the pound saw its lowest value against the dollar in more than 3 decades. Despite all this, many Leave union campaigners believe that a silver lining will soon emerge from within the dark clouds and these are only temporary setbacks for Britain.

Many of the Brexit supporters firmly believe that there is more to gain than lose for UK with the Brexit decision. Majority of Britons think that the Britain's economic prospects have always been good whether inside or outside the Union and there is no need to really worry about the consequences of Brexit.

Britain wants to make Brexit, a success in the face of all odds, now that it has come out of the European Union. However, a number of changes are expected with many older agreements getting replaced by new ones. While most issues remain unclear, the world watches with bated breath the uncertainties and eventualities thrown up because of the bold step taken by UK to Leave the EU.

### **Select References**

- Brexit: top 5 countries and sectors at risk - Atradius\_economic\_research September 2015.
- MIT Observatory of Economic Complexity.
- [www.bankofengland.co.uk](http://www.bankofengland.co.uk)
- [www.bbc.com/news/uk-politics](http://www.bbc.com/news/uk-politics)
- [www.bloomberg.com](http://www.bloomberg.com)
- [www.business-standard.com](http://www.business-standard.com)
- [www.citizenadvise.org.uk](http://www.citizenadvise.org.uk)
- [www.economictimes.indiatimes.com](http://www.economictimes.indiatimes.com)
- [www.gov.uk](http://www.gov.uk)
- [www.independent.uk](http://www.independent.uk)
- [www.irishtimes.com](http://www.irishtimes.com)
- [www.lisbontreaty.org](http://www.lisbontreaty.org)
- [www.markiteconomics.com](http://www.markiteconomics.com)
- [www.money.cnn.com](http://www.money.cnn.com)
- [www.ndtv.com](http://www.ndtv.com)
- [www.newstatesman.com](http://www.newstatesman.com)
- [www.surrey-chambers.co.uk/financially-speaking/brexit-employment-of-eu-nationals-and-uk-employees](http://www.surrey-chambers.co.uk/financially-speaking/brexit-employment-of-eu-nationals-and-uk-employees).
- [www.telegraph.co.uk](http://www.telegraph.co.uk)

## The Disinvestment Programme in India - Impact on Efficiency and Performance of Disinvested Government Controlled Enterprises (1991 - 2010)

Anjana Mani\*

### Introduction

The Public Sector Enterprises have been of predominant importance from time immemorial, with several theories of growth highlighting the working of the Government through state enterprises. There were however, two schools of thought – the Classical school that advocated the existence of a free economy, adopting the policy of laissez faire, while the modern economists, especially John Maynard Keynes, spoke of the importance of a mixed economy, where there was co – existence of the public and private sectors.

In India, the Public Sector Enterprises have always been considered as engines of growth for their potential to foster and increase the pace of development in the country. The role of these enterprises in Pre – Independent India was negligible, given that private enterprises governed the development in the country during those times. With Independence, PSUs in the country gained importance and had the opportunity to promote rapid development in the country.

The public sector was structured to spearhead a chain of revolutions leading to the path of economic growth.

In the initial years of planning, the public sector was used as strong tool by the government to maintain its control over the key industries. The public sector was, in fact, seen as an instrument to move towards the ideal of a “socialist state”.

Before liberalization in 1991, the Central Public Sector Enterprises enjoyed monopoly and State patronage. But the policy of the license Raj - a policy, by which licenses were given to industries to set up their units which had encouraged a certain amount of corruption and red tapism in order to procure the license to start the functioning of the enterprise-was dismantled.

The USA along with the World Bank, IMF and other international organizations advocated what is generally known as – ‘The Washington Consensus’ – a set of policy measures by which the state in developing countries, would dilute its stake in the Public enterprises in favour of the private players and bring about a complete transformation in its performance.

Several countries across the world adopted this policy of Disinvestment to infuse more discipline in the functioning of the enterprises, due to private

---

\* Synopsis of the Ph.D. thesis submitted by the author under the guidance of Dr. K.K. Seethamma, Former Registrar, Chairperson & Professor of Economics Bangalore University & Awarded Ph.D. in Economics by the University in July, 2017.

participation. Disinvestment has been extremely successful as an economic policy measure mainly in China, Hungary, the United Kingdom and South Africa. These countries witnessed voluminous increases in the revenues of their disinvested firms consistently after disinvestment.

### The Indian Scenario

An escalation in the government's current expenditure was mooted as the reason for the fiscal deficit's growth to abominable extents. Interest payment ate up a large share of government expenditure in the absence of returns on productive capital expenditure and investment financed by debt, which in an efficient system, would have eased the crisis. A souring fiscal deficit and the Gulf War of 1990 inaugurated a chain of macro-economic problems. NRI deposits started flowing out and the Balance of Payment condition deteriorated. The government took huge loans from the IMF (US\$2.4 billion in January 1991). The foreign exchange reserves

sharply went down so much so that in July 1991, it was a mere US\$ 1 billion, sufficient to finance imports not even for a fortnight. It was in this atmosphere of crisis that the newly elected government in 1991 brought in a bagful of reforms, primarily aimed at macro - economic stabilization and reconstituting the industrial sector.

Additionally, nonviable PSEs were posing risk to the Government of using tax payers' money for non-productive purposes. Further, huge amount of accumulated debt of PSEs enabled Government's stake imperative. The situation lead the Government to resort to disinvestment.

The new economic policy of liberalization, privatization and globalization promulgated in 1991 induced the policy of disinvestment in the public sector units to find funds for meeting fiscal deficit, enable public participation, firm up market discipline and improve overall performance of PSUs. The table below briefs about the sources and share of funds between 1991-92 & 2009-2010.

Disinvestment from 1991 - 1992 till 2009 - 2010		
Item	Amount Realised (Rs. In Crore)	Percent
Receipts through sale of minority shareholding in CPSEs	39,617.91	68.68
Receipts through sale of majority shareholding of one CPSE to another CPSE	1317.23	2.28
Receipts through Strategic sale	6,344.35	11.01
Receipts from other related transactions	4,005.17	6.94
Receipts from sale of residual shareholding disinvested CPSEs/companies	6,398.27	11.09
<b>Total</b>	<b>57,682.93</b>	<b>100.00</b>

**Source:** Department of Disinvestment, Government of India

The consequence of this is the formation of Disinvestment Commission in 1997 which recommended, inter alia, restructuring and reorganizing PSUs, strengthening well performing enterprises and utilize the disinvestment proceeds funding them.

**The National Common Minimum Programme (NCMP)** adopted by the Government, in a nutshell outlines the policy of the Government with respect to the public sector including disinvestment of

Government equity in Central Public Sector Enterprises:

1. Commitment of the Government in having strong and effective public sector enterprises by full managerial and commercial autonomy.
2. Transparency in privatization efforts. Retention of existing "Navratna" companies.
3. Privatization is expected to increase competition.

The Cabinet Committee on Economic Affairs has also approved the **appointment of Merchant Bankers and other Intermediaries** for disinvestment transactions,

involving offer for sale or fresh issue by the company. This approval was expected to help planning and timing of the public offerings in a manner that they are spread out evenly and avoid bunching as far as possible so as to ensure better response from investors.

### Significance of the Study

For a company, efficiency is a measure of its capacity to deliver cost effective services and products maintaining a high quality and support to customers. A Company's ability to generate revenue greater than its expenses incurred for a particular period of time, reflects the amount of profits made by the Company. The extent of profit made has a spiraling effect on reinvestment capacities of the company influencing its secular growth. Companies that are efficient ensure optimum usage of resources contributing majorly to the steady and rapid development of an economy. Different types of efficiencies are used as metrics of measurement in different fields

- **Technical Efficiency** - is said to occur when the optimality condition is defined by a production function. The optimality condition reflects that the exact number of inputs are used, to produce a vector of outputs. Thus there are no inputs that are extra and redundant.
- **Allocative Efficiency** - The point reached by a firm, when the ratio of marginal products is equal to the ratio of their prices - when the goods and services are distributed in the economy according to preferences indicated by the consumers. This indicates that the firm has used its productive inputs in proportions which minimise costs and ensures correction of market failures.
- **Economic Efficiency** - The simultaneous occurrence of technical efficiency and allocative efficiency results in economic efficiency. The product of technical and allocative efficiency was termed global efficiency or productive efficiency.<sup>1</sup>
- **Dynamic Efficiency** which results from Innovative ways of production. It is associated with Prof. Schumpeter.
- **X Efficiency** is a type of efficiency measure applied specifically to those situations where there is more or less motivation of the management to maximise output or not. It occurs more in imperfect markets. This concept was coined by the economist Harvey Leibenstein.

Implementation of economic reforms that were necessitated in 1991, were primarily through the route of disinvestment. Disinvestment is known to achieve a greater inflow of private capital and the use of private management practices in Public Sector Undertakings, as well as enable more effective monitoring of management discipline by the private shareholders. Such changes are said to lead to an increase in the operational efficiency and the market value of the PSUs. This in turn would enable the much needed revenue generation by the government and help reduce deficit financing.

The Government of India had proposed that the proceeds obtained from disinvestment - which also form part of the annual estimated budgetary receipt - would be better utilised if diverted towards areas of social development such as basic health, family welfare, primary education and the reduction of the staggering public debt owed by the Government of India.

Another critical development is to encourage private players in the industry such as telecommunications to help derive cost advantage by the consumers.

Disinvestment also impacts the working of the capital markets in the country, helping to establish more accurate benchmarks for pricing and facilitates the raising of funds by the privatised companies for their future projects or expansion. The SEBI has encouraged the Indian Government to sell its stake to investors in the domestic market than the overseas markets, through the route of Global Depository Receipts and American Depository Receipts, to prevent excessive ownership in the hands of foreigners.

Better market discipline and an escalation in overall

---

<sup>1</sup> Farrell. M.J.: 'The Measurement of Productive Efficiency' JSTOR, 2005

profitability of the firm, mainly due to higher labour productivity is another outcome of disinvestment. This would help foster the twin objectives of economic growth along with conserving scarce resources by reducing wastage due to greater productivity.

## Review of Literature

**Geeta Gauri (1996)** in her paper titled '**Privatisation and the Public Sector in India – Analysis of Impact of a Non – Policy**' opined that the lack of a comprehensive policy on privatisation stands out in contrast to other aspects of the New Economic Policy. Perhaps this is politically expedient, but in terms of economic management and more so public sector management, the lack of a policy can result in unexpected outcomes which may not be all that expedient. Her paper attempted to provide glimpses of the possible outcomes of the non-policy on privatisation, focusing on the fiscal, efficiency and intersectoral dimensions.

**Dr. Himanshu Joshi (2001)** in his paper titled **Does Disinvestment Improve Financial Performance? A Case of Bharat Heavy Electricals Ltd. (BHEL)** advocated that a change in ownership would result in a change in the performance of the companies, as the main conflicting objective between the public and private sector is that of service and profits respectively. He studied the impact of disinvestment on BHEL and found that the company saw a major improvement in its profitability measured by the return on sales, a fall in its leverage measured by the debt - equity ratio, an improvement in its liquidity and a fall in the dividend payout ratio, primarily due to increased retained earnings maintained by the company.

**Neelam Jain (2002)** in her article titled '**Privatisation and Disinvestment in Public Sector Undertakings in India**' was of the opinion that National Policy Initiative like Liberalisation, Privatisation and Globalisation are significant innovations in the recent history of economic policy aimed at the faster development of the economy. Public Sector reforms require reduction of state control of the economy and expect participation of the private enterprises and market forces in the production process.

**Vipin Malik (July - September 2003)** in his article titled '**Disinvestments in India: Needed Change in Mindset**' believed that the existence of corruption and bureaucracy were delaying the implementation of disinvestment in India. While countries like Hungary, China, the Soviet Union and several other countries have successfully implemented the policy of disinvestment using several routes like the IPO, convertible bonds, the system of vouchers and foreign investors primarily, in India, the political parties are in agreement that disinvestment should be executed, but, there is no concerted move to do so. The poor pace of execution coupled with lethargy has caused the receipts from disinvestment to be minimal. He also suggested a five point reform process to improve and hasten the process of disinvestment

**Nand Dhameja (2003)** is of the opinion that the clock on Public Sector Undertaking has taken a full turn. Once seen as the engines of industrial growth, most of the state enterprises became a big drain on public money a decade or so later. The economic reforms of 1991-92 initiated the steps for privatisation or sale of such units on the economic grounds so as to lessen the burden on government finances. The article analyses the strategy, economics and administrative exercise behind the process of disinvestment.

**Bennett, John and Maw, James (2003)** in their paper titled '**Mass Privatisation and Partial State Ownership of Firms in Transition Economics**' examine how partial state ownership affects the firms' subsequent investment and output behaviour. They determine how the optimum retained state ownership share depends on product market competitiveness and find the conditions under which it would be preferable to sell the firms to a single owner.

**R. Nagaraj (2005)** in his paper titled '**Disinvestment and Privatisation in India - Assessment and Options**<sup>2</sup> opined that Ownership reform in public sector enterprises (PSEs) initiated since 1991 has yielded minimal receipts. The initial lethargy was perceived as an opportunity to make a careful decision regarding the choice of public sector enterprises to invest in. The opinion was, that since large firms were being selected, the chances of success would be very



high. Mutual Stock holding among complimentary enterprises linking it with public sector banks by encouraging active interaction between them and arranging for alternatives to dysfunctional legislative and bureaucratic interferences have been suggested.

**Amit Kumar Srivastava, Vilas Vasantrao Kulkarni (2006)**, in their paper titled '**Disinvestment in India: A Stakeholders' Management Perspective**' opined that India, after independence, adopted mixed economy, aiming socialistic pattern, through heavy investment in the public sector enterprises (PSE). Increasingly, PSE's activities were extended to non-infrastructure, non-core, and non-strategic activities, which later proved to be of major concern to the Government. The GOI in 1991 initiated a radical economic reform to increase the private sectors participation. These reforms have affected many sectors and caused resistance from different stakeholders. The success rate of disinvestment in India is about 50 percent only and thus, the management of various stakeholders including, international agencies, corporate houses, political parties, trade unions/employees, local community, media etc. become crucial for the success or failure of the disinvestment policies.

**Bala, Madhu (November 2006)** in her paper titled '**Economic Policy and State Owned Enterprises: Evolution Towards Privatisation in India**' providing an overview of the process of disinvestment and its implementation in India, argues that there has been state intervention through the state owned enterprises since time immemorial. Soon after independence, the Public Sector enterprises were highly efficient occupying the position of 'Commanding Heights', but this was short lived. Inefficiency and lack of accountability resulted in escalating losses of the public sector enterprises. She states that with the policy of liberalisation introduced, the enterprises have had to depend a lot more on the market forces, than the government. The economic reform implementation has been inefficient bringing in negligible receipts for most years. She has also cited several reasons why the policy of disinvestment hasn't been welcomed by some officials.

**Gupta Seema, P.K. Jain, Surendra S. Yadav and V.K. Gupta (2011)** in their paper titled '**Financial performance of disinvested central public sector enterprises in India: An empirical study on select dimensions**' studied the impact of disinvestment on public sector enterprises and compared their performance in the pre and post disinvestment periods. Their findings indicate that the loss making units that were disinvested did not improve in performance, while profit making units that were disinvested showed tremendous improvement in profitability and performance. They were also of the opinion that partial disinvestment would not be successful, as majority control was still in the hands of the government resulting in inefficiency in operation, along with a lack of competitive industrial structure resulting in high costs incurred.

**Garg Rakesh (July 2011)** in his article titled '**Impact of Disinvestment on Corporate Performance**' states that economic reforms that commenced in 1990 met with strong opposition from other political parties slowing down the process and infusing inefficiency and lethargy into the entire process. He studies how disinvestment has improved the performance of public sector units, if correct and timely implementation is carried out.

**M. Kanchan, R.G. Herlekar (December 2013)** in their article '**Ailing Public Sector Undertakings: Revival or Euthanasia**' opine that the loss making public sector units are ridden with inefficiency and complacency, especially units like HMT and Hindustan Cables Limited. The government financially supporting the restructuring of these firms has been censured by the authors, as restructuring has not improved the operating efficiency or liquidity position. Infact, the test on bankruptcy conducted reveals that there has been hardly any improvement with restructuring. They stated that as there was no change in management or production, the process of financial restructuring would benefit only for a short period, while disinvestment would bring in long term positive changes.

---

<sup>2</sup> This study is prepared for the ADB Policy Networking Project, coordinated by Chiranjib Sen, Indian Institute of Management Bangalore. I am grateful to T.C.A. Anant, K.L. Krishna and many participants of the two workshops held in New Delhi and Bangalore, for their comments and suggestions on the earlier drafts of the paper. Usual disclaimers apply.

## Objectives of the Study

- To analyse the changes in the **EPS of some disinvested companies** in the post reform period.
- To analyse the impact of disinvestment on **labour productivity using qualitative techniques**
- To measure the impact of disinvestment on the **financial efficiency of a company** using the **efficiency ratios**
- To construct an EGARCH model to study the impact of disinvestment on the **share price volatility - A case of the Oil and power sector firms in India...**
- To suggest an appropriate group of shares for the ETF through the construction of an **Efficient Frontier**
- To estimate the **appropriate Timing of disinvestment** using the **Force Index**
- To suggest suitable policy measures.

## Hypotheses

1. Disinvestment improves labour productivity of the disinvested companies.

$$H_1 > H_0$$

2. Disinvestment enhances the efficiency, increases the profitability and the overall production of the disinvested companies.

$$H_1 > H_0$$

## Methodology

- The data used is secondary from several sources –The Ministry of Finance - Government of India,, Department of Disinvestment - Government of India, CMIE database, PROWESS database, Company Annual Reports, Public Enterprise Survey, JSTOR, UNDP Journals, Economic and Political Weekly, Journal of Economic Literature, Ideas Repec Journal, Journal of Economic Perspectives, The Economist, The Southern Economist and the World Bank Report.
- Primary data on labour productivity is also collected from a couple of disinvested companies.
- The analysis of the obtained data would be carried out using several **Financial Ratios, Technical Analysis, Statistical tools** like correlation, regression, time series, ANOVA and **Econometric**

**tools** like the usage of **Garch** models to study the impact of disinvestment.

## Research Gaps

- Disinvestment receipts have been inconsistent since 1991, even though the Government, in every budget, has been very optimistic with the targets set to raise receipts from disinvestment, they have seldom achieved it. One of the causes for this could be the lack of timely disinvestment. One of the gaps is that research on the use of the **Force Index**, to determine the timely disinvestment of shares to optimize the receipts has not been covered by researchers.
- The existing modes of disinvestment in India were not consistently yielding the revenue expected, to render the process of disinvestment successful. It was thereafter conceptualised that an Exchange Traded Fund, comprising the shares of the around 11 profit making Central Public Sector Enterprises, was to be started, to assure better prices for the equity of these companies, through disinvestment. Whether the etf would yield the required results and revenue, would depend on the portfolio of shares of the selected companies. Not much research has been undertaken to highlight the construction of an '**Efficient Frontier**' comprising a portfolio of shares of the Public Sector Enterprises that have the best possible expected rate of return for their level of risk, when disinvested.
- Any programme is termed successful, primarily when the returns are voluminous. Share prices are one of the main factors that determine the strength of a company. The news about a company's performance and policies and the reaction of the market to these mainly determine the company's share prices. The volatility clustering of the share prices of disinvested companies in India, to assess the asymmetric effects between positive and negative returns on assets of disinvested companies in India has not been researched on adequately, using the econometric technique of **EGARCH**.

## Findings from the Study

- From the research undertaken, it has been found that disinvestment has had a myriad impact on companies, due to several factors

(i) **The extent of disinvestment undertaken – a minority stake sale** has not yielded too much of a change in performance, as government control is prominent and lesser autonomy is given to the company, while a **majority stake sale** (the government retains a 26% stake only in the company) **or a strategic sale** (the ownership and management are totally transferred to a private enterprise) has resulted in a complete turnaround in the revenues of the company, labour management and policy restructuring. Companies like Hindustan Zinc Limited have recorded very high share prices consistently and have diversified immediately after the sale of the company to a private player, Sterlite.

(ii) **The human resource available in the disinvested firm** – the type of labour force available influences the success of disinvestment in that company. Companies like HZL and NTPC have undertaken major labour restructuring schemes, whereby, they have changed the composition of labour, improving the overall efficiency of the firm, due to the disinvestment.

(iii) In the post reform period, only for three years, the disinvested proceeds exceeded the budgeted receipts due to the mode of disinvestment undertaken – mainly through majority stake sale or strategic sale alone.

(iv) The financial ratios – inventory turnover ratio, return on sales, earnings per share, have shown a significant rise since disinvestment – particularly in ONGC, NTPC and HZL. Maharatnas like ONGC have also benefitted from disinvestment undertaken in them, mainly through cross holding of shares, reflected primarily in its market capitalization. Currently ONGC is leading the top fifty Public Sector Enterprises with a market share of Rs.2,49,435.31 crore.<sup>3</sup> HZL & NTPC, too have shown improved returns with disinvestment improving their efficiency and performance.

**Table 1:** Earnings per Share of HZL from Disinvestment

Year	Reported Net Profit (in Cr.)	Number of Outstanding Shares (in Cr.)	Earnings Per Share (in)
1991-92	7.2764	41.2532	0.18
1992-93	9.2421	41.2532	0.22
1993-94	7.6554	42.2532	0.18
1994-95	9.7275	42.2532	0.23
1995-96	8.2335	42.2532	0.19
1996-97	9.717	42.2532	0.23
1997-98	12.33	42.2532	0.29
1998-99	13.09	42.2532	0.31
1999-2000	90.42	42.2532	2.04
2000-01	169.22	42.2532	4.0
2001-02	67.96	42.2532	1.61
2002-03	142.15	42.2532	3.36
2003-04	404.59	42.2532	9.58
2004-05	655.33	42.2532	15.51
2005-06	1472.48	42.2532	34.85
2006-07	4441.81	42.2532	105.12
2007-08	4396.01	42.2532	104.04
2008-09	2727.61	42.2532	64.55
2009-10	4041.41	42.2532	95.65

**Source:** Several Profit and loss statements of HZL

The government began disinvesting its stake in Hindustan Zinc Ltd from the very beginning. In 1991-92, the government auctioned 22.22% of its stake in the company to financial investors through the transaction of sale of minority shareholding. In 1992-93, a further 5.78% of its stake was auctioned again to the financial investors, bringing the total stake of the government in the company to 72%.

In 2002-03, the government decided to use the route of strategic sale, on the recommendation of the

<sup>3</sup> Department of Disinvestment, Government of India.



Disinvestment Commission, and sold 22.07% of its stake in HZL to Sterlite Opportunities and Ventures Ltd, along with selling 1.50% of its stake to the employees. This brought down the stake of the government in the company to 48.47%. In 2003-04, the government disinvested a further 18.92% of its stake in HZL in favour of Sterlite Opportunities and Ventures, bringing its holding in the company to 29.55%.

### Oil and Natural Gas Corporation (ONGC)

**Table 2:** Earnings per share of Oil and Natural Gas Corporation

Year	Reported Net Profit (in Cr.)	Number of Outstanding Shares (in Cr.)	Earnings Per Share (in)
1991 - 92	405.7	142.5934	2.85
1992 - 93	788.5	142.5934	5.53
1993 - 94	1588.1	142.5934	11.14
1994 - 95	2346.3	142.5934	16.45
1995 - 96	1945.4	142.5934	13.64
1996 - 97	2033.6	142.5934	14.26
1997 - 98	2677.8	142.5934	18.77
1998 - 99	2754.5	142.5934	19.32
1999-2000	3639.47	142.5934	25.45
2000-01	5228.78	142.5934	36.67
2001-02	6192.33	142.5934	43.43
2002-03	10529.32	142.5934	73.84
2003-04	8664.45	142.5934	60.76
2004-05	12983.05	142.5934	91.05
2005-06	14430.78	142.5934	101.20
2006-07	15642.92	213.8873	73.14
2007-08	16701.65	213.8873	78.09
2008-09	16126.32	213.8873	75.40
2009-10	16767.56	213.8873	78.39

**Source:** Several Profit and Loss accounts of ONGC

With disinvestment, most companies showed an improvement in EFFICIENCY. A study on The Maharatna, ONGC revealed that the company showed a massive increase in its earnings per share, volume of sales,

inventory and the Inventory turnover ratio, reflecting overall improvement in efficiency in the firm, ever since the government implemented disinvestment using the mode of cross holding of shares.

The policy of Administered Price Mechanism of the Government of India had hindered and restricted the profits of this oil giant. With deregulation introduced in 1997, ONGC was able to sell oil prices at international prices, giving an impetus for its profits to increase. A subsequent disinvestment of ONGC in 1999, through the method of cross holding of shares, saw the performance of ONGC improved manifold, as reflected in its EPS. Being awarded the status of Maharatna, the company has diversified and become a lot more competitive, being a world power oil company currently.

**Table 3:** Earnings per share of NTPC

Year	Reported Net Profit (in Cr.)	Number of Outstanding Shares (in Cr.)	Earnings Per Share (in)
1991-92	734.62	7.5083	97.84
1992-93	886.57	7.5083	118.08
1993-94	1057.97	7.9998	132.25
1994-95	1125	7.9998	140.63
1995-96	1352.61	7.9998	169.08
1996-97	1679.43	7.9998	209.93
1997-98	2122.3	7.9998	265.29
1998-99	2270.72	7.9998	283.85
1999-2000	3424.53	7.8125	438.34
2000-01	3733.8	7.8125	477.93
2001-02	3539.62	7.8125	453.07
2002-03	3607.5	781.2549	4.62
2003-04	5260.8	781.2549	6.73
2004-05	5807	824.5464	7.04
2005-06	5820.2	824.5464	7.06
2006-07	6864.7	824.5464	8.33
2007-08	7414.8	824.5464	8.99
2008-09	8201.3	824.5464	9.95
2009-10	8728.2	824.5464	10.59

**Source:** Several Profit and Loss reports of ONGC

The government has disinvested 5.35% of its stake in NTPC in 2004-05 through the mode of public offer, the type of transaction being sale of minority shareholding, reducing its share to 89.5% and not 94.65%, as simultaneous issue of fresh capital also took place at the time. In 2009-10 the government disinvested a further 5% in the company, bring its stake down to 84.5%.

Post disinvestment, the management efficiency in the company improved. The company's net profits recorded increased at a massive rate, due to lesser government interference and more autonomy given. The company has issued bonus shares and share splits, resulting in an increase in earnings per share and overall profitability of the company.

- (v) Market information causes volatility in share/asset price returns in the stock market. Any asymmetry in market information would cause greater variability and volatility. Volatility is a measure of variability in a stochastic process. Variability of asset prices is induced by anticipated changes in the expectations of investors. A good model of volatility provides accurate estimates and forecasts, enabling the estimation of market risk and portfolio optimisation. A study of the volatility in the share prices of ONGC revealed that The Egarch long run volatility values of 11.71% and 5.76% indicate excessive volatility clustering, causing great uncertainty in the market. The ongoing deregulation policy of the government wherein to lessen their burden and losses, the government was targeting the large profit making public sector enterprises in the oil industry, who had already been disinvested, to take on the burden of the oil subsidy, forcing the company's performance to be affected. Greater government influence was obviously the main factor affecting the performance of these large public sector enterprises.

### **Limitations of the Study**

Availability of data was the biggest hurdle faced while undertaking research. Companies were not forthcoming with data unavailable online, for security reasons. Databases like PROWESS, CMIE also were available

only to researchers and students belonging to the respective member Organisations.

As the study is limited to disinvested companies in a couple of Industries, namely the Oil and Power Industries in the Indian Economy, the conclusions drawn would be true of most of the companies, but not all, as some companies could show results contrary to those obtained from the research study, as they would not have benefitted much from Disinvestment.

The difficulty in getting complete data from primary sources has limited the extent of research. Data that has been used for the study, is mostly secondary data and insufficiency of data, cripple the conclusions drawn and the accuracy of the research study done.

### **Recommendations Based on Findings**

- On the basis of the findings, the following recommendations are made –
- The Government should adopt the appropriate mode of disinvestment ensuring that all stakeholders benefit.
- Preferably the sale price of the shares should be at a 10% discount from the previous close price on the stock market, to ensure adequate gains from purchase for the buyers.
- Unlisted companies should first be listed, before they are sold via disinvestment.
- Timing of disinvestment could be undertaken, applying the force index, to optimize receipts from disinvestment without having to resort to any distress sale.
- More autonomy should be given to the management to ensure suitable and competitive policy implementation.
- Suitable policy measures that could be incorporated to improve the efficiency of the execution of Disinvestment process in India.

### **The Future of Disinvestment**

The fiscal deficit of the Government is growing at an alarming rate over the last few years and needs to be arrested in order to facilitate faster and smoother development in India. Some of the large and profitable

Public Sector Undertakings have continued to make substantial profits, and have even earned a 'Maharatna Status' from the Government. But the performance of the larger number of the Public Sector Undertakings is still a cause for major concern for the Government, as they continue to drain its resources for their survival, and the overall profitability of the sector is plummeting every year.

A policy of disinvestment is imperative to rectify the inefficiency in these enterprises and escalate Government profits, ensuring optimum usage of the resources in a planned manner. Disinvestment is a policy that is inevitable for India, to achieve a higher growth rate, along with plugging the growing fiscal deficit.

## The Application of Total Quality Management (TQM in Not for Profit Organizations (NPOs) – with Special Reference to The AkshayaPatra Foundation in India

S.R. Sandhya Rani\*

### 1.1 Background

Production of standardized products began in 2nd World War, wherein standard became essential support in Military organization. During the post 2nd World War period controlling quality during production process was given prime importance for products of defense origin in USA. The textile mill was facing the problem of production of standardized cloths in UK. The necessity of production of standardized product led to the introduction of process control. The aim was to correct the production systematic process level wherein any system problem are attended to, for ensuring at the end a standardized product. The process was termed Statical Process Control wherein X R charts were used effectively. This was followed by product control techniques as enumerated by charts such as defects charts, proportion of defect charts such as no defect, proportion of defect chart and number of defect per unit and the like.

The realization that statistical process control and

product control are only to produce products which appear exactly alike came up a little later. The control chart specialists implied that the process and product control technique meant only control of the process for production of similar products within specification limits. The concept of quality management in its totalitarian sense was discovered by Walter A Deming. Total Quality Management in its sense meant quality as positioned in consumer's mind, would get inducted in the modification of design prototype and commercialization of the product. Total Quality Management ensures a sense of quality complete in all respect. Such an effort would yield rich dividends in terms of increase in product performance and increase in product life. The Japanese efforts in introducing TQM for consumer electronic products have heralded global revolution.

### 1.2 Review of Reviews

The reviews have been attempted with respect to two dimensions:

(1) Concepts and (2) Application.

---

\* This is synopsis of the thesis guided by Dr. T.V. Raju, Director of R.V. Institute of Management, Bengaluru 560 041. Manipal University has awarded Ph.D. degree in Management in March 2017.

The total quality management as a concept emerged from the industry wherein control of errors, defective items and not meeting standards of specifications was in vogue. The conceptual foundation was to minimize systemic errors and accept errors which happened by chance in a production environment. Quality as a tool was examined in its source of its generation happening at time of design, which leads to production of defective items through a production process. All quality gurus concentrated on formulating a perfect design which they presume would lead to a quality product (Taguchi). The concept of quality is an organizational setting was introduced by Deming, who linked up Vision, Mission, Goals and Objectives of the organization to the production of end products. An induction of quality idea in people across hierarchy is expected to lead to quality products which are consistent, sufficient, and efficient in terms of value of the end product. The clarity in quality came up when customer feedback and its transmission to the top of the organization, which in turn would lead to process flow of quality as a corrective idea of the improvement of the product. Deming positioned quality in an organizational setting in the minds of human resources. Thus quality became a core theme of study wherein, completeness of idea of quality is to be encircled with.

As many as 49 available materials, in published or unpublished form, thesis or reports, books and research papers on application of TQM have been reviewed. The overall review on application orientation on concept of quality is done here. The principles of TQM has found application is automotive industries, construction industry, big and small scale industries in private or public sector, technology transfer, financial services, software companies and in market orientation. Factor analysis of TQM across organizations, in education and in research and development, has been applied. Tools of TQM such as Six Sigma, Kaizen, Pareto analysis, lean management, Just In Time (JIT) have found applications in several industries. The use of TQM in public transportation libraries, education instruction and in universities is becoming common. The relation between TQM and balance score card, TQM and human resources, TQM and learning, TQM and health and medi-care services have been done. Use of TQM in land administration,

firm performance, and effectiveness of strategies are documented. The application of TQM in non for profit organization in terms of making critical insights are found in the papers of guy D. Langvardt (2007), process improvement of NPO in Vikki C. Lasstier (2007) and in the literature support of industry application.

The classic book of Peter F. Drucker (1990) provides strong theoretical foundations on the principles and practices to be followed in managing an NPO. Thus it can be concluded that there is no comprehensive study on application of TQM in an NPO setting.

### 1.3 Research Gap

Studies for review conducted so far indicate that there are several applications of TQM of the product and service industries. TQM is considered a tool, a practice a system a thought process and a thought revolution in management. The range of studies extends to several product bases, industrial systems, types of organizations and to various governance styles. No study appear to have been done conspicuously on application of TQM principles to a Non-Governmental Organization (NGO) or a not for profit organization. The present study intends to examine application of TQM in an NGO or a Not for Profit Organization (NPO).

### 1.4 Selection of the Organization

The Global Journal in its 2013 report has short listed 450 NGOs from a list of 10 million organizations. The first three NGOs based on a sector have been ranked on the basis of impact, innovation and performance. TAPF is ranked as best organization that is **number one in children and youth sector**. Hence TAPF is selected for the study.

#### The Akshaya Patra Foundation (TAPF) - A Profile Origin

The origin of The AkshayaPatra is based on a life time vision of Srila Prabhu Pada – the Founder Acharya of ISKCON movement in the world-on a day when he saw children fighting with street dogs for food. This lead to a lifetime vision which is stated thus, “No child within a radius of 10 miles from our center should go hungry.”

#### Vision

The ISKCON center in Bangalore was visited by

Mr. Mohandas Pai in 2000. The interactions with Mr. Mohandas Pai lead to the seedling of serving food to children in government schools. Mr. Abay Jain inducted similar thoughts from where the idea of doing something that may touch school children came out. The target group to be covered was school children in Government schools. The vision of Srila Prabhupada got contextually adopted as: "To ensure that no child in India is deprived of education because of hunger." Accurate mission statement came out from the adopted vision, the mission statement of AkshayaPatra now is: "To reach out five million children by 2020".

### **Objectives of The AkshayaPatra Foundation**

The objectives of The AkshayaPatra can be stated given the adopted vision and mission statements. The objectives are:

1. To serve nutritious food for children studying in Government school.
2. To facilitate the school children were served with food to learn better and
3. To enable any other activity that will help foster to reach the goals set by the organization.

### **Goals of TAPF in India:**

1. To cover all five million children by 2020.
2. To cover all Indian states (25 Indian States + two union territories) by 2020.
3. To enable take up support activities after class tuitions health care, life skills program and Provision of scholarships for 2020.
4. To make AkshayaPatra model available for emulation in different context.
5. To work towards vertical and horizontal expansion to foster growth.
6. For ensuring the support of corporate donors.
7. To make the organization more transparent and accountable for all its action &
8. To build up social capital for the society.

TAPF has grown from strength to strength since its establishment in 2000 in Bangalore. The program began with feeding 1500 Government school children in the periphery of Bangalore city in year 2000. As on

April 2013, TAPF is serving 1.3 million children across 9 Indian states in 18 locations.

### **1.5 The Problem Statement**

The problem of Total Quality efforts and results therein are of interest to anyone who intends to conduct research in area of total quality. Studies appear to have been done mostly in manufacturing sector across the 1st and 2nd World war and emerging economies.

Studies have been done in the area of service quality. The research studies of Parushuraman and others have assessed service quality in all sectors-product and services included. No study has been done in Total Service Quality. Equally deficient on studies on TQM is in "Not for Profit" organization (NPO). An authenticated assessment of Total quality is the need of the hour for enhancing the application of TQM and to make out characteristic differences the organization under study.

### **1.6 Objectives of the Study**

Given the relevance of TQM across all organizations, the present study applies to an NGO known as The AkshayaPatra Foundation (TAPF). The context of study as applicable to TAPF has the following objectives:

1. To make thorough review of TQM principles and its application;
2. To analyze the organization selected for the study The Akshaya Patra which is a unique NGO in the Indian context;
3. To examine the application of TQM principles by TAPF
4. To suggest how TQM principles could be more effectively applied to TAPF.

### **1.7 Hypotheses:**

The settings so far described of the study have enabled us to float the following hypothesis:

1. Basic principles of TQM are conceptually positioned at the corporate level at TAPF.
2. Application of TQM is done in the food production process at TAPF.
3. The children are getting good quality nutritious food on time from TAPF.
4. Performance of The AkshayaPatra can be termed as excellent.



## **1.8 Total Quality Management (TQM) – An Appraisal**

The quality of a product is reflected by the feedback given by the customer after use. Any organization intends to have continuous feedback to enable product / service improvement. All giant size organizations in the manufacturing sector will have quality in action by efforts in multifarious dimensions. When asked about quality amongst segments of people in the organization, nothing comes out clear. It is here an effort needs to be made to understand TQM in terms of concepts, types, dimensions steps, principles absolutes & tools.

### **Evolution of the Concept**

Quality is defined in several dimensions. Quality is “fit for use”, it is control, it means assurance Quality is defined as “Fitness of use”. Quality is expected to derive greater consumer satisfaction. It will yield higher returns. Quality reflects reliability and effectiveness – i.e., doing right thing right. Quality means consistency. Quality will address customer wants and needs at a lower cost. Quality is addressed by change dimension such as technology society, economic and political dimensions. Quality is sure to help predict customer needs. Quality is a characteristic of a product or service that satisfied customer needs. A quality product is free of deficiencies. Quality is “information to requirement”. This means that no quality leads to non-performance. Hence quality is a customer determination based on Experience of a product or service. Measure against stated or unstated conscious, or sensual, technically operational or entirely subjective and always represents a moving target in a competitive market.

There are different types of quality problems at different stages in production and after completing the production of final product. At first quality problems emerge in the design stage.

An assessment has to be made to examine whether the product has been designed to meet the customer needs – real or perceived or both. The next phase is to examine quality in terms of conformance i.e. whether the product produced has met the requirements set forth by the customer. Further the phase is performance. Customers would examine whether the product/service is performing as intended or identified by customer.

To sum up there are three types of quality issues at design, conformance & performance phases of a product. Quality also has to be assessed as efficiency in operation with minimum of resources. The size or volume, cost and lead time of production of delivery matter here.

## **2.0 Research Design**

### **2.1 Area of Study and Choice of Organisation**

The area of study is an NPO in India which has the distinction of being the best and ranked as number one in child and youth sector in the World as per The Global Journal Feb. 2013. The organization is – The AkshayaPatra Foundation (TAPF – 2000). The selection of the organization is justified on the following grounds:

TAPF delivers mid-day meal to the children who are studying in Government owned Primary and Secondary Schools in India.

The children belong to the most under privileged sections of the society.

No distinction is made by gender, religion or any other ‘narrow domestic wall’.

The organization is recognized by the government – state and central.

TAPF is recognized by donors, corporate, foundations, big and small donors.

TAPF covers 10 states in India in 22 locations.

Quality process is initiated and efforts have been made to install quality in the process as well as product delivery.

TAPF is the only organization which has implemented technology in large scale food production.

The organization is making continuous efforts in the improvement of physical product service delivery and reach of the end users (children).

### **2.2 Universe of Study**

The present study intends to examine the application of TQM principles and contribution in the commercial settings, to a setting of an organization in Non-Governmental format or Not for Profit Organization (NPO). While total quality management aims at



positioning of quality based on the needs of consumers, the same gets transmitted in refinement of product design, the process and the end product. The Not for Profit Organization (NPO) has a similar setting in terms of service product to be positioned and delivered to its target group. The formation of an NPO is legally set as delivering quality service product without profit orientation. Over the years it has been observed that, NPOs decline because of dependency syndrome of the organization i.e. every NPO, which is formally established, will depend on its donors, after a year or two for acquiring funds. The failure of an NPO leads to nonfunctioning of the organization.

Each NPO that is setup is on a social cause for deriving social novelty. This requires continuation and sustenance of the organization for long period of time. The service product to be delivered to the end users is dependent on availability of funds for setting the organization towards delivery. The organization requires more funds for consistent delivery and expansion of the end user base. The recognition of the organization have enthused all donors to support on a large scale and in large numbers. The need for the present study in defining the universe is in the context of reception of the end users, the donors by making the organization deliver the right service product at the right time and ensure continuity. The universe of the present study is to assess the TQM and its practices in an NPO setting to evaluate and assess ramifications of quality service product delivered to users.

## 2.3 Population

The coverage of the study in terms of geography is India. The six Indian states form the geographies for study: 1. Karnataka, 2. Gujarat, 3. Rajasthan, 4. Odhisha, 5. Uttar Pradesh & 6. Andra Pradesh.

The following variables of the population are covered: a. Number of children, b. Number of schools and c. Type of kitchen. The study entails the coverage of different domains who contribute to the process of total quality diagrammatically are: i. Kitchen supervisors, ii. Schools children and Teachers, iii. Donors & iv. The Government.

The population size of each one of these is given below:

Sl. No.	Particular	No.
1	Suppliers	-
2	Kitchen Supervisors	320
3	Schools	10050
4	Children	1347513
5	Donors	-
	Individuals	140370
	One time donors	106459
	Corporate donors	7977
	Trusts and foundations	1007
	Governments	9

## The Selection Process:

The year of establishment of AkshayaPatra kitchen vary from 2000 & 2012. Those units which are serving food for children since last five consecutive years spread across 9 states have been selected. This is based on the assumption that any quality process to get initiated will require a continuous and uninterrupted service of food delivery to children of under privileged schools for 5 years. This criterion is applied across all states to enable selection number of schools and children.

## Type of Kitchen:

Two types of kitchen are in operation:

(1) Centralized & (2) Decentralized.

Centralized kitchen serves food for larger number of children per day as compared with decentralized kitchen. The quality initiatives are rigorous implemented and documented in centralized kitchen. The effort is the same in Decentralized kitchen. However decentralized kitchen relatively smaller number of children. Decentralized kitchen located in rural remote areas to facilitate serving a cluster of schools. These are characterized by food culture, prevalent in those areas. These are women empowered operating under self-help groups. The food served will meet the standards of nutrition for young children. All the inputs and training required for preparation of food will be given in decentralization kitchen since they are located in access difficult areas. The study intends to restrict to centralized kitchens.

### Centralized Kitchen:

Centralized kitchen normally serves about a lakh children. Amongst the centralized kitchen those which are serving more than 50,000 children are considered as large kitchens & included in study. The list of centralized kitchens across different states and their coverage of schools and children are given below:

Sl. No.	State	Centre	No. of Children	No. of Schools
1	Andhra Pradesh	Hyderabad	54,849	454
2	Gujarat	Gandhinagar	1,21,508	666
3	Karnataka	Bangalore	85,204	487
4	Karnataka	Bellary	1,15,945	575
5	Karnataka	Hubli	1,26,693	789
6	Karnataka	Bangalore Vasanthpura	99,326	568
7	Orissa	Puri	55,835	648
8	Rajasthan	Jaipur	92,763	1081
9	Uttar Pradesh	Vrindavan	1,39,262	1874

Total No. of States = 6 (66%)

Total Kitchens = 9 (45%)

Total No. of Children – 8,91,685 (66.17%)

Total No. of Schools – 7142 (71.06%)

The study thus intends to cover six out of 9 States where AkshayaPatra is in operation. This means covering nine out of 20 kitchens & 66.17% of children & 71.06% of schools for study.

### 2.4 Sampling Design

The sampling plan has aimed at convergence of centers kitchens children and teachers. The sampling plan has envisaged proportional weights with respect to children and teachers. The sampling plan has envisaged proportional weights with two genders of children covered. The determination of sample size with % error works out to N = 891685 size of population.

The number of teachers will be in proportion with number of children selected. Those teachers belonging to a school whose children have been selected would

be interviewed i.e. selection of Teachers is dependent on the selection of children in that school, where teacher & taught meet. This would enable to capture perceptions and experiences of children & teachers.

### Selection of Employees:

The organization of each kitchen is best with the employees who are designated with the job of supervisors. Each Centralized Kitchen consists of Supervisors / Head of Quality, Preproduction & Production, Post Production, Quality, HR, School Relation, Finance and Maintenance. Since the study mainly connected assessing quality, two of supervisors except from Finance & Maintenance would be selected. The employees in each kitchen are rigorously supervised by the corresponding group head. Two functionaries from each of these areas would get selected for enumeration that is out of nine kitchen selected 12 functionaries who are responsible for monitoring activities and quality functions would form the sample. In essence 108 (12 X 9) functionaries would be enumerated. The sample size is 50% of the total number of human resources who perform their activities (108 / 216).

### Donors:

Donors form the Finance base for institutional development. They contribute to physical infrastructure, such as land, building, Motor vehicles and other such items connected with capital expenditure. The Donors are of 5 types. They are individual donors, one time donors, corporate donors, trust & foundation and Government Donors. The breakup of Donors by type is given below:

Donors by Type of AkshayaPatra Foundation as on 2012-13.

Sl. No.	Donor Type	No
1	Individuals	1,40,370
2	One time donors	1,06,459
3	Corporate donors	7,977
4	Trusts & Foundations	1,007
5	Governments (8+1)*	9

\* 8 State Governments and one Central Government

The donors who are active and who are associated with the organization would be considered. That is one time donors who just contribute funds & who remain functionally not associated with the organization are ignorant or not aware or partly aware of the activities of the organization. The data we intend to collect from them would be scanty or partly true. As such it has been decided to not to interview one time donors.

The selection process of other types is enumerated here:

### Individual Donors

Amongst individual donors a list of donors from India was prepared, and 58 Donors were enumerated. The enumeration process was personal interviews.

### Corporate Donors

A list of corporate donors was made. Those corporate donors who are contributing to the institution was short listed. The first 24 short listed corporate donors were enumerated through online.

### The Government

There are eight state governments and one central government for the AkshayaPatra. The contribution of government by size was listed. That state which is contributing highest was selected. A check list was prepared and appropriate data was collected for assessment.

The overall research plan across all target groups against their population size is briefed below:

Sl. No.	Particulars	Sample Size	Population Size
1	Children	500	12,72,215
2	Teachers (1:5)	100	-
3	Employees	108	216
4	Donors	-	-
	Individuals	50	1,40,370
	Corporates	10	79,777
	Trusts & Foundations	-	1,007
	Governments	1	9
5	TAPF Trustees to be interviewed	1	8
6	No. of states selected	1	9
7	No. of kitchens	9	20
8	No. of years of kitchen served	> 5	-
9	No. of meals prepared per day	> 50,000	-

### 2.5 Determination of Sample Size

The sample size is spread from the end target group, the determination of children spread across six states in nine kitchens form the size variable. The method of

probability proportional to size (PPS) sampling has been used. The overall size of sample is restricted to 500 numbers which is statistically large. The sampling plan for the entire study is tabled below:

Sl. No.	State	Kitchen	No. of Children	Percentage of Children Total	Sample size	No. of Teachers Covered
1	Andra Pradesh	Hyderabad	54,849	6.15	31	6
2	Gujarat	Gandhinagar	1,21,508	13.63	68	14
3	Karnataka	Bangalore HK Hill	85,204	9.56	48	10
4	Karnataka	Bellary	1,15,945	13.00	65	13
5	Karnataka	Hubli	1,26,693	14.22	71	14
6	Karnataka	Bangalore Vasanthpura	99,326	11.15	56	11
7	Orissa	Puri	55,835	6.26	31	6
8	Rajasthan	Jaipur	92,763	10.40	52	10
9	Uttar Pradesh	Vrindavan	1,39,262	15.63	78	16
		<b>TOTAL</b>	<b>8,91,685</b>	<b>100</b>	<b>500</b>	<b>100</b>

Table: Determined Sample Design and Frame.

The children are selected by equal opportunity to gender. The sample size thus becomes:

$$n = 0.00192 / .0000038723 = 496 \text{ at } z = 1.96, d = .00000387223.$$

The number children interviewed using PPS method of sampling across kitchen is 593. The distribution of children and other target groups covered are given in the following table:

## 2.6 Operational Definitions

There are two categories of operational definition envisaged in the study. First is the operational definition of TQM Concept. Secondly, the operational definition of functionaries of TAPF.

### TQM Concepts

**Quality:** The food product which is fit for human consumption.

**Total Quality:** That food product which is of high quality prepared under established process of hygiene, nutrition value and acceptable taste.

**Standard of Quality:** That standard set by ISO 22000 for food quality.

**Food Safety:** That standard set for delivery of "safe, nutritious, tasty food on time, and every time" (compliance of norms of Food Safety Standards Act – FSSAI – 2006).

**Kaizen:** Continuous improvement made in each phase of the process to ensure overall food safety and standards.

**Six-Sigma:** Reduction of errors on delivery of mid-day meals in accordance with menu charted.

**5S:** Those principles of Sort, Segregate, Shine, Standardize and Sustain – which ensure an orderly disposition of housekeeping practices.

**Nutrition Value of Food:** That composition of nutrition will help improve health of children across special differentiation.

**Hygiene:** Refers to practices which lead to cleaning, sorting, storing and such other practices in storage production and distribution processes which would lead to a healthy product for consumption.

**Personal Hygiene:** Refers to individual as well as group hygiene practices which will lead to improvement and sustenance of health.

**Menu:** That list of items identified and listed as the requirement for the end users.

## **2.7 Target Groups**

The Target Groups are given here: i. Pre-Production Supervisor, ii. Production Supervisor, iii. Post Production Supervisor, iv. Quality Supervisor, v. HR Supervisor, vi. School Relations Supervisor, vii. Teachers, viii. Children, ix. Donors, x. Quality Head & xi. Board of Trustees.

## **2.8 Instrument Development**

Three major instruments are essential as a part of the study: 1. Check list, 2. Schedule & 3. Questionnaire.

### **Check List:**

A detail check list was prepared to study macro level performance of AkshayaPatra. This check list included variables associated with the institutions. Number of meals served, number of children served, number of schools covered, location, number of years of serving, number of employees, no. of donors, types of donors, the government, the trustees and several such details were covered. The check list enabled the researcher to prepare the base for research.

### **Schedule:**

A format needs to be prepared to elicit information in the organization. The performance of production process and the reach of different target group's annual statement of accounts and such other details were formatted to be collected. This schedule enabled the researcher to prepare a sampling plan.

### **2.8.1 Slicing of Instruments**

#### **Questionnaire Development:**

Questionnaire was developed with respect to following target groups:

1. Children, 2. Teachers / Head Masters, 3. Donors, 4. Pre-production supervisors, 5. Production supervisors, 6. Post production supervisors, 7. Quality supervisors, 8. HR supervisors & 9. Supervisors for school relations.

#### **Questionnaire Development Process:**

Each Questionnaire is divided into two major parts. Part I is Demographics & Part II reflection on statements.

#### **Demographics:**

Demographics covered in all instrument age, gender,

school, education qualifications, number of years of services, locations, occupations of parents, religion, status, area of work in AkshayaPatra, qualification, no. of years of contribution, regularity of contribution, presence and absence of Quality department and type of kitchen.

### **Part II:**

The part II in each questionnaire has a set of statements which covers various aspects of quality.

#### **Children Questionnaire:**

The end product is the food delivered to children six days in a week, Monday to Saturday. Food prepared in AkshayaPatra kitchen would be delivered in hygienic special stainless steel containers to enable children eat fresh food. The location needs of children in terms of staple and nutritious food is being delivered. The quality aspects with respect to children are encompassed in the characteristics of interest with respect to target group. The attributes or characteristics of interest are: 1. Taste, 2. Sufficiency 3. Variety of menu, 4. Time of intake, 5. Freshness, 6. Preparation for taking food, 7. Serving food, 8. Cleaning plates, 9. Regularity, 10. Personal hygiene, 11. Improvement in performance, 12. Improvement in learning, 13. Happiness and 14. Satisfaction after consuming food, 15. Socialization, 16. Improvement in health, 17. Feedback, 18. Itemized delivery, 19. Purpose of joining school, 20. Nutritional value of food, 21. Flavor/Aroma, 22. Do not waste food, 23. Sweets, 24. Curds, 25. Cleanliness worker.

Some relevant statements were developed using the language of children to enable them to reflect experience. As many as 25 statements were developed and edited with the help for experts in this field. The refined questionnaire was then replicated for pilot testing.

#### **Instrument for Teachers / Head Masters:**

Part I is Demographics.

The Part II of this instruments consisted of making an assessment of the food delivered through AkshayaPatra. The first 20 questions are measuring same parameter as that of children's questionnaire, other five questions are mentioned below. The variables concerned in this instrument are: 1. Quality, 2. Sufficiency, 3. On time

delivery, 4. Quality delivery (hot), 5. Improvement in enrollment, 6. Attendance/Punctuality of children, 7. Hygiene habit of children, 8. Socialization, 9. Taste of food, 10. Regularity of feedback, 11. Action on feedback, 12. Variety of food delivered, 13. Improvement in children health, 14. Freshness (hot), 15. Improvement in learning, 16. Nutrition value, 17. Improvement of Feedback, 18. Regularity of food served, 19. Dropout rate reduced.

### **Instrument of Pre-Production Supervisors**

This instrument covers those aspects of inventory control and quality to be ensured. It covers details of vendors, supplier development, food safety, inspection, check list, inventory management, sequence of raw materials used, storage and retrieval, JIT FIFO, care in using raw material, sufficiency of stock, duration of stock, clearing, pest control payment of price to vendors, punishment to erring suppliers, grading of suppliers, list of approved suppliers, follow ERP, Procuring vegetables, hygiene and application of 5S.

### **Instrument of Production Supervisors**

Production Supervisors are expected to follow quality initiatives right from availability of raw materials to caring for food safety. The variables and attributes covered are cleaning and sanitizing, ERP, JIT schedule for cooking availability of food grain material, sterilization before cooking, monitoring critical control points, Standard Operating Procedure (SOP) Automated Technology, level of human intervention Training of cooks and supervisors, taste improvement, assessment of nutrition value, preparation of material for cooking, quality checks, adherence to practices, Quality initiatives, Kaizen, 5S, Six sigma process improvement, food lab, ecofriendly initiatives fuel efficiency, prepared for emergency, traceability, practices of good habits, quality and safety, prevention of wastage and air pollution.

### **Post Production Supervisors Instruments**

Post Production Supervisors are expected to take care of food. Important characteristics of quality covered are Kaizen, Six Sigma, holistic approach, safety, on time delivery, road safety care before loading food & delivery, route optimization for delivery of food,

tampering of food, GPRS tracking, training, ISO 22000. Ideas on reduction of cost & employee care.

### **Instrument for Quality Initiatives Supervisors**

The characteristics of quality covered are food safety standard, FEFO, JIT, FIFO, training, pest control supplier development, grading of suppliers, taste, nutrition, ISO 22000, holistic approach, ISO Audit, Internal quality audit, 5S, Surprise audits, Food lab, biogas, hygiene, on time delivery GPRS, Employees safety, training, route optimization for delivery of food, traceability and team building.

### **Instruments for Supervisors HR**

These supervisors take care of hygiene, training, food safety, quality, customer satisfaction, good practices, emergency preparedness, training of employees, water and air pollution, team building, employee benefits and training of children.

### **Instruments for Supervisors School Relations**

The main concern of supervisor school relation is on time delivery, quality, GPRS, taste, sufficiency, consistency searching for new ideas and team building.

### **Questionnaire for Donors**

The donors are supporters of the institution who take care by contributing their savings. The mindset of a donor in terms of association, contribution, image value, cause, intention, volunteering giving back to society, pride of giving and association are considered. The instrument will examine the characteristics of donor and the relationship of the organization with them. An assessment of traits of a Daani would be examined. The questionnaire also examines the value for money donated. Check list are prepared separately for corporate donors, and the Government, with exclusion is one time donors Trusts & Foundations. Any donor who appreciates the organization by contribution will repeat the exercise when he is convinced of right use of his donation.

The questionnaire also examines the value for money donated in terms of transparency, usage and realization of value.

### **Translation**

All the developed instruments have been translated



into five languages from English: 1. Kannada, 2. Telugu, 3. Hindi, 4. Gujarathi & 5. Oriya.

### **Statistical Tools Used**

The first tool that is used is assessing sampling adequacy. The adequacy of a sample is examined in terms of association of sample values and its closeness to the population values.

### **Reliability & Validity**

The reliability & validity of data sets would be assessed by Cronbach's Alpha and split half method.

Neyman's sphericity ratio was computed to support reliability and validity measures.

### **Data Editing**

Any data set needs editing because of likely presence of outliers. The data set would be normalized by Z statistics to facilitate removal of outliers.

Correlational Analysis was done to examine the degree of association between production and distribution. The values of r and chi square revealed the degree of association between experienced responses of employees, teachers and children.

Multiple regression analysis would be attempted to pin points the significance and the role of people in influencing the overall performance for effectiveness of the organization.

Conjoint analysis would be attempted to analyze the influence of people food target groups & donors.

**Quality Head and Board of Trustee's** enumeration was by interview with set of questions /check list to cover all parameters.

An **interview with Government** officials of Mid Day Meal scheme was done with a set of questions.

### **2.9 Limitations of Study**

The limitations of the study are:

1. The assessment of application of TQM is with respect to an NPO in child and youth sector.
2. This study area is India and the coverage is with respect to six States of India where the TAPF is in operation.

3. The selected kitchens for the study are those which are continuously supplying food for children for last five years.
4. The study is limited to TAPF in India. There are offices outside India. As such they are not considered.
5. The decentralized kitchens are not studied. Kitchen which are serving 50,000+ children are considered for the study.
6. The extent of local participation in each location is not considered for analysis. TAPF is the center of study.
7. Care has been taken to translate the instruments into six Indian languages. There are some possibilities of translation errors, transcription errors.
8. Each child is expected to reflect on its own. There are, however, some possibilities of peer group influence (the child may get influenced by children next on either side). Efforts have been made to reduce peer group effects.

### **3.0 Findings & Conclusions:**

The analysis of different target groups such as children, teachers, supervisors in pre-production, production, post production, school relation HR quality and donors has reflected many salient findings. These are coded here in a sequence.

#### **3.1 Reflection of Children**

As many as 593 children covering six states nine kitchens studying between 5th & 10th standard have an average age of 12.98 (13) years. The father of children is mostly coolie or farming as their occupation. The mothers of these children are mostly home maids or home makers.

The gender ratio of the children is 48.9% boys and 51.1% girls. The children belong to Hindu (88.9%), Muslim (8.1%), Christians (1.7%) and others including Jains is 1.3%. The children have responded positively and have rated 4.5 + out of 5 for the parameters in the instrument. The children are delivered food in accordance with an approved menu for 6 days in a week. The children are getting sufficient food, on time, always, hot and with different taste of sambar every day. They enjoy eating food with friends and have perceived an improvement

in their health. They like sweets and curds wherever served, and very much like the taste of food.

They have picked up learning, healthy living habits such as washing hands before eating food, drinking clean water, washing plates before and after eating food, wear clean clothes and comb hair every day. These are supplemented by food of high nutrition value contained in dhal and vegetables consumed by them. They are scoring well in the examination which indicates an improvement in learning. The aroma and taste of food are liked by children. Having said this there is awareness amongst children that they do not come to school to eat food alone (null hypothesis accepted).

### **3.2 Reflection of Teachers**

The teachers have an average age of 44.28 years with a composition of males (36.3%) and females (63.7%) respectively. As much as 35.5% are under graduates with an average experience of 17.42 years. The average number of years of food served by TAPF to the schools is 6.6 years. The average reflections for all parameters are 4.67 out of 5. The teachers certify that the food served is sufficient, hot and of variety. The teachers confirm that children eat together and are happy with the taste of food served. The sambar served is rich with dhal and vegetables. The teachers certify that quality of food has improved after periodic feedback. The teachers are happy about quality of food which has resulted in increase in enrolment, improvement in attendance and learning and significant reduction in school dropout rate of children.

### **3.3 Reflection of Production Distribution Supervisor Analysis and Quality Efforts**

All the supervisors in the production base have been interviewed whose average age is 31.81 years and vary by gender – males (92.3%) and female (7.7%). The average age of service is 5.41 years. These supervisors are subject to ISO Audits (ISO-22000 for food safety). Standing operating procedures of health and hygiene are in action. The production process is mostly automated. Human intervention is kept at minimum eco-friendly initiatives and cost reduction practices are followed. Although practices are uniform across all kitchens under study, there are differences across

locations. The number of years of service of supervisors will have significant influence on the practices.

There are positive and one to one to one relationship on the production spree from pre-production to school relations. The results indicate organic and cohesive relations between different groups of quality initiatives of value addition across target groups. Huge systems in food delivery need not just co-ordination but concerted efforts in delivering quality food. There is sequencing slicing of activities from the entire spectrum. Quality reflexes are being transmitted through periodic feedback enabling quick corrections.

### **3.4 Donor**

There are several types of donors such as donor trustees, corporate, one time and individual donors. As many as 58 individual donors and 24 corporate donors were studied.

(i) Corporate Donors: Corporate donors covering 9 states numbering 24 have been analyzed. The industry back up of these donors are software manufacturing, consultancy, service industry and others. Of these two thirds are regular donors and one third are one time donors. These donors have supported TAPF by giving cash, vehicles infrastructure and in other forms. The sample covered is donors who are contributing since last seven years. About one third of them are contributing since last 2 years. Donors contribute to demonstrate corporate social responsibility and for deriving tax benefits. The donors are happy to contribute so society.

(ii) Individual Donors: The analysis of individual donors has been done to assess and search for reasons as to why they contribute to TAPF. As many as 58 individual donors have been selected at random and administered the instrument to make an assessment of their characteristics. Age, gender, profession, number of years of contribution to TAPF and their computer savvy habit of visit to AkshayaPatra website has been collected. The responses are assessed on attributes such as happiness, convincing, contribution of TAPF, transparency, image value, society, intension to contribute regularly, pride to contribution donation decision, donation-return, awareness of Government support and updating information have

been documented through the instrument. These are qualitative attributes of a donor to an organization. These reflect the source of strength base to TAPF. The results represented and analyzed here.

### 3.5 Quality Head and Quality Efforts

The head of quality for TAPF was in-depth interviewed and ascertain on scope, practices, complaints, kaizen, training and ombudsman. It has revealed that the scope of TAPF is not on all development of children but only production and distribution of tasty, hot food on time and every time. Three quality 'Ps' People, Process and Performance are being practiced ISO-22000 and Hazard Analysis Critical Control Point (HACCP) are being practiced. Kaizen is practiced through Akshaya Pragathi Initiatives Production Process Compliance Index (PPCI) and Vehicle Hygiene Index (VHI) is being computed to assess quality at regular intervals. Ombudsman direct email communication and awareness programme are in place to remove fear wherever such situations were to arise.

### 3.6 Board of Trustee

The telephonic interview was conducted with Vice President who is a member of board of trustee, TAPF. The vision is to reach 5 million children by 2020 and to truncate the programme by 2030. TAPF depends on government funding at 60% and the 40% is raised through donations. TAPF is providing food to 13.5 million children and blue coloured labourers. Requests are being attended to the people of different target groups such as family members of patients of government hospitals, senior citizens and garments workers. Communication with donors is done periodically by e-news letter and updating websites. Quarterly meeting of Trustees is being done in addition to networking and mail communication. The funds flow is from Government, Public and Private sector companies, HNI (High Network Individual). Expansion efforts are being done by involving celebrities and using technology. Special efforts are being made to release the dreams of children by organizing contact programme.

Food safety, taste of food and attention to details are 3 dimensions of quality efforts done by TAPF. Audit and risk management efforts are done by well-known independent organization.

### 3.7 The Government

The Government – State and Central are supporting Mid Day Meal (MDM) Programme with shares of 25% and 75% respectively. The Government of Karnataka is supporting 70 NPOs covering 9 lakh children including TAPF. The government support is continuous and uninterrupted. The NPOs are provided three months advance in cash and grains in grant. The financial and social audit is done at regular intervals. The government has arrived at a statistics of 90% of children taking food, covering all 70 NGOs. The 10% of total child population is beset with psychological inhibition. This statement corroborates with the statement of children under TAPF, that they don't come to school to each food alone. The second statement of significance is the children in urban area consume less food that prescribed, whereas children in rural area eat food as per prescribed norms. The government provides an annual rise of 7.5% in the consumption cost.

### 3.8 The Total Quality Index (TQI) – Methodology

The study is holistic in making an effort to assess total quality. The target groups are in several dimensions. Each group is having its own relevance in the context of total quality. The product is to develop food and deliver it on time and every time of taste, hygiene, nutrition suitable to each specific region.

The Total Quality Index is composite in nature and is self weighting. The Total Quality Index (TQI) is defined as

$$TQI = \frac{\sum_{Ci=1}^{12} W_i C_i}{\sum_{Ci=1}^{12} W_i} \times 100$$

Wherein  $C_i$  represents component in the holistic system i.e. each  $C_i$  is defined thus:

$C_1$  = is the component attributed to children in schools 25 variables and attributed over 593 respondents.  $C_1$  calculated is 89.39

$C_2$  = is the component attributed to children in schools 25 variables and attributed over 125 Teachers respondents.  $C_1$  calculated is 89.39

C3 = Responses of pre-production supervisors C3 = 92.05

C4 = C4 is responses of production supervisors and calculated value is 86.94

C5 = is responses of post-production supervisors and calculated value is 88.78

C6 = is responses of quality supervisors and value calculates is 91.49

C7 = is response from supervisors working in HR area and calculated C7 = 92.94

C8 = is response from school relation supervisor and calculated value is = 89.10

C9 = is response from quality head of TAPF and value calculated is at 95.745

C10 = is response from trustee and calculated value is equal to 97.87

C11 = is contribution from government and based on interview with government official its value = 90.00

C12 = is contribution from corporate and individual donors = 81.48.

Each component is given a score of 100. The value that is derived is based weighted scores obtained by reflection of respondents for the structured and well validated instrument. Thus primary data is the basis for assessing the performance of each component. Wherever checklist based interviews are done, the interview base results are used for deriving scores. Thus the TQI is a self weighting design based on functions of the organization. The TQI for TAPF gets a weightage of production component 800 out of 1200 and the external activities of donors, government, children and teachers will get 100 each. Thus the TQI index is having a weightage of 75% to production stream of activities including quality functional conceptual and trustee.

$TQI = (89.39 + 88.56 + 92.05 + 86.94 + 88.78 + 91.49 + 92.94 + 89.10 + 95.745 + 97.87 + 90 + 81.48)$

$= \frac{1084.345}{1200} \times 100$

$= 90.36208$

TQI = 90.36

## 4.0 Policies

The Total Quality Index of AkshayaPatra is 90.36. This composite index is a self weighted. The component index in the production process across eight dimensions varies between 88.78 and 95.75. These variations suggest us policy prescriptions. They are enumerated below:

1. There is need to sustain the present composite index at 95.
2. The gap between pre-production supervisors, production supervisors and post production supervisors are to be kept at a constant place of 95.
3. The high level of cohesion of HR supervisors need be sustained at 92.94.
4. The school relation activity is at the level of 89.10. This has to be upgraded to 95.
5. Quality heat is conceptually sound at 95.75. This needs to be sustained.
6. Concerted efforts are needed to bring performance level in production at 95.
7. The trustee is almost perfect at 97.87. The policy must be to ensure same level of consistency and to pull up performance up to 95.
8. The performance perception of the government of all 70 NGO in Karnataka is at 90. This level has to be sustained for long time improvisation.
9. The donors corporate and individual are to be perceived differently by TAPF. This difference in perception will enhance funds in flow.

## 4.2 Strategies

Training of production supervisors at three levels had to be taken up for improving the performance level.

1. The quality supervisors need retraining in quality sustenance initiatives.
2. HR supervisors are to be trained in updated laws, handling grievance and in personal practices.
3. The school relation activity can be further strengthened by high frequency feedback and training of teachers at the school level.

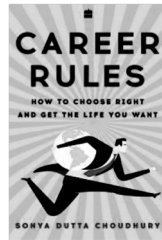
4. The conceptual soundness of quality head must be sustained by implementation of standards and practices. ISO 22000, FSSAI are to be implemented and adopted to location specific requirement.
5. The relationship with government must be sustained at same level. This can be done by short term crash programmes at the headquarters in each state.
6. The donor relations can be maintained by involved attention for better harmony field visits of short term duration can be arranged by TAPF.
4. The cohesive efforts in the production phase which includes quality at the inventory level and at the throughput level must continue with appropriate checks and rechecks.
5. Children and teachers are to be continuously trained on hygiene practices to enable effective supplementation of quality efforts.
6. There is need to continuously retrain people at the production level to back up and sustain quality efforts.

## 4.2 Suggested Actions

The present study has led to indicative actions based on the findings:

1. The first action should be to make efforts to continuously sustain effective backward, throughput and forward linkages in the long term centers of mass production and delivery of food. The centers are Bengaluru- Rajajinagar, Vasanthpura, Hubballi and Ballari centers in Karnataka. Hyderabad (erstwhile AP), Gandhinagar (Gujarat), Puri (Odisha), Vrindavan (UP) and Jaipur (Rajasthan).
2. Secondly, those centers which are serving relatively less number of children and in the centers served by decentralized kitchens, quality efforts have to be initiated.
3. ISO 22000 should be implemented across all kitchens to ensure standardization of quality.
7. The back office operations are well formatted. The same steps can be replicated with minor adaptations across all centers and in the centers to be established in the near future.
8. The Donors have perceived high image value for AkshayaPatra. This perception is reflected in large one time payments and continued donations each year. TAPF should make efforts to build relationships for its growth.
9. The concept of AkshayaPatra matches well with people in the hierarchy and people across society. The support of the Government will continue with concomitant public opinion. TAPF must make efforts in converting public goodwill to the backup support of the Government.
10. TAPF can extend its centers to whole of India covering all 29 States and Union territories.
11. TAPF must make efforts to acquire corpus funds by regulating channels of expenditure.

## BOOK REVIEW



### CAREER RULES

SONYA DUTTA CHOUDHURY: How to Choose Right and Get the Life you Want

Published by Harper Collins Publishers India, PP: 1 to 276

**Reviewer: N.S. VISWANATH\***

The book under review is entitled: 'CAREER RULES-HOW TO CHOOSE RIGHT AND GET THE LIFE YOU WANT'. The author has documented live cases of successful job seekers in various spheres of human activity. The spread ranges from jobs in computer field to entertainment and entrepreneurship, counselling, law, teaching, coaching, health care, food and hospitality, digital marketing, consulting and any other job any one can think of. There are in all cases of twelve success professionals who could carve out jobs in various spheres of human activity. The people who have made their jobs are all post graduates with their basic degree in technology, science, arts and so on from schools of high reputation. The book provides wealth of current information and links up with success stories. The writing style of author is impeccable. Anyone who begins to read will stop when the book ends. There are certain references of books to be read in pages 89, 201 & 271. The professionals who were chosen for

description became professionals after making a choice of job they loved to work with in order to demonstrate their success. One can read success story of a college dropout to a successful story of a person with a highest university degree (Ph.D). One can get an impression that acquisition of certification such as Graduation, Masters, Ph.Ds with help facilitate to switch over jobs. Ultimately we have to choose a job that he/she loves so that there will be no regrets in life later on. The people who are referred to in this book are people who still live with us. They are in the process of carving out life. Most important is the confidence one can acquire after reading this book. The book is for students who are in the adolescent age and who have not yet thought of a career. Complete reading of this book may influence a reader to lead to shape up career and life to emulate.

Students are advised to read through this book for acquiring knowledge and insights.

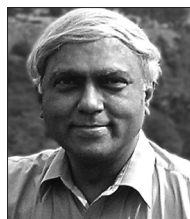
---

\* Director and Principal, M.P. Birla Institute of Management, Bengaluru.





Editor-in-Chief  
**Dr. N.S. Viswanath**



Joint Editor-in-Chief  
**Dr. B. Shekar**

Editors  
**Prof. K.L. Ramadas**  
**Prof. B.V. Pushpa**

**DHARANA**  
**INTERNATIONAL JOURNAL OF BUSINESS FROM BHARATIYA VIDYA BHAVAN'S**  
**M. P. BIRLA INSTITUTE OF MANAGEMENT, BENGALURU**

Established: June 2007  
ISSN 0974-0082  
Vol.11, ISSUE # 2 (July-December, 2017)

*Administrative & Editorial Office:*

**BHARATIYA VIDYA BHAVANS**  
**M. P. Birla Institute of Management**  
#43, Race Course Road, Bengaluru 560 001, India  
•Ph: +91-80-2238 2798, 4277 2000  
•Email: nsv@mpbim.com

**DHARANA** an International journal of business, published in January and July, every year,  
by Bharatiya Vidya Bhavan's M. P. Birla Institute of Management, Bengaluru

# **INSTRUCTIONS FOR AUTHORS**

**Dharana - an International journal of business from Bharatiya Vidya Bhavan's M. P. Birla Institute of Management**, Bengaluru welcomes original articles on research into theory and practice of Business and Management. Publication will depend on relevance and clarity. Articles of speculative nature and of wide ramification will also be considered. An article should not be more than 5000 words. The article should have proper reference to key articles in the chosen topic area of the author(s).

**Originality Report:** In order to ensure originality of research, a certificate of Anti-plagiarism by Turnitin Software (page 1) to be attached. Similarity index of 15% is allowed.

**REFEREING:** Research contributions received will be subjected to review by two or more referees on a 'double blind' system, whereby the name(s) of contributor(s) will be kept concealed from that of the referees and vice versa. Acceptance of an article is dependent on meeting the standards set by the journal. Revision whenever necessary should be done by the author(s) before publication.

**PAPER PROCESSING FEES:** No processing Fee is charged.

**COPYRIGHT AND PUBLICATION:** Submission of any article implies that it has not and will not be published in any form/ language in any other journal. The author(s) shall assign copyright to the publisher for sanctioning reprints, photocopies and reprinting complete issues/volumes at a later period. Traditional rights of the author(s) would not, however, be jeopardized by assigning copyrights to the publisher, i.e., the author(s) has (have) the right, to reuse, veto publication of third party and obtain (or seek permission) for quoting in any other journal. Submission of an article shall be accompanied by a written declaration that the article is an original contribution and has not been submitted elsewhere for publication.

**PREPARATION OF MANUSCRIPT:** The article should be written in clear and concise English. The typeset should be in double-line spacing on single sided A4 size paper with a one-inch margin on all sides of each page. Pages should be numbered sequentially.

References, tables, exhibits and legends for figures should be printed on separate pages. One hard copy and one soft copy (on a CD) in MS Word format, should be submitted. The e-version of the article will be used for refereeing, reviewing, and for authors' editing & final revision.

## **REFERENCES**

All references should be indexed using Arabic numerals and referred in the manuscript by the corresponding numbers. The Authors are advised to follow APA style of referencing. Examples follow:

**A Journal Publication:** Glazer Rashi, Joel H. Steckel and Russel S. Winer, "Locally Rational Decision Making: The Distracting effort of information on Managerial performance", *Management sciences*, 38, February 1992, 212-226.

Vol.11, #2 (July-December 2017)

**A Conference Publication:** S.F Roehrig, Path analysis and probabilistic networks: analogous concepts, in: Jay F. Nunamaker, R.H. Sprague (Eds.), *Proceedings of the 26th Hawaiian International Conference on System Sciences*, Vol. III, IEEE Computer Society Press, Los Alamitos, CA, 1993, pp.523-532.

**A Monograph:** Harawini G. Swavy I, "Mergers and acquisitions in the US Banking Industry: Evidence from the capital markets", North-Holland, Amsterdam, 1990.

**An article in an edited book:** Mac Avoy and E. Roberts, "Establishing Superior Performance through Competitive Analysis", in *Strategic Planning and Management Hand book*, William R. King and David I. Chelland (Eds.), Van Nostrand, New York, 1987.

**A Book:** A. Zeithaml Valarie, A. Parasuraman and Leonard L. Berry, "Delivering Quality Services: Balancing customer perception and expectations", Tree Press, New York, 1990.

**Webliography:** <http://www.elsevier.com/trackarticle>; Date of retrieval: 21 October 2007.

## **ARRANGEMENT OF ARTICLES**

The article should be arranged in the following order:

1. Title, Author(s), Affiliations, Postal and e-mail addresses.
2. A 100 word abstract briefing the purpose, scope and conclusions, along with keywords and phrases.
3. Sequential arrangement of the text with proper headings.
4. Acknowledgement(s), if any.
5. References (including Webliography).
6. Illustrations on a separate sheet without text.

Title, Name(s) of Author(s), and the abstract should be centered. Rest of the text, along with section headings, subsection headings and formula(s) should be left justified. Headings should be sequentially numbered using the Decimal Numbering scheme. Keywords and phrases should be in italics.

The first page of the manuscript should contain:

- i Title,
- ii Name(s) of the author(s) and institutional affiliation(s),
- iii Abstract of about 100 words,
- iv Keywords and phrases,
- v A footnote containing the corresponding author's name, address, e-mail address, telephone and fax number, if any.

Acknowledgement(s), if any, of resource person(s) and/or of grants received may be mentioned as a foot note.

Footnotes may be used, wherever necessary to a minimum, and they should be double spaced.

Formula(s) should be numbered on the right hand margin. Derivation details of Formula(s) may be provided on separate sheets.



## SUBSCRIPTION

(For One Year Only)

**Name of Subscribing Individual/Institution:**

**Address:**

**PIN/ZIP:**

Please accept the enclosed Cheque (Local only) /

Demand Draft (No. ....)

Dated .....drawn on .....

..... Bank, favouring

**M.P. Birla Institute of Management, Bengaluru.**

**Tick the appropriate Box below**

### INDIVIDUAL

☐ **Print Version :** ₹ 1200/- (or \$100) for  
2 years - 4 issues

### INSTITUTION

☐ **Print Version :** ₹ 1,200/- (or \$100) for  
1 year - 2 issues

### ALUMNUS

(with Registration Number and Year of Graduation)

☐ **Print Version :** ₹ 1200/- (or \$100) for  
2 years - 4 issues

Date:

Signature

Mail the completed form along with Cheque/Draft to:  
**Subscription Desk, Dharana**  
**Bharatiya Vidya Bhavan's**  
**M.P. Birla Institute of Management**  
**#43, Race Course Road, Bengaluru 560 001, India**  
**Ph: +91-80-2238 2798, 4277 2000**

## ADVERTISEMENT

(Per Issue)

**Name of Institution:**

**Address:**

**PIN/ZIP:**

Please accept the enclosed Cheque (Local only) /

Demand Draft (No. ....)

Dated .....drawn on .....

..... Bank, favouring

**M.P. Birla Institute of Management, Bengaluru.**

**Tick the appropriate Box below**

- ☐ **Inner Full Page (Black & White)** ₹ 7,500/-
- ☐ **Front Cover Inside (Colour)** ₹ 15,000/-
- ☐ **Back Cover Inside (Colour)** ₹ 15,000/-
- ☐ **Back Cover (Colour)** ₹ 25,000/-

### Advertisement Size :

Book Size : 19.0 cm (W) X 25.0 cm (H)

Print Area : 16.0 cm (W) X 22.0 cm (H)

Date:

Signature

Mail the completed form along with Cheque/Draft to:  
**Advertisement Desk, Dharana**  
**Bharatiya Vidya Bhavan's**  
**M.P. Birla Institute of Management**  
**#43, Race Course Road, Bengaluru 560 001, India**  
**Ph: +91-80-2238 2798, 4277 2000**







आ नो भद्रा : क्रतवो यन्तु विश्वतः ।  
 "Let Noble Thoughts Come To Us From Every Side"  
 - Rig Veda 1-89-1

## Bharatiya Vidya Bhavan's M P Birla Institute of Management

#43, Race Course Road, Bengaluru 560 001

•Phone: +91-80-2238 9634, 4277 2000

•Fax: +91-80-2238 9635 •E-mail: admission@mpbim.com

[www.mpbim.com](http://www.mpbim.com)

Ranked  
21st among top  
100 B-Schools Surveyed by  
SILICON INDIA EDUCATION  
in the survey "What if not  
IIMs - B-School  
survey 2017"

**silicon india**



Approved by AICTE & Affiliated to Bangalore University

## MBA Degree Programme TWO YEAR FULL-TIME

### Dual Specialisation of Your Choice\*

Marketing Finance HRM

Health Care Management

Banking Finance & Insurance  
Services Management

Startups & SMEs Management

\*Subject to Minimum intake



NAAC Accredited Institution



IS / ISO 9001:2008 Certified Institution

## BHARATIYA VIDYA BHAVAN MYSURU KENDRA



## Bhavan's Priyamvada Birla Institute of Management

CA-14, 1st Cross, Vijayanagar 1st Stage

Mysuru 570 017, India • Phone: +91-821-2413390 / 91

• Fax: +91-821-2412141 • E-mail: bpbimmysore@gmail.com

[www.bpbim.org](http://www.bpbim.org)



## Bhavan's Management Education Excellence in Mysuru



PGDM Equivalent to MBA for  
Admission to Ph.D. by VTU

**AICTE  
Approved  
2-year PGDM  
Programme**

Partnering with University  
of Kassel, Germany  
(DAAD-Sean-DEE) for  
Faculty / Student Exchange  
Programs

## Dual Specialisation of your choice

• Marketing • Finance • HRM • Systems



बैंक ऑफ़ बड़ौदा  
**Bank of Baroda**  
India's International Bank



## A HOME LOAN THAT MAKES OWNING A HOME MORE JOYFUL.

Presenting **#AllInYourInterest Baroda Home Loans**

- Long tenure upto 30 Years • Quick Approvals
- Free Accidental Insurance Cover
- Extra Savings by Linking Savings Account

Call toll free no. (24 x7): 1800 22 33 44 / 1800 102 44 55  
Give a missed call: 846 700 1111 | [www.bankofbaroda.co.in](http://www.bankofbaroda.co.in)

Follow us on



**@8.30%\* p.a.**

\* Conditions apply.