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User Perception of Automatic Ticket Vending Machine: A Study of Indian Southern Railway

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Abstract: *This paper throws a light on user perception of Automatic Ticket Vending Machine (ATVM) offered by Southern Railway in India. It also tries to find out the awareness level of smart card service among passengers in Chennai District. The smart cards are nowadays commonly utilized for purchasing the transportation services ticket fares like buses, railways, etc. A smart card, chip card, or integrated circuit card (ICC), is any pocket-sized card with embedded integrated circuits which can process data. The Indian Railways has rolled out ATVM as part of an Unreserved Ticketing System (UTS) at major railway stations in India. The Railway has issued smart cards to facilitate inter-city travel. This card will work as a prepaid device, which will allow commuters to travel specified routes via rail without worrying about cash. The commuters would have to swipe at both occasions – entry and exit. Depending on the distance covered, the balance on the card will be adjusted. To add to the security at the platforms, ticket checkers would be alarmed with palm tops to scan the smart cards. The smart cards will greatly reduce queues at manual ticketing counters and will drive process efficiencies. The southern railway has installed 455 Automatic Ticket Vending Machine at more than 191 suburban railway stations in Chennai Central, Beach, Fort, Nungambakkam, Kodambakkam, Mambalam, Saidapet, Guindy, St. Thomas Mount, Pazhavanthangal, Thirusoolam, Meenambakkam, Pallavaram, Chrome pet, Mylapore, Tambaram and Chepauck stations. About 9 lakh people use suburban rail transport every day. The primary objective of the study is to analyze the awareness level of the passengers and their perceptions regarding smart card services rendered by southern railway in Chennai district. It also focuses on the significant factors influencing the passengers to buy smart card service. It is inferred from the survey that majority of the respondents have become aware of the smart card service rendered by Southern Railway. It also reveals that ATVM is found to be very personable and friendly while handling the transactions of smart card service to make inter-city travel.*

Keywords: Automatic Ticket Vending Machine (ATVM), Integrated Circuit Card (ICC), Unreserved Ticketing System (UTS), Smart Cards, Automated Teller Machines, Kiosk, Indian Railway System.

Introduction

The smart cards are nowadays commonly utilized for purchasing the transportation services ticket fares like buses, railways, etc. There are many such projects underway around the world for transportation utility services like railways. The important factor for the ticketing system in railways is the transaction payment time. The payment time of not more than 300 milliseconds is usually demanded. The Indian Railways smart card is pre-filled and does not have to connect to the bank's site for payment. So, the speed of the facility is very good for payment. The feedback of the respondents who already a user of this service will depend upon this important factor. A smart card, chip card, or integrated circuit card (ICC), is any pocket-sized card with embedded integrated circuits which can process data. Smart cards are available to commuters at railway stations.

Railways mull smart cards to facilitate inter-city travel. This card will work as a prepaid device, which will allow commuters to travel specified routes via rail without worrying about cash.

The project is being undertaken in collaboration with BEST bus transport system of Mumbai. During a rail journey, the smart cards would be scanned by special machines positioned at various places at the platform. The commuters would have to swipe at both occasions – entry and exit. Depending on the distance covered, the balance on the card will be adjusted. To add to the security at the platforms, ticket checkers would be alarmed with palm tops to scan the smart cards.

The system could be extremely beneficial for commuters who travel to-and-fro between cities and their respective suburbs. Delhi Metro Rail Corporation (DMRC) is the first transporter to have introduced smart cards for travelling in the Capital. Around 1.9 lakh commuters having smart cards travel by metro every day. In Mumbai also, BEST bus service has launched smart cards for frequent travellers. The chip inside the cards usually has details of permitted routes and validity of the smart cards. If the card is valid, the scanning machine or the ticket checker gets a green signal. The smart card service would not be for low pricing but for unlimited travel on the specified route. Apart from using radio frequency based cards (RFID) in travel, the Railways are also under the process of implementing computerized charting process. It has already implemented RFID tags on wagons to monitor the mobility of wagons. Till now it has done an investment of Rs.230 crores on 2,00,000 wagons. The Indian Railways has rolled out Automatic Ticket Vending Machine (ATVM) as part of an Unreserved Ticketing System (UTS) at major railway stations across the nation. The passengers at all these stations can book unreserved tickets through ATVM by smart cards. The AVTM solution in its entirety has been conceptualized and designed by CRIS (Centre for Railway Information Systems) using NXP's MIFARE DES Fire technology based on the international ISO 14443A standard. NXP is planning to provide MIFARE DES Fire-based ICs and Siepmann's Card Systems will provide the card. The adoption of contact less ticketing will greatly reduce queues at manual ticketing counters and will drive process efficiencies. Initially, in 2007 CRIS had developed smart card based contact less ticketing solutions using NXP's MIFARE 1KB Classic chip in Mumbai Suburban Railway and Chennai, wherein approximately 5 lakh cards were issued to passengers in the Central Western Railway at Mumbai and Southern Railway at Chennai.

Automatic Ticket Vending Machine (ATVM)

Automatic ticket vending machines using 'smart card' designed and developed by the Centre for Railway Information Systems were installed at all suburban railway stations. Many such machines have been installed in railway stations over the past few years. The facility operates similar to the Automated Teller Machines. The commuters have to purchase 'Smart Card' Coupons, place them in a slot on the ticket vending machine, select the route and destination on the touch screen and once the details are confirmed, a computer-printed ticket is delivered. Commuters have to initially buy Rs.100 coupons and later recharge them in denominations of Rs. 50. Recharge of the coupons could be made in specified counters. Once the ticket is purchased through the machines, the appropriate amount would be deducted from the commuters' coupon. The Southern Railway has initially appointed the staff be present near the machines to assist the commuters. Automatic ticket vending machines is aimed at clearing the rush of daily commuters and avoiding overcrowding at counters.

The system was set up first in Mumbai and Bangalore. Now the facility would be available at Chennai Central Moore Market Complex, Beach, Fort, Park, Nungambakkam, Kodambakkam, Mambalam, Saidapet, Guindy, St. Thomas Mount, Pazhavanthangal, Tirusoolam, Meenambakkam, Pallavaram, Chromepet, Mylapore, Tambaram and Chepauk stations. About 9laks people

use suburban rail transport every day. At present, the ATVMs are only for suburban train tickets. The ATVMs are fruitful in reducing queues in suburban stations as the transaction is cashless and convenient. The time taken to print a ticket is less than a second. These machines are used for dispensing platform tickets and unreserved journey tickets,”

An Overview of ATVM



“Smart card to make all hassles at counters a thing of the past”

Statement of the Problem

The queues in front of the ticket counters in suburban railway stations have been drastically increased over the period of time. In order to reduce the rush of daily commuters and to avoid overcrowding at ticket counters, Southern Railway has installed Automatic Ticket Vending Machine in major suburban railway stations for reducing queues and dispensing unreserved journey tickets as well as flat form tickets electronically. The southern railway has installed 455 Automatic Ticket Vending Machine at more than 191 suburban railway stations in Chennai Central, Beach, Fort, Nungambakkam, Kodambakkam, Mambalam, Saidapet, Guindy, St. Thomas Mount, Pazhavanthangal, Thirusoolam, Meenambakkam, Pallavaram, Chrome pet, Mylapore, Tambaram and Chepauck stations. About 9 lakh people use suburban rail transport every day. It has paved the way to study the user perception of smart card service offered by the southern railway. The study analyses the opinions of passengers regarding essential features of smart card service and its utility for commuters as smart cards will greatly reduce queues at manual ticketing counters and will drive process efficiencies.

Objectives of the Study

- To evaluate the user perception of Automatic Ticket Vending Machine (ATVM) that processes smart card service.
- To analyze the level of awareness of passengers regarding Smart Card Service offered by Southern Railway.
- To throw a light on the significant factors that influence the passengers to buy Smart Card Service.
- To offer suggestions on the basis of the opinions given by the respondents.

Research Design and Methodology Adopted

The research design applied for the study is of descriptive nature. A non –probability convenience sampling technique was adopted for selecting the sample size for the research paper. A sample size of 200 respondents was drawn for the study. The sapling areas of the study can include Chennai Central, Beach, Fort, Nungambakkam, Kodambakkam, Mambalam, Saidapet and Guindy. The data required for the study were purely primary data collected through the personal

survey by preparing a structured questionnaire, which consists of dichotomous, close ended, multiple choice and ranking questions. In order to prepare an effective questionnaire, a pilot survey of 20 respondents was conducted, which is 10 percent of the total sample size of the study. During the pilot survey, most of the respondents were felt comfortable in responding the questionnaire. The same questionnaire was chosen for the main survey also. The statistical tools applied for the study for drawing statistical inferences about the study can include chi-square Test, K-S Test, Spearman’s Rank Correlation and ANOVA Test. The findings, suggestions and conclusion about the study are purely based on the opinions and responses given by the respondents. The period of the study was one month, Nov-Dec 2009.

Limitations of the Study

The sample size chosen for the research study might not be representative of total population. Due to short span of time, the study is restricted to 200 samples only. Data collected from the respondents are based on their opinions and knowledge. Sometimes, they may subject to bias. Few respondents were found to be reluctant while answering the questionnaire.

Statistical Analysis

The researcher has applied statistical tools to the following hypotheses for drawing statistical inferences about the study.

- **H1:** The demographic variables have no significant influence over the sources of awareness about smart card services rendered by Southern Railway.
- **H2:** There is no significant relationship between the occupation of respondents and the frequency of using ATVM.
- **H3:** There is no significant association between the duration of using the service of smart card by the respondents and their opinions about the services rendered by the machine.

1. Chi-Square Test: Chi-square test is used to test whether a variable has a significant influence over the other variable. For this purpose, the factors considered for the study are broadly classified into two groups. The first group consists of demographic factors namely (1) Gender, (2) Age, (3) Education, (4) Monthly Income and (5) Occupation. The second group consists of a variable for analysis is sources of awareness.

Null-Hypothesis (Ho): The demographic variables have no significant influence over the sources of awareness about Smart Card Service rendered by Southern Railway.

Table No.1: Demographic Variables Vs. Quality of Service by ATVM

| Sl.No. | Variables | Chi-square Value | Table Value | S/N |
|--------|----------------|------------------|-------------|-----|
| 1. | Gender | 2.21 | 5.99 | NS |
| 2. | Age | 1.63 | 9.49 | NS |
| 3. | Education | 0.61 | 9.49 | NS |
| 4. | Monthly Income | 2.19 | 9.49 | NS |
| 5. | Occupation | 1.63 | 12.59 | NS |

(Source: Primary Data) (S: Significant, NS: Not Significant)

Inference: The Table No.1 clearly indicates that the null hypothesis (Ho) is accepted (Not significant) in all the demographic variables. Hence, it is concluded that the demographic variables such as gender, age, education, monthly income and occupation have no significant influence on the sources of awareness about Smart Card Service rendered by Southern Railway.

2. K-S Test:

Null-Hypothesis (H₀): There is no significant relationship between the occupation of respondents and the frequency of using ATVM.

Table No. 2: Computation of D_{Max} Value

| O | CFo | Fo(x) | E | CFe | Fe(x) | D _{Max} = Fo(x)-Fe(x) |
|--------------|-------|-------|--------------|-------|-------|---------------------------------|
| 27.78 | 27.78 | 0.68 | 6.85 | 6.85 | 0.17 | 0.51 |
| 5.56 | 33.34 | 0.81 | 6.85 | 13.7 | 0.33 | 0.48 |
| 3.67 | 37.01 | 0.90 | 6.85 | 20.55 | 0.50 | 0.4 |
| 2.67 | 39.68 | 0.96 | 6.85 | 27.4 | 0.67 | 0.29 |
| 1 | 40.68 | 0.99 | 6.85 | 34.25 | 0.83 | 0.16 |
| 0.44 | 41.12 | 1 | 6.85 | 41.12 | 1 | 0 |
| ΣO=41.1 2 | | | ΣE=41.1 2 | | | |

(Source: Primary Data)

Table No. 3: Occupation of Respondents Vs. Frequency of Using ATVM

| Sl.No | Variable 1 | Variable 2 | Calculated Value of D _{max} | Table Value of D _{max} | Significant/ Not Significant |
|-------|---------------------------|--------------------------|--------------------------------------|---------------------------------|------------------------------|
| 1. | Occupation of Respondents | Frequency of Using ATVM. | 0.51 | 0.096 | Significant |

Inference: The Table No.3 states that the null hypothesis (H₀) is rejected (Significant).Hence, it is concluded that there is a significant relationship between the occupation of respondents and the frequency of using ATVM.

3. Analysis of Variance (ANOVA) Test:

Null Hypothesis (H₀): There is no significant association between the duration of using the service of smart card by the respondents and their opinions about the services rendered by the machine.

Table No.4: ANOVA Table

| Sources of Variation | Sum of Squares | Degree of Freedom | Mean Squares |
|----------------------|----------------|-------------------|--------------|
| Between samples | 475 | 3 | 158 |
| Within sample | 779 | 12 | 65 |
| Total | 1254 | 15 | |

Calculated value of F is = 2.43

Level of significance = 5%

The table value of F for v₁ = 3 and v₂ = 12 at 5% level of significance = 3.49

Inference: Since the calculated value of $F = 2.43$ is less than the table value of $F = 3.49$, the null hypothesis is accepted. It is inferred that there is no significant association between the duration of using the service of smart card by the respondents and their opinions about the services rendered by the machine.

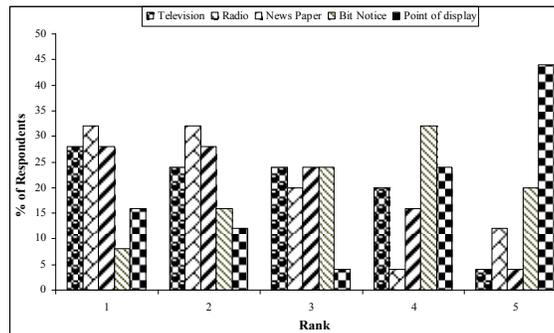
4. Ranking of media preferred by the respondents to popularize Smart Card Service:

Table No. 5: Ranking of Media for Publicity of Smart Card Service

| Rank \ Media | Rank | | | | | Total |
|------------------|----------------|----------------|----------------|----------------|----------------|-------|
| | R ₁ | R ₂ | R ₃ | R ₄ | R ₅ | |
| Television | 56 (28%) | 48 (24%) | 48 (24%) | 40 (20%) | 8 (4%) | 200 |
| Radio | 64(32%) | 64(32%) | 40(20%) | 8 (4%) | 24 (12%) | 200 |
| Newspaper | 56 (28%) | 56 (28%) | 48 (24%) | 32 (16%) | 8 (4%) | 200 |
| Bit Notice | 16 (8%) | 32 (16%) | 48 (24%) | 64 (32%) | 40 (20%) | 200 |
| Point of Display | 32 (16%) | 24 (12%) | 8 (4%) | 48 (24%) | 88 (44%) | 200 |

(Source: Primary Data) (Figures in parenthesis indicate percentage of respondents)

Figure No.1: Ranking of Media for Publicity of Smart Card Service



Inference: The above figure portrays that 32% of respondents or 64 respondents (Out of 200) have ranked radio as No.1 media for making publicity of Smart Card Service. The following box provides details of percentage of respondents who have ranked different media as No.1 for making the publicity of Smart Card Service.

| Media | % of Respondents |
|------------------|------------------|
| Television | 28 |
| Radio | 32 |
| Newspaper | 28 |
| Bit Notice | 8 |
| Point of display | 16 |

Recommendation

1. It is observed from the study that the Smart Card Service requires a wide range of publicity in an effective and informative mass media like T.V., Newspapers, Theatres and Radio etc.,
2. The card should be allowed for renewal with the lapsed amount with a nominal penalty/fine because the passengers had a bad experience that the balance amount of smart card gets lapsed on expiry.
3. The Southern Railway Department should install ATVMs at major railway stations because the passengers frequently deduct the amount by using smart card each time a travel is made unlike a pass. In a pass, the passengers need not to detect the amount each time a travel is made by them.
4. The Railway Department needs to ensure the functionability of ATVM because most of the respondents have voiced that the kiosk installed are few and not available at all railway stations. Whenever it is available, most of the time it is out of order, either due to paper ticket exhausted, or the kiosk itself out of order. Also, the expiry of card is not very prominent on the screen.
5. ATVM must have an additional feature of displaying expiry date along with the display of balance amount on the ticket screen because passengers are always in a hurry to get the ticket and take back the card.
6. Since there is no restriction for the passengers to carry as many smart cards as possible, the railway can restrict the number of cards a person has to carry.

Findings and Conclusion

58% of the respondents are male and 42% are female. Nearly 48% are in the age group of below 30 years. Most of the respondents (64%) are private employees. Nearly 85% of the respondents are aware of Smart Card Services rendered by Southern Railway and 81% of the respondents have been using Smart Card Service close for more than one year. 69% of the respondents would like to recommend Smart Card Service to others. 100 percent of the respondents have felt that the Smart Card Service requires wide publicity.

It is concluded from the study that majority of the passengers (85%) are aware of Smart Card Service rendered by Southern Railway. The survey also indicates that most of the commuters have responded that they know how to operate ATVM for accessing their journey tickets as well as platform tickets by using Smart Card. Two third of the respondents have felt that ATVM is found to be very personable and friendly while handling their transactions. The survey has given a clear picture that three fourth of the passengers are satisfied with essential features of ATVM such as quick service, technology, convenience, prompt delivery, flexibility and less waiting time. In order to increase the sales of Smart Card and accessibility of Kiosk, the Southern Railway should install ATVM in all major railway stations.

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Methods of Voting System and Manipulation of Voting

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Abstract: *In this paper an attempt has been taken to describe various types of voting system and manipulation of them. French philosophers Marquis de Condorcet (1743-1794) and Jean-Charles Borda (1733-1799) introduced modern voting system. Duncan Black first introduced the manipulation of voting in 1958 in his book "Theory of Committee and Elections". Condorcet, Borda and even many modern politicians believe that elections are logically imperfect. In this paper this imperfection is analyzed in some detail. In this paper voting methods are discussed in very simple but in a detailed manner. Voting system is directly involved with Economics, Political Science and Social Science. So that if one has no proper knowledge of the voting system then he can not serve the society in proper way and cannot expect the economic development of the society. Some voting methods such as Arrow's theorem, median voter theorem, randomized voting, Muller-Satterthwaite theorem and Gibbard-Satterthwaite theorem are apparently non-manipulability and are included in this paper.*

Keywords: Voting system, voting paradox, manipulation of voting, condorcet winner, dictatorship, strategy-proofness.

Introduction

A voting system is of manipulability whenever some individual misrepresents his preferences in order to secure an outcome preferred to the outcome when he is honest otherwise it is strategy-proof. In voting system every voter's preference ordering i.e., the preference profile, taken collectively, form the input the output is usually a single certain winner or a set of winners. The methods of transforming preference profiles into winners i.e., mappings from the set of possible preference profiles into the set of alternatives is called voting procedures. For each preference profile the mapping produces a single winning alternative. Such a mapping is called a social decision function (SDF). The social welfare function (SWF) on the other hand, first studied by Arrow, are the rules for transforming preference profile into social preference orderings or rankings. The definition of SWF given by Arrow is as follows: Let $Y = \{a_1, a_2, \dots, a_n\}$ denote a finite set of alternatives or social choice options among which the voters must select one and let $R(Y)$ denote the set of strict linear rankings on Y . Let $N = \{1, 2, \dots, n\}$ be a finite set of individual voters. A function $f : R^N \rightarrow Y$ will be called a social choice function. A member of R^N is called a profile of rankings and its i th component is called individual i 's ranking.

A SWF is a function $f : R^N \rightarrow R$ which aggregates voters' preferences into a single preference order on Y . The N -tuple: (R_1, \dots, R_N) of voters' preferences is called a preference profile. Arrow declared that there exist no satisfactory SWF (Islam *et al.* 2009). A satisfactory SDF should not be a dictatorship (Feldman 1979). Gibbard (1973, 1978) and Satterthwaite (1975) in-

dependently proved this as follows: “If a satisfactory social decision function is one which is always immune to manipulation and which is non-dictatorial, there is no satisfactory social decision function”. Following Myerson (1996, 2009) we have discussed some portion of this paper in some detail.

This paper is an exposition of voting system and of the manipulation of voting. French political philosophers Borda (1781) and Condorcet (1785) introduced modern voting system but they had not mentioned about manipulation of voting. Condorcet, Borda and even many modern politicians believe that elections are logically imperfect. In this paper we will explore such imperfections of the election in some detail. Duncan Black (1958) first introduced the manipulation of voting. Here we discuss in easier way of voting system and manipulation of them (Feldman 1979; Myerson (1993, 1996, 2006, 2009); Blackorby, *et al.* 1990; Blackorby, *et al.* 2002; Saporiti and Thomé 2006; McLennan 2008; Saporiti 2008; Miller 2009; Robert and Tsoukiàs 2009; Sato 2009).

The concept of Median Voter is described following Black (1948, 1958); Gans and Smart (1994); Myerson (1996); Austen-Smith and Banks (1999); Congleton (2004); Saporiti and Thomé (2006); Saporiti (2008); and Penn *et al.* (2008). In this paper we have discussed relatively simple models of voting system but the real political settings are more complex than the models seem to imply (Congleton 2004). We used simple model basically for three reasons namely: i) simple models allow knowledge to be transferred from person to person than those of more complex models, ii) simple models provide us some clear knowledge of voting whereas complex models do not always provide so, iii) from simple models we, the common people, can understand the main features of the voting system which is a theme of democracy.

Condorcet Method

A Condorcet method is any single-winner election method which always selects the Condorcet winner (i.e., an alternative that beats every other alternative in sequence of pair-wise majority contests); the candidate who would beat each of the other candidates in a run-off election if such a candidate exists. Condorcet method is named after the French political philosopher Marquis de Condorcet (1743-1794). Condorcet (1785) introduced imperfection of jury by problem in probability theory as follows: There are two alternatives x and y between which a panel of jury is to decide, who is guilty or innocent. Between the two alternatives one is guilty and the other is innocent. Since the members of jury are imperfect, so they may err. Since the jury members are efficient, so that if the numbers of jury members are more than enough the probability of correct voting will be less wrong. Suppose, x gets more votes than y , so that probability x of being innocent to more correct (Feldman 1979). Let probability of voting correctly be p , so the probability of voting incorrectly is $(1 - p)$. Suppose there are three alternatives, say, x , y and z . Here one alternative is innocent and other two are guilty, so that the problem is complicated. Suppose the contest will be pair wise. As before if x gets more votes than y , and y gets more votes than z , and x gets more votes than z . In this case jury's decision of being innocent is x and the probability of x being innocent can be calculated as before. But the following case is not so easy which creates a paradox.

Now we discuss the Condorcet voting paradox in which there is no Condorcet winner (Condorcet 1785; Risse 2005). In this section and throughout the paper we consider each voter ranks the list of candidates in order of preference i.e., for three candidates x , y and z the preference profile of a voter may be as follows:

1. x

2. y
3. z .

Here x is one's first choice, y is second choice and z is third choice. For convenience, we will use this profile as, $xPyPz$. Let us assume that there are 17 voters of three types and three alternatives x, y, z . Let preference relations are as follows:

- Type 1: $xPyPz$ by 8 voters,
- Type 2: $yPzPx$ by 5 voters,
- Type 3: $zPxPy$ by 4 voters.

In an election a vote between x and y , x collects $8+4=12$ votes and y collects 5 votes, so that x wins. Again a vote between y and z , y collects $8+5=13$ votes and z collects 4 votes, so that y wins. Again a vote between x and z , x collects 8 votes and z collects $4+5=9$ votes, so that z wins. We observe that there is a cycle in the voting results where x is defeated by y , y is defeated by z and also z is defeated by x which is a voter paradox.

Condorcet's ad hoc judgment is that x is the Condorcet winner, since x wins by 7 votes and defeats by 1 vote, y wins by 9 votes and defeats by 7 votes, z wins by 1 vote and defeats by 9 votes. But this is not a satisfactory and acceptable decision. Again consider the preference relations be as follows:

- Type 1: $xPyPz$ by 49 voters,
- Type 2: $yPzPx$ by 2 voters,
- Type 3: $zPxPy$ by 48 voters.

Here y is preferred by a 50 – 49 majority to x and by a 51 – 48 majority to z . So, according to the Condorcet criterion, y should win, despite the fact that very few voters rank y in the first place but the plurality (will be discussed later) elects x .

Borda Count

Jean-Charles Borda (1733-1799) developed another voting method named "method of marks" (Borda 1781). Each elector ranks the alternatives according to his order of preference (ties disallowed). Once all votes have been counted and the candidate with the most points is the winner. It is currently used for the election of two ethnic minority members of the National Assembly of Slovenia, and in modified forms, to select presidential election candidates in Kiribati and to elect members of the Parliament of Nauru. It is also used throughout the world by various private organization and competitions. In this method if there are m alternatives, an elector's first choice is assigned $(m-1)$ points, his second $(m-2)$ points and so on down to his last choice, which is assigned 0 point. One property of the Borda rule is that each of the voters of each type gives $m(m-1)$ marks to the candidates. Borda votes in the above first example be as follows:

- For x : $8 \times 2 + 5 \times 0 + 4 \times 1 = 20$ marks,
- For y : $8 \times 1 + 5 \times 2 + 4 \times 0 = 18$ marks,
- For z : $8 \times 0 + 5 \times 1 + 4 \times 2 = 13$ marks.

Here x gets highest marks 20, so x wins. We observed that Borda method has no voter paradox but it has some problems. Black (1958) and Satterthwaite (1975) modified the Borda method by misrepresentation of their preferences by the electors. Now we modify the example by adding two alternatives u and v . The preference relations be as follows:

- Type 1: $xPyPzPuPv$ by 8 voters,
- Type 2: $yPzPxPuPv$ by 5 voters,
- Type 3: $zPxPyPuPv$ by 4 voters.

Now Borda counts be as follows:

For x : $8 \times 4 + 5 \times 2 + 4 \times 3 = 54$ marks,
 For y : $8 \times 3 + 5 \times 4 + 4 \times 2 = 52$ marks,
 For z : $8 \times 2 + 5 \times 3 + 4 \times 4 = 47$ marks,
 For u : $8 \times 1 + 5 \times 1 + 4 \times 1 = 17$ marks,
 For v : $8 \times 0 + 5 \times 0 + 4 \times 0 = 0$ mark.

So that in this case x wins again. If the type 3 voters falsely declared that their preference ordering is as,

Type 3: $zPyPuPvPx$ by 4 voters,

then the Borda counts would be,

For x : $8 \times 4 + 5 \times 2 + 4 \times 0 = 42$ marks,
 For y : $8 \times 3 + 5 \times 4 + 4 \times 3 = 56$ marks,
 For z : $8 \times 2 + 5 \times 3 + 4 \times 4 = 47$ marks,
 For u : $8 \times 1 + 5 \times 1 + 4 \times 2 = 21$ marks,
 For v : $8 \times 0 + 5 \times 0 + 4 \times 1 = 4$ marks.

In this case y would have won. The voters of type 3 would have been better off than when they voted honestly; the method provides a temptation for misrepresentation of preferences. The possibility of manipulation of the result of an election through the misrepresentation of preferences as described above was considered neither by Borda nor by Condorcet.

Borda Rule is Cloning Manipulable

We have seen that Borda did not use manipulation in his voting method. But we can manipulate the Borda rule by introducing a cloning candidate (Serais 2002). Suppose x would be defeated in an election following Borda count. The candidate x can manipulate the election outcome in his favor by introducing his clone y (say) in the choice set, the clone y being defined as an alternative which is ranked immediately below x in the individual preferences.

Let $N = \{1, 2, \dots, n\}$ be the set of individual voters, and let $Y = \{x, y, z, \dots\}$ be the finite set of alternatives. Choose a set $A \subseteq Y$ be a finite set where $n(A) = m$. Now for $A = \{x, y, z\}$ the six possible preference orderings over A will be numbered as follows:

Table 1: Possible Preference Orderings Over the Set A

| n_1 | n_2 | n_3 | n_4 | n_5 | n_6 |
|-------|-------|-------|-------|-------|-------|
| x | x | y | y | z | z |
| y | z | x | z | x | y |
| z | y | z | x | y | x |

A voting situation is a vector, $s = (n_1, \dots, n_6)$, where n_j ($j = 1, \dots, 6$) be the number of type j voters and $\sum_{j=1}^6 n_j = n$. Here n is the total number of voters in an election. Let $S^n = \{s^1, \dots, s^n\}$ be the set of all possible voting situations. A social choice function $f : S^n \rightarrow A$, assigns to each voting situation a non-empty subset of A . Let N_{xy} be the number of voters who prefer x to y , $S_{B,s}^x$ be the Borda score of x , and $S_{B,s}^{xy}$ be the difference of Borda score between x and y for the voting situations i.e., $S_{B,s}^{xy} = S_{B,s}^x - S_{B,s}^y$. Now we can introduce the mathematical definition of a clone as follows:

A candidate y is a clone of x for a voting situations if and only if $\forall z \in X \setminus \{x, y\}, \forall i \in N$
 $xP_i z \Leftrightarrow yP_i z$ and $\forall i \in N, xP_i y$.

This type of manipulation was introduced by Dummett (1998) where he called it agenda manipulation. Dummett observed that the Borda rule may suffer from this manipulation and explained by a series of examples. Here we set an example where there are 12 voters and they have to choose preference relation among four alternatives x, y, z and u . Let the preference relations be as follows:

- Type 1: $yPuPzPx$ by 2 voters,
- Type 2: $uPzPxPy$ by 2 voters,
- Type 3: $zPuPyPx$ by 2 voters,
- Type 4: $xPuPyPz$ by 3 voters,
- Type 5: $xPyPuPz$ by 1 voter,
- Type 6: $zPyPxPu$ by 2 voters.

Borda votes in the above example be as follows:

- For x : $2 \times 0 + 2 \times 1 + 2 \times 0 + 3 \times 3 + 1 \times 3 + 2 \times 1 = 16$ marks,
- For y : $2 \times 3 + 2 \times 0 + 2 \times 1 + 3 \times 1 + 1 \times 2 + 2 \times 2 = 17$ marks,
- For z : $2 \times 1 + 2 \times 2 + 2 \times 3 + 3 \times 0 + 1 \times 0 + 2 \times 3 = 18$ marks,
- For u : $2 \times 2 + 2 \times 3 + 2 \times 2 + 3 \times 2 + 1 \times 1 + 2 \times 0 = 21$ marks.

Here u gets highest 21 marks, so u wins and y gets second lowest 17 marks. Dummett assumes that before the election, a fifth candidate, v is introduced by y whom every voter ranks immediately below y . Then the preference profile would be as follows:

- Type 1: $yPvPuPzPx$ by 2 voters,
- Type 2: $uPzPxPyPv$ by 2 voters,
- Type 3: $zPuPyPvPx$ by 2 voters,
- Type 4: $xPuPyPvPz$ by 3 voters,
- Type 5: $xPyPvPuPz$ by 1 voter,
- Type 6: $zPyPvPxPu$ by 2 voters.

Then the Borda votes would be as follows:

- For x : $2 \times 0 + 2 \times 2 + 2 \times 0 + 3 \times 4 + 1 \times 4 + 2 \times 1 = 22$ marks,
- For y : $2 \times 4 + 2 \times 1 + 2 \times 2 + 3 \times 2 + 1 \times 3 + 2 \times 3 = 29$ marks,
- For z : $2 \times 1 + 2 \times 3 + 2 \times 4 + 3 \times 0 + 1 \times 0 + 2 \times 4 = 24$ marks,
- For u : $2 \times 2 + 2 \times 4 + 2 \times 3 + 3 \times 3 + 1 \times 1 + 2 \times 0 = 28$ marks,
- For v : $2 \times 3 + 2 \times 0 + 2 \times 1 + 3 \times 1 + 1 \times 2 + 2 \times 2 = 17$ marks.

Now y gets highest score of 29 marks and wins in the election. Here we observed that in initial voting situation y scored second lowest 17 marks but after cloning a candidate v as fifth candidate by y placed him in first position. So that cloning manipulation is sufficiently powerful to win in an election by a losing candidate.

Let there are two losing candidates in an election. Now we will discuss the cloning manipulation by a single loser. Let $A = \{x, y, z\}$ then the voting situation s^1 be as follows:

Table 2: The Voting Situation of s^1 .

| n_1 | n_2 | n_3 | n_4 | n_5 | n_6 | Score s |
|-------|-------|-------|-------|-------|-------|------------|
| x | x | z | z | y | y | 2 |
| y | z | x | y | z | x | 1 |
| z | y | y | x | x | z | 0 |

From table 2 we find;

$$S_{B,s^1}^x = 2(n_1 + n_2) + n_3 + n_6, \quad S_{B,s^1}^y = n_1 + n_4 + 2(n_5 + n_6) \quad \text{and} \quad S_{B,s^1}^z = n_2 + 2(n_3 + n_4) + n_5,$$

$$N_{xy} = n_1 + n_2 + n_3, \quad N_{yx} = n_4 + n_5 + n_6, \quad N_{xz} = n_1 + n_2 + n_6, \quad N_{zx} = n_3 + n_4 + n_5,$$

$$N_{yz} = n_1 + n_5 + n_6 \quad \text{and} \quad N_{zy} = n_2 + n_3 + n_4,$$

$$N_{yz} + N_{zy} = n_1 + n_2 + n_3 + n_4 + n_5 + n_6 = n,$$

$$\text{Similarly,} \quad N_{xy} + N_{yx} = n \quad \text{and} \quad N_{xz} + N_{zx} = n.$$

Let $S_{B,s^1}^{xy} \geq 0$ and $S_{B,s^1}^{xz} \geq 0$, so that x wins by Borda counts. Now suppose y is in the lowest position by Borda counts. The candidate y could introduce u whom every voter ranks immediately below y . Then the voting situation s^2 would be as follows:

Table 3: The Voting Situation of s^2

| n_1 | n_2 | n_3 | n_4 | n_5 | n_6 | Score s |
|-------|-------|-------|-------|-------|-------|------------|
| x | x | z | z | y | y | 3 |
| y | z | x | y | u | u | 2 |
| u | y | y | u | z | x | 1 |
| z | u | u | x | x | z | 0 |

From table 3 we find:

$$S_{B,s^2}^x = 3(n_1 + n_2) + 2n_3 + n_6$$

$$= (2(n_1 + n_2) + n_3 + n_6) + (n_1 + n_2 + n_3)$$

$$= S_{B,s^1}^x + N_{xy},$$

$$S_{B,s^2}^y = 2n_1 + n_2 + n_3 + 2n_4 + 3(n_5 + n_6)$$

$$= (n_1 + n_4 + 2(n_5 + n_6)) + (n_1 + n_2 + n_3 + n_4 + n_5 + n_6)$$

$$= S_{B,s^1}^y + n,$$

$$S_{B,s^2}^z = 2n_2 + 3(n_3 + n_4) + n_5$$

$$= (n_2 + 2(n_3 + n_4) + n_5) + (n_2 + n_3 + n_4)$$

$$= S_{B,s^1}^z + N_{zy},$$

$$S_{B,s^2}^u = n_1 + n_4 + 2(n_5 + n_6) = S_{B,s^1}^y.$$

Since u is cloned by y , so u is always beaten by y . Now y beats x if,

$$N_{yx} > S_{B,s^1}^{xy} \quad \text{i.e.,} \quad S_{B,s^1}^y + n > S_{B,s^1}^x + N_{xy}$$

$$\text{i.e.,} \quad 2(n_1 + n_4) + 3(n_5 + n_6) + n_2 + n_3 > 3(n_1 + n_4) + 2n_3 + n_6 \quad (1)$$

Now y beats z if,

$$N_{yz} \geq S_{B,s^1}^{zy} \quad \text{i.e.,} \quad S_{B,s^1}^y + N_{yz} + N_{zy} \geq S_{B,s^1}^z + N_{zy} \quad \text{i.e.,} \quad S_{B,s^1}^y + n \geq S_{B,s^1}^z + N_{zy}$$

$$\text{i.e.,} \quad 2(n_1 + n_4) + 3(n_5 + n_6) + n_2 + n_3 > 3(n_3 + n_4) + 2n_2 + n_5. \quad (2)$$

Inequalities (1) and (2) satisfy all the properties of Borda rule, so that y wins in the election. Now we describe the cloning manipulation by both of the losing candidates. In table 2 we consi-

dered that x wins but y and z were defeated. Now both y and z could introduce cloning candidates. Let u be the clone of y and v be the clone of z and let only y would be benefited by cloning. The voting situation s^3 would be as follows:

Table 4: The Voting Situation of s^3 .

| n_1 | n_2 | n_3 | n_4 | n_5 | n_6 | Score s |
|-------|-------|-------|-------|-------|-------|------------|
| x | x | z | z | y | y | 4 |
| y | z | v | v | u | u | 3 |
| u | v | x | y | z | x | 2 |
| z | y | y | u | v | z | 1 |
| v | u | u | x | x | v | 0 |

From table 4 we find:

$$\begin{aligned}
 S_{B,s^3}^x &= 4(n_1 + n_2) + 2(n_3 + n_6) \\
 &= (2(n_1 + n_2) + n_3 + n_6) + (n_1 + n_2 + n_3) + (n_1 + n_2 + n_6) \\
 &= S_{B,s^1}^x + N_{xy} + N_{xz}, \\
 S_{B,s^3}^y &= 3n_1 + n_2 + n_3 + 2n_4 + 4(n_5 + n_6) \\
 &= (n_1 + n_4 + 2(n_5 + n_6)) + (n_1 + n_2 + n_3 + n_4 + n_5 + n_6) + (n_1 + n_5 + n_6) \\
 &= S_{B,s^1}^y + n + N_{yz}, \\
 S_{B,s^3}^z &= n_1 + 3n_2 + 4(n_3 + n_4) + 2n_5 + n_6 \\
 &= (n_2 + 2(n_3 + n_4) + n_5) + (n_1 + n_2 + n_3 + n_4 + n_5 + n_6) + (n_2 + n_3 + n_4) \\
 &= S_{B,s^1}^z + n + N_{zy}, \\
 S_{B,s^3}^u &= 2n_1 + n_4 + 3(n_5 + n_6) \\
 &= (n_1 + n_4 + 2(n_5 + n_6)) + (n_1 + n_5 + n_6) \\
 &= S_{B,s^1}^y + N_{yz}, \\
 S_{B,s^3}^v &= 2n_2 + 3(n_3 + n_4) + n_5 \\
 &= (n_2 + 2(n_3 + n_4) + n_5) + (n_2 + n_3 + n_4) \\
 &= S_{B,s^1}^z + N_{zy}.
 \end{aligned}$$

Since u be the clone of y , so u is always beaten by y . y beats x if $S_{B,s^3}^{yx} > 0$

$$\Rightarrow S_{B,s^1}^y > S_{B,s^1}^{xy} + N_{xz} \quad \text{i.e., } 2S_{B,s^1}^y > S_{B,s^1}^x + N_{xz} \quad \text{i.e., } S_{B,s^1}^y + N_{yx} + N_{yz} > S_{B,s^1}^x + N_{xz}$$

$$\text{i.e., } S_{B,s^1}^y + N_{yx} + N_{yz} + N_{xy} > S_{B,s^1}^x + N_{xz} + N_{xy}$$

$$\text{i.e., } S_{B,s^1}^y + n + N_{yz} > S_{B,s^1}^x + N_{xz} + N_{xy},$$

$$n_1 + n_4 + 2(n_5 + n_6) + n + n_1 + n_5 + n_6 > 2(n_1 + n_2) + n_3 + n_6 + (n_1 + n_2 + n_6) + (n_1 + n_2 + n_3)$$

$$\text{i.e., } 4(n_5 + n_6) + 3n_1 + n_2 + n_3 + 2n_4 > 4(n_1 + n_2) + 2(n_3 + n_6). \quad (3)$$

Again v is the clone of z so that $S_{B,s^3}^{yz} \geq 0$ gives $S_{B,s^3}^{zv} \geq 0$ which implies $S_{B,s^3}^{yv} \geq 0$.

$$\begin{aligned} \text{Again } y \text{ beats } z \text{ if } S_{B,s^3}^{yz} \geq 0 &\Rightarrow S_{B,s^3}^{yz} \geq N_{zy} - N_{yz} \Rightarrow S_{B,s^1}^y + n + N_{yz} \geq S_{B,s^1}^z + n + N_{zy} \\ \text{i.e., } 4(n_5 + n_6) + 3n_1 + n_2 + n_3 + 2n_4 &> 4(n_3 + n_4) + 3n_2 + 2n_5 + n_1 + n_6. \end{aligned} \quad (4)$$

Inequalities (3) & (4) satisfy all the properties of Borda rule, so that y wins in the election. In this section we have shown by calculations that Borda voting is for sincere voters and manipulation is impossible but a defeated candidate can manipulate Borda voting in his favor by introducing his clone.

Majority Voting

In section 2 we observed the voting paradox in majority voting where there is no unambiguous winner. We modify the majority voting by the introduction of an agenda (Black 1958; Feldman 1979). Let us again consider the preference relation of section 2 i.e.,

Type 1: $xPyPz$ by 8 voters,
Type 2: $yPzPx$ by 5 voters,
Type 3: $zPxPy$ by 4 voters.

Now suppose that x is the *status quo*, while y is a motion to change the status quo and z is an amended version of that motion. A typical committee practice, which Black (1958) called Procedure α , is to hold a vote between y and z (the motion and the amended version), and place the winner of that vote against x (the status quo). If votes are sincere, Procedure α produces y on the first round (the amendment is defeated) and x on the second (the bill is defeated). In these circumstances, type 2 voters could misrepresent their preferences as,

Type 2: $zPyPx$ by 5 voters.

Then, z could win the first round (the amendment would pass) and then z defeated x (the amended bill would be adopted). In this case type 2 voters could be benefited by manipulation of voting.

A second committee practice, which Black (1958) called Procedure β , pits each motion against the status quo. We have shown z defeats the status quo but y does not, so that z is adopted, provided the voters vote sincerely. We observed that under Procedure β , type 1 voters have an opportunity to gain by misrepresentation. If they vote as of their preferences were,

Type 1: $yPxPz$ by 8 voters,

Then both y and z would defeat the status quo in the first round. In the second round y would defeat z . So that type 1 voters would have manipulated the choice of y , which they prefer, over z .

Single Transferable Voting System

The single transferable vote (STV) is a system of preferential voting designed to minimize wasted votes. In STV, a constituency elects two or more representatives per electorate. As a result the constituency is proportionally larger than a single member constituency from each party. Political parties tend to offer as many candidates as they most optimistically could expect to win; the major parties may nominate almost as many candidates as there are seats, while the minor parties and independents rather fewer. STV initially allocates an elector's vote for her most preferred candidate and then, after candidate have been either elected or eliminated, transfers surplus or unused votes according to the voter's stated preferences (ties disallowed). It is a many ballots electoral system and mainly used in the English-speaking countries. It can be used for either single winner or multi-winner voting system and we will discuss both methods in this section.

History of STV

The concept of transferable voting was first proposed by Thomas Wright Hill in 1821, for application in elections at his school but was not populated. Carft Andrae in 1855 proposed a transferable voting system for election in Denmark and used it in 1856 to elect the Danish Rigsdag. The English barrister Thomas Hare is generally credited with the concept of STV and proposed that electors should have the opportunity of discovering which candidate their vote had ultimately counted for, to improve their personal connection with voting. Andrew English Clark was successful in persuading the Tasmanian House of Assembly to be the first parliament in the world elected by what become known as the Hare-Clark system, named after himself and Thomas Hare. The STV is a system of preferential voting designed to minimize wasted votes which provides proportional representation while ensuring that votes are explicitly expressed for individual candidates rather than party lists. In 2007 STV is used for parliamentary elections in the Republic of Ireland, North Irish Assembly and Malta. It is also used for the Australian Senate in the form of a group voting ticket, as well as certain regional and local elections in Australia, local government elections in Australia, local government elections in New Zealand. It is held up by its supports as being the best and fairest electoral system in the world, but political parties dislike it and resist to adopting it because it requires candidates to compete publicly with one another. If it is popularized in the society then there is probability of political parties to be completely abolished.

Setting the Quota

In an STV election, a candidate requires a certain minimum number of votes ‘*the quota*’ to be elected. A number of different quotas can be used; the most common is the *Droop quota*, given by the formula (Droop 1881):

$$\left(\frac{V}{S+1}\right)+1$$

where, V = the total number of valid votes cast.

S = the number of seats to be filled.

STV is a step procedure, in each step voters cast votes for their most preferred candidate. It proceeds according to the following steps:

- i) Any candidate who touched or exceeded the required quota is declared elected.
- ii) If not enough candidates have been elected, the count continues.
- iii) If a candidate casts more vote than the quota, then their surplus is transferred to other candidates according to the next preference on each voter’s ballot.
- iv) If none meets the quota, the candidate with the fewest votes is eliminated and their votes are transferred. This process continues until the last candidates survive which is the winner in the election.

Again in quota system, voting procedure is stopped when the numbers of remaining candidates instead of counting votes until all candidates have reached a quota. In STV, candidates who receive excess votes and candidates who are excluded have their votes transferred to other candidates, it is said to be minimize wasted votes. Let us introduce a simple example:

Let 40 guests (voters) are invited in party and 5 food stuffs (candidates), 3 of which will be selected. The candidates are: Beef (x), Mutton (y), Chicken (z), Fish (z) and Vegetable (v). Each

of the 40 guests is given 2 ballots. In quota system, the number of votes to be elected is $\left(\frac{40}{3+1}\right) + 1 = 11$.

In the following table 5 we have shown only first and second preferences of their food stuffs. We have excluded higher order preferences because in our election these are no needed.

Table 5: First and second Preferences of the Voters.

| | | | | | | |
|-------------------|----------|----------|----------|----------|----------|----------|
| No. of guests | 10 | 5 | 8 | 3 | 2 | 7 |
| First preference | <i>x</i> | <i>x</i> | <i>y</i> | <i>z</i> | <i>u</i> | <i>v</i> |
| Second preference | <i>y</i> | <i>v</i> | | | <i>v</i> | |

When ballots are counted the election proceeds as follows:

Step 1

| | | | | | |
|-----------------|----------|----------|----------|----------|----------|
| Candidates | <i>x</i> | <i>y</i> | <i>z</i> | <i>u</i> | <i>v</i> |
| Collected votes | 15 | 8 | 3 | 2 | 7 |

In step 1 *x* has 4 more votes than the quota, so *x* is declared elected. Candidate *x*'s surplus votes transfer equally to *y* and *v* according to voters of *x* second choice preferences then the step 2 being as follows:

Step 2

| | | | | | |
|-----------------|----------|----------|----------|----------|----------|
| Candidates | <i>x</i> | <i>y</i> | <i>z</i> | <i>u</i> | <i>v</i> |
| Collected votes | 11 | 10 | 3 | 2 | 9 |

In step 2 even with the transfer of this surplus no candidate has reached the quota. Then *u* with the lowest votes is eliminated. The votes of *u* are transfer to his second preference *v* to reach the quota then the step 3 being as follows:

Step 3

| | | | | |
|-----------------|----------|----------|----------|----------|
| Candidates | <i>x</i> | <i>y</i> | <i>z</i> | <i>v</i> |
| Collected votes | 11 | 10 | 3 | 11 |

In step 3, *v* is elected but has no surplus to transfer. Neither of the remaining candidates meets the quota. Therefore *z* has lowest votes is eliminated. Candidate *y* is the only remaining candidate and so wins the final seat.

Final Result: The winners are *x*, *v*, *y* i.e., Beef, Vegetable and Mutton.

The Process of Single Winner in STV and Manipulation of Voting

It is also a step procedure, in which, at each step voters cast votes for their most preferred candidate. In step 1, each voter casts vote for his most favorite candidate. Then the candidate with the fewest votes is eliminated. In step 2, each elector casts a single vote for his most favorite among the remaining candidates. As before the candidate with the fewest votes is eliminated. The process continues until one candidate remains. The last candidate is considered as the winner. Consider the preference profile as follows:

Step 1

- Type 1: *xPzPyPu* by 10 voters,
- Type 2: *yPzPxPu* by 7 voters,
- Type 3: *uPzPyPx* by 5 voters,
- Type 4: *zPyPuPx* by 3 voters,
- Type 5: *uPzPxPy* by 4 voters.

In step 1, *z* with 3 votes is eliminated, and then the preference profile will be as follows:

Step 2

- Type 1: *xPyPu* by 10 voters,
- Type 2: *yPxPu* by 7 voters,

Type 3: $uPyPx$ by 5 voters,
Type 4: $yPuPx$ by 3 voters,
Type 5: $uPxPy$ by 4 voters.

In step 2, u with 9 votes is eliminated, and then the preference profile will be as follows:

Step 3

Type 1: xPy by 10 voters,
Type 2: yPx by 7 voters,
Type 3: yPx by 5 voters,
Type 4: yPx by 3 voters,
Type 5: xPy by 4 voters.

In step 3, x with 14 votes is eliminated. Finally y will be the remaining person and will win in the election. Type 3 voters prefer z to y . They anticipate that y will win then they could manipulate the preferences as follows:

Type 3: $zPxPuPy$ by 5 voters.

Then as before in step 1 u with 4 votes would be eliminated and then the preference profile would be as follows:

Step 2a

Type 1: $xPzPy$ by 10 voters,
Type 2: $yPzPx$ by 7 voters,
Type 3: $zPyPx$ by 5 voters,
Type 4: $zPyPx$ by 3 voters,
Type 5: $zPxPy$ by 4 voters.

In step 2a, y with 7 votes would be eliminated and then the preference profile would be as follows:

Step 3a

Type 1: xPz by 10 voters,
Type 2: zPx by 7 voters,
Type 3: zPx by 5 voters,
Type 4: zPx by 3 voters,
Type 5: zPx by 4 voters.

In step 3a, x with 10 votes would be eliminated. Finally z would be remaining person and would win in the election. Therefore, we have seen that STV is manipulable.

Tie-Breaking in STV

Although we mentioned above that in STV ties disallowed, sometimes ties can occur for several different reasons and the ties need to be broken (Newland and Britton 1997; O'Neill 2004). The ties can be broken simply by lottery system such as tossing coin. But this system is not the best one and usually the following four rules are used in tie-breaking.

- i) Forwards Tie-Breaking (*FTB*): Choose the candidate who has the most (least) votes at the first stage where they had unequal votes.
- ii) Backwards Tie-Breaking (*BTB*): Choose the candidate who has the most (least) votes at the previous stage or at the latest point in the count where they had unequal votes.
- iii) Borda Tie-Breaking: Choose the candidate with the highest (least) Borda score.
- iv) Coombs Tie-Breaking: Choose the candidate with the fewest (most) last place votes.

Sometimes after breaking tie by any of the above mentioned rules the candidate would still face tied. In this case it is useful to distinguish between *weak ties* and *strong ties*. A weak tie occurs when candidates have the same number of votes at a given stage. A strong tie occurs when candidates are still tied after applying a tie-breaking rule (any one rule from (i)–(iv) mentioned above). A strong tie would be broken by lottery. Here we will use ERS97 rules of tie-breaking (Newland and Britton 1997; O’ Neill 2004). The difference between *FTB* and *BTB* is given in table 6 which is from Newland & Britton (1997) without any change.

Table 6: Example Tally with ERS97 Rules where 60 Voters are Electing 2 Candidates from 6.

| | | Surplus of x | Eliminate w | Eliminate v | Eliminate z |
|------------------|----|----------------|---------------|---------------|---------------|
| Stage | 1 | 2 | 3 | 4 | 5 |
| x | 23 | 20.00 | 20.00 | 20.00 | 20.00 |
| y | 13 | 13.00 | 13.00 | 15.00 | 15.00 |
| z | 6 | 6.50 | 10.00 | 12.00 | 2.00 |
| u | 7 | 7.50 | 9.50 | 12.00 | 18.00 |
| v | 7 | 7.50 | 7.50 | - | - |
| w | 4 | 5.50 | - | - | - |
| Non-Transferable | 0 | 0.00 | 0.00 | 1.00 | 5.00 |

Here we have to eliminate one candidate at stage 4 and there is a tie between candidates z and u . Thus, tie-breaking needs to be used to determine which candidate is to be eliminated. We use the *FTB* following ERS97 rules. In this case we first look to the counts at stage 1. From table 6 we see that u has one more vote than z at stage 1. So that candidate z is eliminated. If z and u had been tied at stage 1, then we would have to be looked to subsequent stages. If z and u would have been tied in all stages, then we would have been a strong tie which would have been broken by lottery.

But in *BTB* we have to look at the previous stage to break ties and if necessary to the preceding stages. In table 6 we see in preceding stage 3 that z is ahead to u , so that u would be eliminated.

One problem arises with *FTB* where the elimination order is: 4, 1, 2, 3 which is not sequential and is undesirable. If we make a meaningful sequence starting from 4 then the order is: 4, 3, 2, 1 which is *BTB*. Again *FTB* does not use the most relevant information than *BTB* to break the tie. Hence *BTB* is better than *FTB* in tie-breaking.

Probability of Eliminating of Winning Candidates in Tie-Breaking STV

In tie-breaking STV, ERS97 rule sometimes eliminates winning candidates without manipulation of voting which is undesirable. Suppose there are 31 voters and 6 candidates among which one will be elected. Each of the voters is given 4 ballots (O’ Neill 2004). In step 1 the preferences would be as follows:

Step 1

| No. of votes | 4 | 5 | 5 | 2 | 4 | 11 |
|----------------------------|-----|-----|-----|-----|-----|-----|
| 1 st preference | x | y | z | u | v | w |
| 2 nd preference | y | z | y | x | x | |
| 3 rd Preference | z | | | y | y | |
| 4 th preference | | | | z | z | |

In step 2, u with fewest votes would be eliminated and u 's votes would be transferred to his second preferred candidate x . The preference profile of step 2 would be as follows:

Step 2

| | | | | | |
|-----------------|-----|-----|-----|-----|-----|
| Candidates | x | y | z | v | w |
| Collected votes | 6 | 5 | 5 | 4 | 11 |

In step 3, v with fewest votes is eliminated and v 's votes would be transferred to his second preferred candidate x . The preference profile of step 3 would be as follows:

Step 3

| | | | | |
|-----------------|-----|-----|-----|-----|
| Candidates | x | y | z | w |
| Collected votes | 10 | 5 | 5 | 11 |

In step 3, a tie arises between y and z with the fewest 5 votes. Then both would be eliminated by ERS97. However, instead tie would be broken by *FTB* or *BTB* or by lottery. Suppose z was eliminated by lottery and z 's votes would be transferred to his second preferred candidate y . Then y would be tied with x . The preference profile of step 4 would be as follows:

Step 4

| | | | |
|-----------------|-----|-----|-----|
| Candidates | x | y | w |
| Collected votes | 10 | 10 | 11 |

In that situation tie would be broken by *FTB* rule. In step 1 candidate x has fewer votes than y , so that x would be eliminated and y as x 's second preferred candidate received all of x 's votes and beat w with 20 to 11 votes in final step. Therefore, winning candidate in ERS97 rule was eliminated which is unacceptable situation in STV election.

So that there is a flaw in STV, ERS97 *FTB* rule. This flaw could be removed in two ways: (i) by changing the rules of STV, ERS97, (ii) by using *BTB* rule which is better as we have seen before. Hence with *FTB* a winning candidate could be improperly eliminated however, with *BTB* both of these last-place candidates cannot win and can thus be properly eliminated.

Plurality Voting

The plurality voting system is a single-winner voting system often used to elect executive officer or to elect members of a legislative assembly, which is based on single member constituencies. This is the simplest of all voting systems for voters and vote counting officials. Generally plurality ballots can be categorized into two forms. The simplest form is a blank ballot where the name of a candidate is written in by hand. A most structured ballot will list all the candidates and allow a mark to be made for a single candidate; however a structured ballot can also include space for a write-in candidate as well. Sometimes at the end of each candidate a known symbol is enclosed and each voter votes for his favorite by sealing on the symbol of his favorite. Under this system the winner of the election acts as representative of the whole region of his constituting area. In this method there are many candidates or alternatives and there are many voters or individuals where each voter casts only one vote for one candidate. The candidate who collects highest total wins in the election; there is no requirement that the winner gain an *absolute majority* of votes. This type of voting system is prevailed in most of the countries in the world such as the USA, the UK, Canada, India, Bangladesh, Pakistan, and so on. This type of voting sometimes is called *simple plurality*, *first past the post* (FPP) or *winner-takes-all*. Plurality voting is used for local and/or national elections in about 43 of the 191 countries of the UN. The term FPP was coined as an analogy to horse racing, where the winner of the race is the first to pass a particular point as the track, after which all other runners completely lose. In some countries such as France a different plurality system is used, where there are two rounds; the *two-ballots* or *run off election* plurality system. If any candidate in the first round gains majority of the votes then there

is no need of second round, otherwise the two highest-voted candidates of the first round compete in a two-candidate second round. Most of the voters cast vote for one among the favorite candidates who has a strong chance of winning. However, some voters will want to manipulate the result by misrepresenting their votes. Consider three preference relations be as follows:

Type 1: $xPyPz$ by 15 voters,

Type 2: $yPzPx$ by 12 voters,

Type 3: $zPyPx$ by 4 voters.

In a sincere election, type 3 voters cast their votes for z , but x wins the plurality. If type 3 voters anticipate this result, they of course vote for y , as y is their second choice candidate. In this case the type 3 preference would be $yPzPx$, and then y would get $12+4=16$ votes where as x would get 15 votes and in final result y would win. Observed that here 4 voters of type 3 are manipulating the election. Manipulation by a group rather than a single individual is called *coalitional* manipulation. Unfortunately sometimes plurality voting creates tie votes. In the above example if there were 15 type 1 voters and 15 type 2 voters, only 1 type 3 voter and one of the voters in type 1 is the leader. In a sincere election x would cast 15 votes and y would cast 15 votes z would cast 1 vote, and the leader would break the $x - y$ tie in favor of x , since, x is his most favorite candidate. Anticipating the result that x would win which is less preferred by type 3 voter, he can manipulate the election by the preference profile as $yPzPx$. Then x would cast 15 votes and y would cast 16 votes and final result that y would win. Therefore, the plurality voting is manipulable.

Exhausting Voting

This method is rarely used in modern world, which works in steps. In step 1, each voter casts a vote for his least preferred candidate. The candidate with the largest number of votes is eliminated from the list. The process continues until the last candidate survives which is the winner in the election (ties disallow). Suppose the preference relations be as follows:

Step 1

Type 1: $xPyPzPuPv$ by 5 voters,

Type 2: $yPzPxPuPv$ by 12 voters,

Type 3: $zPxPyPvPu$ by 10 voters,

Type 4: $uPvPxPyPz$ by 11 voters,

Type 5: $vPyPxPzPu$ by 8 voters,

Type 6: $zPxPuPvPy$ by 9 voters.

In step 1, u collects highest score of $10+8=18$ votes, so that u is eliminated. Now the preference relations for step 2 be as follows:

Step 2

Type 1: $xPyPzPv$ by 5 voters,

Type 2: $yPzPxPv$ by 12 voters,

Type 3: $zPxPyPv$ by 10 voters,

Type 4: $vPxPyPz$ by 11 voters,

Type 5: $vPyPxPz$ by 8 voters,

Type 6: $zPxPvPy$ by 9 voters.

In step 2, v collects highest score of $5+12+10=27$ votes, so that v is eliminated. Now the preference relations for step 3 be as follows:

Step 3

Type 1: $xPyPz$ by 5 voters,

Type 2: $yPzPx$ by 12 voters,
Type 3: $zPxPy$ by 10 voters,
Type 4: $xPyPz$ by 11 voters,
Type 5: $yPxPz$ by 8 voters,
Type 6: $zPxPy$ by 9 voters.

In step 3, z collects highest score of $5+11+8=24$ votes, so that z is eliminated. Finally the preference relation for step 4 be as follows:

Step 4

Type 1: xPy by 5 voters,
Type 2: yPx by 12 voters,
Type 3: xPy by 10 voters,
Type 4: xPy by 11 voters,
Type 5: yPx by 8 voters,
Type 6: xPy by 9 voters.

In step 4, y collects highest score of $5+10+11+9=35$ votes, so that y is eliminated. Finally x is the remaining person and wins in the election. If the type 4 voters anticipate that x will win who is not their most liking candidate and there is no chance of winning their most favorite candidate u . So they would want to manipulate the result and they would send a message that they would cast votes for z as their most preferred candidate. Then if z who had a little chance of winning would promise with them that type 4 voters would find favor of z then they would manipulate the preferences as follows:

Type 4: $zPvPuPyPx$ by 11 voters.

In that case no voters of other types would imagine such a manipulation. Similarly as before, in step 1, u would eliminate, in step 2, v would eliminate, in step 3, x would eliminate, in step 4, y would eliminate and finally z would win. So that type 4 voters are better off than when they are honest. Therefore exhausting voting is manipulable.

Approval Voting

Approval voting is a single winner voting system used for elections. In this method each voter may vote for as many of the candidates as he wishes. Let there is a set of n candidates $\{x, y, z, \dots\}$. One may cast 0, 1, 2, ..., or even m votes, where $m \leq n$, by assigning a single vote to each candidate he approves and none to each candidate he disapproves. The candidate with the highest total wins (Brams and Fishburn 1978). The system was described in 1976 by Guy Olte-well and also by Rober J. Weber who coined the term "approval voting". Approval voting has been adopted by the Mathematical Association of America (1986), The Institute of Management Sciences (1987), The American Statistical Association (1987), and Institute of Electrical and Electronics Engineers ((IEEE) (1987)). IEEE rescinded the approval voting in 2002 because the director of IEEE Deniel J. Senese states that "few of our members were using it and it was felt that it was no longer needed". From 13th to 18th centuries, the Republic of Venice elected the Doge of Venice using a multi-stage process that featured random selection and voting which allowed approval of multiple candidates and required a super majority. In 19th century approval voting was used in England. The selection of the Secretary-General of the UN has involved rounds of approval polling to help discover and build a consensus before a formal vote is held in the Security Council. Approval voting usually elects Condorcet winners in practice (Brams and Fishburn 1978).

Sincere Approval Voting

An approval voting is sincere if the outcome is the same as the true preference of the voters (Brams and Fishburn 1978). Let us consider there are four candidates x, y, z and u , and a voter's preference profile being as follows:

$$xPyPzPu.$$

We can write his possible sincere approval votes as follows:

- i) vote for x, y, z and u ,
- ii) vote for x, y and z ,
- iii) vote for x and y ,
- iv) vote for x ,
- v) vote for no candidates.

If a voter be indifferent between y and z but still x is his most preferred candidate, then also (i) to (v) conditions are sincere (in this paper indifferent is not considered). Now we can also include a new combination as a sincere vote which is :

- vi) vote for x and z .

Let us introduce another example as follows:

There are three electors, where elector 1 is a leader; if there are ties for first place, he breaks them and there are three alternatives x, y, z . The preference profile is as follows:

| | | |
|-------------------|----------|----------|
| <u>1</u> (leader) | <u>2</u> | <u>3</u> |
| x | y | z |
| y | z | x |
| z | x | y . |

Each elector may cast 0, 1, 2 or 3 votes. It is foolish to cast votes equally for all or for none. Elector 1(the leader) can vote as follows:

- i) vote for x, y and z ,
- ii) vote for x and y ,
- iii) vote for y ,

and so on.

Here (i) and (ii) are sincere but (iii) is insincere.

Similarly voter 2's sincere strategies are as follows:

- i) vote for y ,
- ii) vote for y and z .

Similarly one can calculate voter 3's sincere strategies.

The following discussion results that approval voting can be manipulated and can be non-manipulated.

Manipulation of the Approval Voting

Let us consider the above example. Here every voter casts 1 vote for his favorite. So that the results are: 1 for x , 1 for y , 1 for z . Person 1 (the leader) breaks the tie in favor of x , so that x wins. Voter 2 anticipates that by the leader's favorite x will win who is his less favorite, so he could vote falsely as: 1 vote for his second favorite z instead, but none for y or x , then the result would be 2 votes for z but 1 vote for x and none for y and finally z would be winning. Therefore, the approval voting is manipulable. On the other hand person 1 votes 1 for each in a sincere way but both 2 and 3 also vote sincerely in the following ways:

- i) person 2 votes 1 for y , 1 for z but none for x
- ii) person 3 votes 1 for z , 1 for x but none for y .

In this case the result would be 2 votes for x , 2 votes for y but 3 for z and z would be winning. For this case the voting is manipulated in a sincere way also.

Non-manipulation of the Approval Voting

Now consider that all the voters except any voter n has declared their true strategies, so that voter n can not be insincere and the result will be their best output. In this case approval voting is non-manipulated.

Arrow's Theorem

For simplicity let us consider there are two individuals in the society and three social alternatives x, y, z . For the preference orderings for individual 1 or 2 there are exactly $6 \times 6 = 36$ different constellations of individual preferences possible in the society (figure 1) where alternatives are ordered from top to bottom. For detail about Arrow's theorem see Arrow (1951, 1963); Feldman 1974; Sen 1970; Barbera 1980; Islam (1997, 2008); Bossert and Weymark (2003), Breton and Weymark 2006; Feldman and Serrano (2006, 2007, 2008); Suzumura 2007; Islam, *et al.* 2009: (Spring and Fall).

Figure 1: The Preference Orderings for Individual 1 or 2 there are Exactly 36 Different Constellations of Individual Preferences Possible in the Society.

| | <u>1</u> | <u>2</u> |
|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | | <u>2</u> | | | | | | | |
| 1 st | x | x | x | x | x | y | x | y | x | z |
| 2 nd | y | y | y | z | y | z | y | x | y | x |
| 3 rd | z | z | z | x | z | x | z | z | z | y |
| 1 st | x | x | x | x | x | y | x | y | x | z |
| 2 nd | z | y | z | z | z | z | z | x | z | x |
| 3 rd | y | z | y | y | y | x | y | z | y | y |
| 1 st | y | x | y | x | y | y | y | y | y | z |
| 2 nd | x | y | x | z | x | z | x | x | x | x |
| 3 rd | z | z | z | y | z | x | z | z | z | y |
| 1 st | y | x | y | x | y | y | y | y | y | z |
| 2 nd | z | y | z | z | z | z | z | x | z | y |
| 3 rd | x | z | x | y | x | x | x | z | x | x |
| 1 st | z | x | z | x | z | y | z | y | z | z |
| 2 nd | x | y | x | z | x | z | x | x | x | y |
| 3 rd | y | z | y | y | y | x | y | z | y | x |
| 1 st | z | x | z | x | z | y | z | y | z | z |
| 2 nd | y | y | y | z | y | z | y | x | z | z |
| 3 rd | x | z | x | y | x | x | x | z | y | y |
| | | | | | | | x | y | x | x |

Arrow's theorem implies that there must be a dictator. Here we suppose individual 1 is a dictator so that from figure 1 individual 1's social decision function (SDF) is as follows:

Figure 2: Person 1 is a Dictator.

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| x | x | x | x | x | x |
| x | x | x | x | x | x |
| y | y | y | y | y | y |
| y | y | y | y | y | y |
| z | z | z | z | z | z |
| z | z | z | z | z | z |

Here individual $\underline{2}$ cannot manipulate SDF of figure 2, since his preference never affects the outcome. Individual $\underline{1}$ cannot manipulate the result, since he always gets his first choice. Therefore Arrow's theorem is non-manipulable in any situation.

Median Voter Model

The method of majority voting prevails before the dawn of recorded history but the concept of median voter theorem came from the Black (1948). Greek Philosopher Aristotle in 330 B.C. wrote *Analysis of Political Decision Making*. Condorcet gave the idea of *pivotal voter*. But neither Aristotle nor Condorcet gave any information about the median voter and we had to wait Black's work on majority voting which was given in 1948.

Basic Concept

Consider three individuals A, B, C visited the U.S.A. from Bangladesh. They had to stay in a residential hotel, A chose a hotel which costs \$1000, B chose a hotel which costs \$1500 and C chose a luxurious hotel which costs \$3000 per night. We can say B as a median voter, since exactly same number of individuals prefer a more expensive hotel than B and as prefer a less expensive hotel than B , of course here one each (Congleton 2004). The weak form of the median voter theorem says the median voter casts his vote for the real situation and wins in the election. We can explain the weak form of the median voter as follows: Let us consider there are two candidates in the election. If voters cast their votes to the candidate who is closed to the median voter always wins the election. As a result the winning candidate always receives the vote of the median voter i.e., the weak form of the median voter theorem is satisfied. The strong form of the median voter theorem says that the median voter always gets his most preferred policy. We can explain strong form of median voter theorem as follows: If both candidates compete to find the favor of the median voter, the positions of both candidates converge towards the policy positions that maximize the median voter's welfare. In this case both candidates get equal number of votes. It is no matter which candidate wins in the election in this limiting case but the median voter gains what the candidates promise in election; i.e., the strong form of the median voter theorem will hold for national public choices. Although the median voter models implies that the median voter gets what he wants but in some cases gains depend on the usual Paretian sense of welfare economics. In electoral contests between two candidates if a median voter exists government policy will maximize the welfare of the median voter in equilibrium. As a result median voter plays a pioneer role in modern democracy.

Mathematical Discussion of Median Voter Model

We have two basic versions of the median voter theorem: (i) Single-peaked preference (Black 1958) and (ii) Single-crossing property (Gans and Smart 1994). Now we briefly discuss following Myerson (1996); Austen-Smith and Banks (1999); Saporiti and Thomé (2006); Saporiti (2008); Penn, *et al.* (2008) the two versions as follows:

Single-crossing property: In single-crossing, preferences are assumed that the set of individuals or voters $N = \{1, 2, \dots, n\}$ are finite and $\#(N) = n > 2$ is odd. The set of alternatives or social options is denoted by $Y = \{x, y, z, \dots\}$, which is also finite subset of the non-negative real line R_+ . Let $P(Y)^N$ be the set of alternatives which is complete, transitive and anti-symmetric binary preferences on Y . Let $P \in P(Y)^N$ be the preference ordering over the elements of Y . For any pair $x, y \in Y$, xPy denotes the strict preference for x against y . Here Y is complete, transitive and anti-symmetric; i.e., for $x, y \in Y$ completeness implies xPy or yPx such that $x \neq y$, transitivity implies if xPy , yPz then xPz and anti-symmetry implies xPy or yPx such that $x = y$. For

$x, y \in Y$, we may write $x < y$ to mean that x is left to y in the spatial voting model. Let the voters' preferences are transitive ordered in some political spectrum say from *leftist* to *rightist*. We mean $i < j$ that voter i is to the left of voter j in this political spectrum. For any two voters i and j such that $i < j$, for any two policy alternatives x and y such that $x < y$,

$$\text{if } u_i(x) < u_i(y) \text{ then } u_j(x) < u_j(y)$$

$$\text{but if } u_j(x) < u_j(y) \text{ then } u_i(x) < u_i(y).$$

This assumption is called the *single-crossing* (*SC*) property. We can also define an easier way *SC* as follows: Let $>$ is linear order of Y and \succ is a linear order of SC , and $SC \subset P(Y)^N$. Now $\forall x, y \in Y$ and $\forall P, P' \in SC$ the single-crossing property indicates,

$$[y > x, P' \succ P \ \& \ yPx] \Rightarrow yP'x \quad \& \quad [y > x, P' \succ P \ \& \ xP'y] \Rightarrow yPx.$$

SC is common and important in political economy. Austen-Smith and Banks (1999: 107) gave an example of *SC* as follows: "For example, in redistributive politics policy makers are concerned with reallocating resources from rich to poor people, subject to the constraint (typically) that such redistributions do not reverse the rank-order of individuals' wealth. So, while there does not exist an obvious ordering of the alternative distributions of wealth, there does exist a natural ordering of individuals and their preferences in terms of individual wealth".

Saporiti (2008) gave examples of *SC* as follows: "Suppose a moderately rich individual prefers a high tax rate to another relatively smaller tax rate, so that he reveals a preference for a greater redistribution of income. Then, the single-crossing property requires that a relatively poorer individual, who receives a higher benefit from redistribution, also prefers the higher tax rate. Sometimes this is interpreted in the literature by saying that there is a complementary between income and taxation, in the sense that lower incomes increase the incremental benefit of greater tax rates. For another example, consider a strong army which prefers a large territorial concession and a small probability of war to a small concession and a high probability of war. Then, under single-crossing, with a lower expected payoff from war, should also prefer the large concession".

If the number of voters is odd and their order is complete and transitive, then there is some median voter m such that

$$\#\{i \in N : i < m\} = \#\{j \in N : m < j\}.$$

For any pair of alternatives $x, y \in Y$ such that $x < y$, if the median voter m prefers x then all voters to the left of the median voter agree with him, but if the median voter prefers y then all the voters to the right of the median voter agree with him. In both cases majority grows where median voter supports. Hence, the alternative that is most preferred by the median voter must be a Condorcet winner.

Single-peakedness: Single-peaked preferences have played an important role in the literature ever since they were used by Black (1948) to formulate a domain restriction that is sufficient for the exclusion of cycles according to the majority rule. A set of preference relations is single-peaked if there is linear order of the alternatives such that every preference relation has a unique most preferred alternative or ideal point, over this ordering, and the preference for any other alternatives monotonically decreases by moving away from the ideal point. Let for each voter i , it is assumed that there is some ideal point $\theta \in Y$ such that for every $x, y \in Y$ if $\theta_i \leq x < y$ or $y < x \leq \theta_i$ then, $u_i(x) > u_i(y)$. We observed that on either side of θ_i , voter i always prefers al-

ternatives that are closer to θ_i . This is called the *single-peakedness* assumption. Now assume that the number of voters is odd, the median voter's ideal point is the alternative θ^* such that,

$$\frac{\#N}{2} \geq \# \left\{ i : \theta_i < \theta^* \right\} \text{ and } \frac{\#N}{2} \geq \# \left\{ i : \theta^* < \theta_i \right\}.$$

The voters who have ideal points at θ^* and to its left form a majority that prefers θ^* over any alternative to the right of θ^* , while the voters who have ideal points at θ^* and to its right form a majority that prefers θ^* over any alternative to the left of θ^* . So the median voter's ideal point θ^* is a Condorcet winner in Y .

In the light of above discussion we see that single-crossing and single-peakedness are different assumptions. Both assumptions give us a result which is "the median voter's ideal point is a Condorcet winner". On the other hand, both assumptions give different property; i.e., single-crossing property implies *the ideal point of the median voter* and the single-peakedness property implies *the median of the voters' ideal points*. Single-crossing assumption follows transitive ordering but does not follow the single-peakedness assumption.

Now we set an example to show the difference between single-crossing and single-peaked (Saporiti 2008). Consider the set of preference relations as follows:

$$\begin{aligned} xP_1yP_1z & \text{ for individual } \underline{1}, \\ xP_2zP_2y & \text{ for individual } \underline{2}, \\ zP_3yP_3x & \text{ for individual } \underline{3}. \end{aligned}$$

We observe that this set has *SC* property on $Y = \{x, y, z\}$ with respect to $z > y > x$ and $P_3 \succ P_2 \succ P_1$ on the other hand, for every ordering of the alternatives, $\{P_1, P_2, P_3\}$ violates the single-peaked property because, every alternative is ranked less preferred in one preference relation.

Both single-crossing and single-peakedness are non-manipulable (Saporiti 2008; Penn *at el.* 2008).

Limitation of the Median Voter Model

Although median voter model plays a pioneer role in election but it does not exist always. For example we have discussed voting paradox in section-2 where we have found no median voter. The absence of median voter equilibrium may also arise in models where candidates can manipulate information and voter turnout.

Randomized Voting

This voting method sometimes is called lottery type social decision mechanism. Let Y be the set of alternatives and p_i be the probability of winning the alternative i . For convenient we assume that there are three alternatives $x, y, z \in Y$. Let us consider the preference profile as follows:

$$\begin{aligned} \text{Type 1: } xPyPz & \text{ by 4 voters,} \\ \text{Type 2: } yPzPx & \text{ by 3 voters,} \\ \text{Type 3: } zPxPy & \text{ by 2 voters.} \end{aligned}$$

We see that there are 9 voters, so that $p_x = \frac{4}{9}$, $p_y = \frac{3}{9}$ and $p_z = \frac{2}{9}$. Let utility scale U be said to fit the preference P if more highly ranked alternatives give greater utility; i.e., $\forall x, y \in Y$, $U(x) > U(y)$ if and only if xPy . For any finite set A , $\Delta(A)$ denotes the space of probability measures on A . Each voter wants to maximize an expected utility function,

$$EU = \sum_{x \in Y} U(x)p(x), \text{ whenever } p \in \Delta(Y).$$

Here EU is increased most whenever the voter casts his vote for the outcome i for which $U(i)$ is largest, which is a sincere election. Hence randomized elections are non-manipulable. If there are some tied elections then these are commonly solved by tossing coins which are non-manipulable randomized elections whose domain is the set of preference profiles and whose range is the set of probability distribution over the set of alternatives. An election which Von Neumann-Morgenstern utility is consistent with the actual preference and Pareto dominated alternatives never receive any probability, then the scheme must be a random dictatorship and the decision scheme is strategy-proof.

Muller-Satterthwaite Theorem

In this section we discuss about Muller-Satterthwaite Theorem (Muller and Satterthwaite 1977) which plays an important role in Economics, Political Science and Social Science (Satterthwaite 1975; Myerson 1996; Reny 2000). We define utility function, social choice function, monotonic function and non-dictatorship as follows (Arrow 1951, 1963; Sen 1970):

Utility Function

We now define the utility function as $u(x) = u(x_1, x_2, \dots, x_n)$. In preference relation we can write $u(x) > u(y) \Leftrightarrow xPy$.

Let us consider a fixed vector x_0 , and consider the set of all the vectors x which are preferred to x_0 . If we denote this set by $V(x_0)$, we can write $V(x_0) = \{x : xPx_0\}$.

For the utility function it can be written as, $V(x_0) = \{x : u(x) > u(x_0)\}$ where $V(x_0)$ is a convex set.

Social Choice Function and Monotonic Function

Let $N = \{1, 2, \dots, n\}$ be the set of individual voters, and let $Y = \{x, y, z, \dots\}$ be the complete and transitive finite set of alternatives. Let $L(Y)$ denote the set of strict transitive ordering of the alternatives in Y and $L(Y)^N$ denote the set of profiles of such preference orderings, one for each individual voter. A function $f : L(Y)^N \rightarrow Y$ will be called a social choice function. A social choice function f is monotonic if whenever $f(L_1, \dots, L_N) = x$ for any alternative x and for every individual i , and every alternative y the ranking L'_i ranks x above y if L_i does, then $f(L'_1, \dots, L'_N) = x$.

Non-Dictatorship

It is required that the SWF should not be dictatorial. That is, there should be no individual such that whenever he prefers x to y , society must prefer x to y , irrespective of the preferences else. This is called the condition of non-dictatorship. Mathematically, there is no individual i such that for every element in the domain of rule f , $\forall x, y \in X$ such that $xP_i y \Rightarrow xPy$. Anonymous voting systems with at least two voters satisfy the non-dictatorship property. The dictatorship is unde-

sirable in the society. First, it is undesirable because one's worst enemy might be dictator. Second, it is not a collective choice rule. So that dictatorship may cause the violation of human rights.

Pre-requisites

Let $N = \{1, 2, \dots, n\}$ be the set of individual voters, and let $Y = \{x, y, z, \dots\}$ be the complete and transitive finite set of alternatives. Let $L(Y)$ denotes the set of strict transitive ordering of the alternatives in Y and $L(Y)^N$ denotes the set of profiles of such preference orderings, one for each individual voter. The utility function is $u = (u_i)_{i \in N}$, where each u_i is in $L(Y)$ and $u_i(x) > u_i(y)$ means that individual i prefers alternative x over alternative y . The assumption of strict preferences implies that either $u_i(x) > u_i(y)$ or $u_i(y) > u_i(x)$ must hold if $x \neq y$. For social choice function $f : L(Y)^N \rightarrow Y$ we have $f(L(Y)^N) = \{f(u), u \in L(Y)^N\}$. So that $\#f(L(Y)^N)$ denotes the number of elements of alternatives that would be chosen by f under at least one preference profile.

Muller-Satterthwaite (1977) Theorem

If $f : L(Y)^N \rightarrow Y$ is a monotonic social choice function and $\#f(L(Y)^N) > 2$, then there must exist some dictator j in N such that

$$f(u) = \arg \max_{x \in f(L(Y)^N)} u_j(x), \forall u \in L(Y)^N.$$

Discussion

Let us consider that f is a monotonic social choice function. Let X be the range of f ; i.e., $X = f(L(Y)^N)$. Let $f(u) = x, x \neq y$ and $\{i : u_i(x) > u_i(y)\} \subseteq \{i : v_i(x) > v_i(y)\}$.

Now \hat{u} be derived from u by moving x and y up to the top of every individual's preferences, keeping the order of preference between x and y unchanged. Also similarly is derived \hat{v} from v in the same way. By monotocity we must have $x = f(\hat{u})$ and $y = f(\hat{v})$. Also monotocity implies that $f(\hat{u}) = f(\hat{v}) = x$, but $x \neq y$ so that $y \neq F(v)$ which is shown in profile 1.

| Profile 1 | | | | | | | Social choice, $f(u)$ |
|------------------|-----|-----------|-------|-----------|-----|-------|-----------------------|
| L_1 | ... | L_{n-1} | L_n | L_{n+1} | ... | L_N | |
| x | ... | x | x | x | ... | x | |
| y | ... | y | y | y | ... | y | \Rightarrow x |
| . | . | . | . | . | . | . | |
| . | . | . | . | . | . | . | |

Again $f(v)$ can not be any alternative y that is Pareto-dominated, under the preference profile v , by any other alternative $x \in X$. Since if u be any preference profile such that $x = f(u)$, Pareto dominance gives $\{i : v_i(x) > v_i(y)\}$ is the set of all voters N . Now let us say that a set of voters T is decisive for an order pair of distinct alternatives $x, y \in X$ if and only if,

$$f(u) = x \text{ and } T = \{i : u_i(x) > u_i(y)\}.$$

That is T is decisive $\forall x, y \in X$ such that every individual in T prefers x over y and nobody choose y over x .

Now let T be a non-empty set of minimal size among all sets that are decisive for distinct pair of alternatives in X . Let us select an individual $j \in T$ and three alternatives $x, y, z \in X$ as before. The preference profile u be such that,

$$\begin{aligned} u_j(x) &> u_j(y) > u_j(z), \\ u_i(z) &> u_i(x) > u_i(y) \quad \forall i \in T \setminus \{j\}, \\ u_k(y) &> u_k(z) > u_k(x) \quad \forall k \in N \setminus T. \end{aligned}$$

So that everyone prefers x, y and z over all other alternatives. By the above discussion decisiveness of T implies that $f(u) \neq y$. If $f(u)$ were x then $\{j\}$ would be decisive for (x, z) , in this case T would not be minimal. If $f(u)$ were z then $T \setminus \{j\}$ would be decisive for (z, y) , in this case T would not also be minimal. So there exists individual j such that $\{j\}$ is a decisive set for all pairs of alternatives. That is for any pair (x, y) of distinct alternatives in X there exists a preference profile u such that $f(u) = x$ and $\{j\} = \{i : u_i(x) > u_i(y)\}$. Also we have found $v_j(x) > v_j(y)$. Hence $f(v)$ can not be any alternative in X other than the one that is most preferred by individual j .

The theorem indicates that there is only one way to design a game that always has a unique Nash equilibrium is to give one individual all the power. Decision-making in the executive branch is often made by a single decision maker, who may be the president of that branch. But sometimes in our society a game has multiple equilibria and the decisions made by rational players may depend on culture and history of focal-point (Schelling 1960). So, sometimes we face social procedures where there are more than two possible outcomes at a time and which are not dictatorial and reflect voters collective expectations.

Gibbard-Satterthwaite Theorem

Gibbard-Satterthwaite theorem shows that, if the set of alternatives contains at least three possible outcomes and individual preferences are not restricted in any particular way, when every strategy-proof (will be discussed later) social choice rule is dictatorial (Gibbard 1973, 1978; Satterthwaite 1975; Reny 2000). That is, there is an individual whose preferences always dictate the final choice regardless of other individuals' preferences. Here we will discuss this theorem easier way as per as possible.

Pre-requisites

Let $f : L(Y)^N \rightarrow Y$ be a social choice function. $\mathbf{L}_{-i}(Y)^N$ be the set of $(n-1)$ -tuples of preferences $(L_1, \dots, L_{i-1}, L_{i+1}, \dots, L_n)$, thought of as configurations of preferences of the voters other than i . A social choice function $f : L(Y)^N \rightarrow Y$ is strategy-proof if $\forall i \in N$ and $\forall (L_i, \mathbf{L}_{-i}) \in L(Y)^N$, there is no $L'_i \in L(Y)$ such that $f(L'_i, \mathbf{L}_{-i}) > f(L_i, \mathbf{L}_{-i})$. Since f is social choice function then $f(L'_i, \mathbf{L}_{-i}) = x$ and strategy-proofness implies that $x = f(L(Y))$ is ranked $f(L'_i, \mathbf{L}_{-i}) = y$ ascending to $L_i(Y)$. So that $f(L'_i, \mathbf{L}_{-i}) = f(L(Y)) = x$. We have discussed in Muller-Satterthwaite theorem that $f(L(Y)) = x$ for every individual i every alternative y , the ordering $L'_i(Y)$ ranks x above y whenever $L_i(Y)$ does. If we move from $L = (L_1, \dots, L_N)$ to $L' = (L'_1, \dots, L'_N)$ by changing the ranking of each individual i from $L_i(Y)$ to $L'_i(Y)$ one at a time but social choice must remain unchanged so that $f(L'_i(Y)) = f(L_i(Y))$; i.e., f is monotonic function. Again f is onto, so that $f(L(Y)) = x$ for some $L(Y) \in f(L(Y)^N)$. By monotocity the social choice remains x whenever x

is raised to the top of every individual's ranking. Since x is at the top of every individual's ranking the social choice is x , consequently f is Pareto efficiency. Hence the individual i is a dictator. Now we can state the Gibbard-Satterthwaite Theorem as follows.

Gibbard (1973)-Satterthwaite (1975) Theorem: If $\#f(L(Y)^N) > 2$ and $f : L(Y)^N \rightarrow Y$ is onto and strategy-proof, then f is dictatorial.

Concluding Remarks

This paper analyzes various types of manipulable and non-manipulable voting systems using some easier methods. We have shown that some methods have Condorcet winner, where there is no voting manipulation and the individuals sincerely declare their preferences. In this paper we have briefly introduced Arrow's theorem. Interested readers are requested to see Arrow (1951, 1963); Sen (1970); Breton and Weymark (2006); Islam, *et al.* (2009: Spring and Fall) for some details. Voting system is closely related with Political Economics and Social Science, and we have tried to show this relationship throughout the paper. We have used easier mathematical calculations and notations to discuss Muller-Satterthwaite theorem and Gibbard-Satterthwaite theorem following Myerson (1996), Reny (2000) and McLennan (2008). The paper is review of other's works but we have tried throughout the paper to discuss voting matters with simple mathematical calculations and introducing definitions where necessary. Voting system is a very complicated field but we have tried our best to make it easier.

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Assessment of Impact of Effectiveness of Advertising in Telecom Service Sector in India

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Abstract: *Creating effective communication with customers is the most important aspect in services marketing. Role of effective communication is to attract and maintain prospective and present customers Advertising as one of the elements of communication mix has the potential to inform the masses, present and prospective consumers about the goods and services of a company and force them to visit the company's manufacturing and/or distribution centers for further information and making purchase decisions. Advertisements for services should provide symbols, or tangible cues, as concrete signals of the service's abstract attributes. The main area of the study is to study the Advertising in Indian Telecom Industry and its Impact on Customers. This research article evaluates the effectiveness of advertising in Indian telecom service sector and customer satisfaction. The sources of data collection used in the study are both primary and secondary in nature. A questionnaire was prepared and distributed to 200 customers in Ghaziabad (NCR). We conducted a survey to know the impact of effectiveness of advertising in telecom service sector in India. The real aim of the project is to study the effectiveness and response of customers towards advertisements provided by major players. In conclusion, the findings of the analysis showed that advertising is an effective tool of creating customers in Telecom Service Sector's today.*

Keywords: Advertising, Telecom service companies, Tele-density

Introduction

Organizations exist to attain certain mission for undefined period of time. In order to exist in the business for a long period of time, organizations must look for effective and efficient ways of doing business activities to achieve organizational objectives. At present due to environmental dynamism and competitiveness, the struggle for survival and succeeding in the business has become more difficult and challenging. The growth trend and nature of the service industry with the competitive environment brought several and special problems for services marketing. Since service encounters are complex and multiple factors affect interactions, organizations have to adopt holistic marketing approach to deal with these problems. Holistic marketing approach for services requires external marketing, which deals with the interaction of the company as a whole with the customer in terms of company product, price, distribution channels, and promotion activities. Internal marketing is the process of engaging the support and commitment of employees and other organizational members for the goals and objectives of the company (Lancaster and Reynolds); and interactive marketing deals with the interaction of frontline employees with customers in terms of understanding and solving customers' problems attentively. One of the four P's of marketing mix is promotion also known as marketing communication. Organizations have to communicate with their existing and potential customers about what they are doing. Marketing

communication is very important and at the same time challenging in the service sector as the nature of services is characterized by intangibility of the service product, which is decisive to convince customers on the value of a product. Most service marketers have access to numerous forms of communication, referred to collectively as the marketing communication mix. The mix includes advertising, personal contact, publicity and public relations, sales promotion, instructional materials, and corporate design (Lovelock and Wirtz, 2004). Marketing communication mix elements provide information and consultation that are important components to add value to a product or service. Customers need information about the features of the product or service, its price and how they can access it, to make informed purchase decision. Thus, if customers are able to get the necessary information about the product timely and adequately, they may feel that they are buying quality product or service. This means having good and effective communication channels adds value to the product or service of the company as customers have confidence on their purchase. Generally, taking into account the nature of the service industry, the challenges it brings to organizations and the need to follow holistic marketing approach to effectively interact with customers highlights the importance and significance of marketing communication activities. In service setting, marketing communication tools are especially important because they help create powerful images and a sense of credibility, confidence, and reassurance.

Generally, advertising has the potential to inform the masses, present and prospective consumers about the goods and services of a company and force them to visit the company's manufacturing and/or distribution centers for further information and making purchase decisions. Advertisements for services should provide symbols, or tangible cues, as concrete signals of the service's abstract attributes (Iacobucci, 2002). Thus communicating and convincing customers to buy service products is by far more challenging than selling manufacturing products.

Indian Telecom Industry

Having emerged as the fastest growing telecom market in the world, India has Over 500 million telecom subscribers, with more than 120 million subscribers added in the last eight months. The tele-density too has shown significant increase to cross the 40 percent mark this year. The two major reasons that have fuelled this growth are low tariffs coupled with falling handset prices.

Surprisingly, CDMA market has increased its market share up to 30% thanks to Reliance Communication. However, across the globe, CDMA has been losing out numbers to popular GSM technology, contrary to the scenario in India.

The other reason that has tremendously helped the telecom Industry is the regulatory changes and reforms that have been pushed for last 10 years by successive Indian governments. According to Telecom Regulatory Authority of India (TRAI) the rate of market expansion would increase with further regulatory and structural reforms. Even though the fixed line market share has been dropping consistently, the overall (fixed and mobile) subscribers have risen to more than 200 million by first quarter of 2007. The telecom reforms have allowed the foreign telecommunication companies to enter Indian market which has still got huge potential. International telecom companies like Vodafone have made entry into Indian market in a big way.

Currently the Indian Telecommunication market is valued at around \$100 billion (Rupees 400,000 crore). Two telecom players dominate this market - Bharti Airtel with 27% market share and Reliance Communication with 20% along with other players like BSNL (Bharat Sanchar Nigam Limited).

SWOT Analysis

SWOT Analysis, is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in telecom service market. It involves identifying the internal and external factors that are favorable and unfavorable to achieving the objective of Indian telecom service providers.

Opportunities :

- *3G Telecom services and 4G services*
- *More Quality Service:* Mobile Number Portability will force the Service provider to improve their quality to avoid losing subscribers
- *Value added Services (VAS) :*
 - The mobile value added services include, text or SMS, menu based services, downloading of music or ringtones, mobile TV, videos, streaming, sophisticated m-commerce applications etc.
 - Mobile banking, Mobile Ticketing etc
- *Boost to Telecom Manufacturing Companies :* Production of telecom equipments in value terms has increased from Rs. 412700 million (2007-08) to Rs.488000 million during 2008-09 and expected to increase to Rs. 575840 million during 2009-10.
- *Changing population psychograpy*
- *Increased penetration level*
- *Increasing flow of FDI*
- *Telecom Equipment Exports :* The Indian telecom industry is expected to reach a size of Rs 344,921 crore by 2012 at a growth rate of over 26 per cent, and generate employment opportunities for about 10 million people during the same period. The sector would create direct employment for 2.8 million people and for 7 million indirectly, according to a Frost and Sullivan report.
- *Horizontal Integration*
 - Entry Into other consumer segments leveraging the present channels
 - E.g. DTH service like Reliance BIG TV, Tata SKY, Airtel digital TV by telecom majors like Reliance, Tata and Airtel Respectively.
 - *Providing fibre Connectivity to 2,50,000 village panchayat by 2012.*
 - *More scope in content related services, since, the consumer is influenced by local culture :* Local festivals like Baisakhi, Chhath Puja, religious festivals like Diwali, Christmas etc., National festivals like Independence Day etc.

Threats :

- *Telecommunication Policies*
 - e.g. Trai's 2G direction affecting new players most notably Tata Teleservices, Norway's Telenor and Essar-owned Loop Telecom
 - Renewal of 2G license on the basis of market rates of 3G auctions
 - TRAI intentions of rolling out 4G or the fourth-generation technology, known as the ultra-broadband in 2-3 years raising fears rendering 3G services somewhat obsolete.
- *Declining ARPU (average Revenue per user) :* E.g. price wars like per-second billing which is deflating revenues and making sure the 'survival of the fittest'
- *Partiality on the part of the Govt :* E.g. Allowing 3G service in a PSU (MTNL,BSNL) before auctioning to Private Sector .

- *Content Piracy*
- *Licenses to many foreign operators*
- *New Technology can change the market dynamics*

Strengths:

- *Huge Customer potential :*
 - Tele-density still being 48% and rural tele-density 21%.
 - India has the fastest growing telecom market in the world with over 500 million telecom subscriber
- *Technology is advanced and easy to implement*
- *High Growth Rate :* Wireless subscribers growing at a CAGR of 60 per cent per annum since 2004.
 - *Allowed FDI limit ranging from 74% to 100% :* The total FDI equity inflows in telecom sector have been US\$ 2223 million during April-November 2009-10
 - *High return on Investment :* Easier to create economies of scale thereby increasing return on investment
 - *Liberalization efforts by Govt :* The share of private sector in total telephone connections is now 82.33% as per the latest statistics available for December 2009 as against a meager 5% in 1999.
 - *Lower capital expenditure:* The Indian telecom market is a high density area, which means more population per tower. This means lower capital expenditure cost.
 - *Management Team has prior experience*

Weaknesses :

- *Poor Telecommunication Infrastructure : Result in Result : Large number of call drops.*
- *High cost of infrastructure*
- *Low customer retention power*
- *Late adopters of New Technology : India will be among the last countries in the world to get access to 3G technology. Some estimates suggest that nearly 132 countries across the world already have 3G technology and mobile services in one form or the other.*
 - *Most competitive market: 10 to 12 companies offer mobile services in most parts of India, globally, the average is 4.*
 - *A market strongly regulated by Government.*
 - *Difficult to enter because of requirement of huge financial resources : E.g Auction of 3G license has reached Rs 15814.15 crores.*

Objectives of the Study

- To know the impact of advertisements of telecom industry on customers.
- To study the effectiveness and response towards advertisements provided by major players.

Research Design

The research design is Descriptive studies. Descriptive studies are well structured, they tend to be rigid and its approach cannot be changed every now and then. The objective of this kind of study is to answer the why, who, what, when and how of the subject under consideration. Descriptive studies are undertaken in many circumstances:

- When the researcher is interested in knowing the characteristics of certain groups such as age, profession.

➤ When the researcher is interested in knowing the proportion of people in given population who have behaved in a particular manner, making projection of certain things.

We have taken descriptive because my research includes the knowing the behavior of customer towards advertisement. We have analyzed how people respond to different advertising or their perception towards advertisement. Also our research is related to companies like Vodafone, Airtel, Reliance communications, BSNL and Idea cellular.

Sampling and Data Collection

For the purpose of this research, non-probability sampling approach was used. non-probability sampling is arbitrary and subjective, due to the fact that a participant does not have a known non-zero chance of being included (Cooper and Schindler, 2006). A sample was drawn from Ghaziabad (NCR). A five point Likert-type scale was also used, with ‘strongly agree’ at point one; ‘agree’ at point two; ‘neither agree nor disagree’ at point three; ‘disagree’ at point four; and ‘strongly disagree’ at point five.

| | | | | |
|----------------|-------|----------------------------|----------|-------------------|
| Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree |
| +5 | +3 | 1 | -3 | -5 |

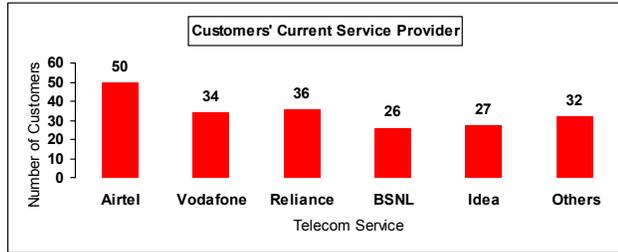
Out of 200 respondents 118(59%) were male and 82(41%) were female. Out of 200 respondents, 54 were between the age of 15-25, 70 were between the age of 26-35, 56 were between the age of 36-45 and 20 were above 45. Out of 200 respondents 28 were matriculate, 40 were intermediate, 72 were graduate and 60 were postgraduate.

Following prominent questions were asked :

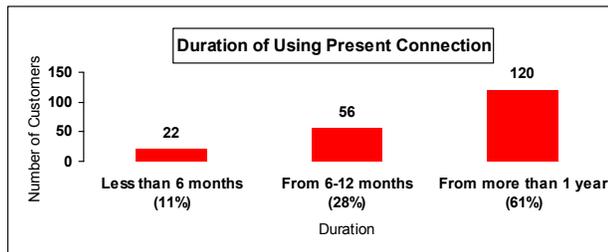
- Who is your current service provider?
- For how long you are using this mobile connection?
- What were the reasons for choosing this mobile connection?
- While purchasing a connection advertising plays any role?
- From where do you watch advertisements the most?
- Which telecommunication company has good advertising?
- Do you think that advertisement made by company informs you about their products?
- Based on advertisements made by company, would you like to go for more connections for you or your family in future?

Findings and Analysis

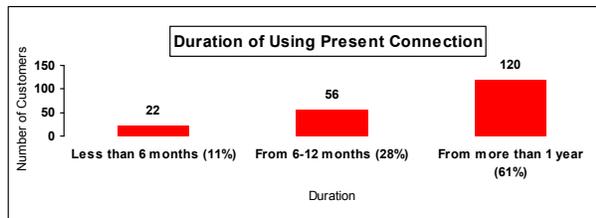
- In response to the question “Who is your current service provider”, Out of 200 respondents 50 were using Airtel (25%), 34 were using Vodafone(17%), 36 were using Reliance(18%), 26 were using BSNL(13%), 22 were using Idea(11%) and 32 were using others(16%).



➤ In response to the question “For how long you are using this mobile connection?”, Out of 200 respondents 22 were using the current connection for less than 6 months(11%), 56 were using it from 6-12 months(28%) and 120 were using it from more than 1 year(61%).



➤ In response to the question “What were the reasons for choosing this mobile connection?”, Out of 200 respondents 76 were influenced by friends and relatives, 24 were influenced by retailers, 16 were influenced by brand image and 84 were influenced by advertisements.

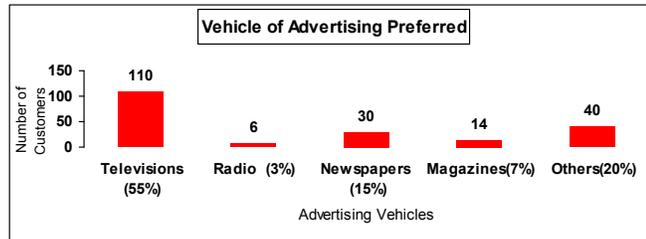


➤ In response to the question “While purchasing a connection advertising plays any role?”, the responses were as follows:

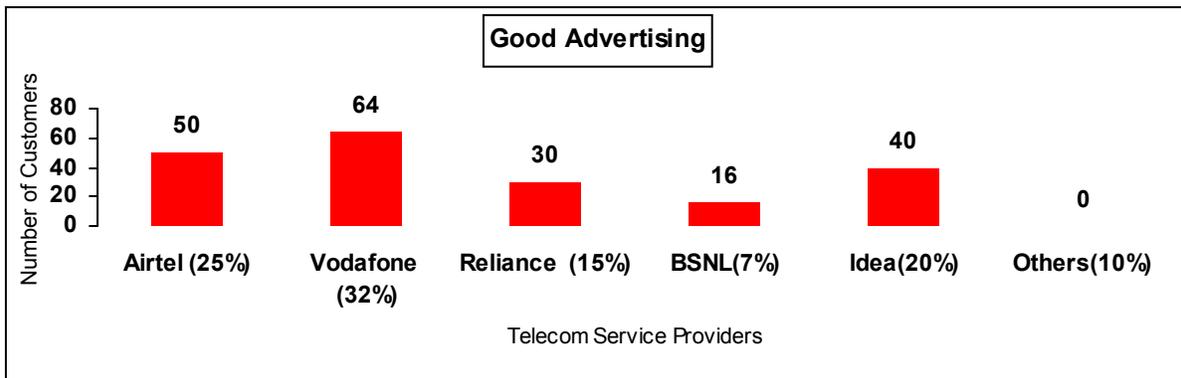
| S.No. | Responses | No. of Respondents | Value of Responses |
|-------|----------------------------|--------------------|--------------------|
| 1. | Strongly Agree | 79 | 395 |
| 2. | Agree | 97 | 291 |
| 3. | Neither Agree nor Disagree | 12 | 12 |
| 4. | Disagree | 12 | -36 |
| 5. | Strongly Disagree | 0 | 0 |
| | Total | 200 | 652 |

Hence, the mean value is 3.26.

➤ In response to the question “From where do you watch advertisements the most?”, Out of 200 respondents 110 replied Television(55%), 6 replied Radio(3%), 30 replied Newspapers(15%), 14 replied Magazines(7%) and 40 replied Others(20%).



➤ In response to the question “Which telecommunication company has good advertising?”, Out of 200 respondents 50 liked the advertisements of Airtel(25%), 64 liked advertisements of Vodafone(32%), 30 liked the advertisements of Reliance(15%), 16 liked the advertisements of BSNL(8%), 40 liked the advertisements of IDEA(20%) and in others 0.

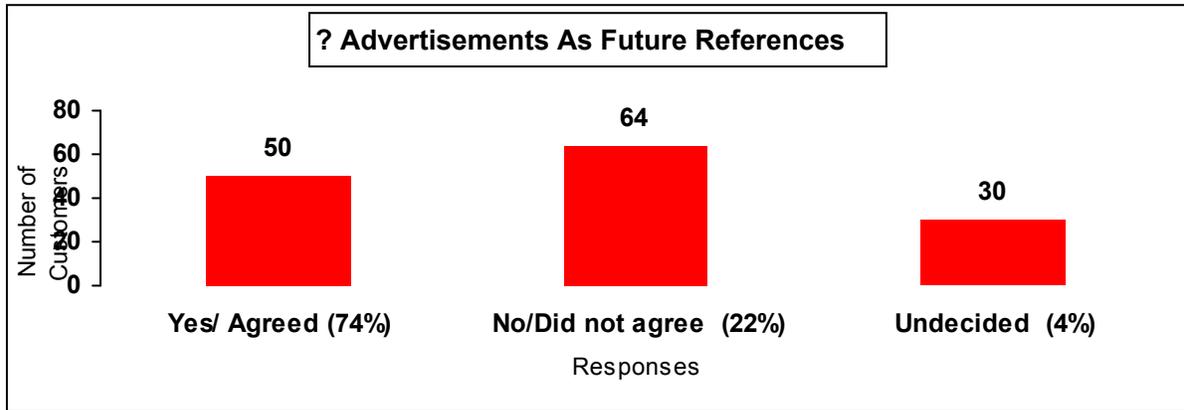


➤ In response to the question “Do you think that advertisement made by company informs you about their products?”, Out of 200 respondents 159 were in favor of that advertisements provides information about the products, 39 were not in favor of that and 2 were not able to decide. the responses can be tabulated as follows:

| S.No. | Responses | No. of Respondents | Value of Responses |
|-------|----------------------------|--------------------|--------------------|
| 1. | Strongly Agree | 56 | 278 |
| 2. | Agree | 97 | 291 |
| 3. | Neither Agree nor Disagree | 2 | 2 |
| 4. | Disagree | 22 | -66 |
| 5. | Strongly Disagree | 17 | -85 |
| | Total | 200 | 420 |

Hence, the mean value is 2.1.

➤ In response to the question “Based on advertisements made by company, would you like to go for more connections for you or your family in future?”, Out of 200 respondents 148 (74%) agreed that they would buy connection on the basis of advertisement made by companies, 44(22%) did not agree and 8 (4%)were not able to decide.



Results

After analyzing the findings, the following inferences can be drawn :

- 74% of the people believes that advertisements play a role while making purchase decision for new connection. So the companies should handle the advertising properly and should try to deliver the information properly.
- In telecom service industry the most important factor which affects the purchase decision of the customers is advertisement. Suggestions of friends and relatives also plays major role in this. So the companies should take care of the existing customers so that they can be recommended to others.
- 55% of the people like to watch advertisements on television. And after television people rated Hoardings (others) most. So the companies should focus more on television ads and creative design of hoardings.
- 32% of the people like Vodafone advertisements more than others. After that Airtel and Idea comes. So the other companies should try to make advertisements which can connect to the customers.
- 74% of the people believe that advertisements provide information about the products. So the companies should try to deliver all the information about the plans and offers through advertisements.
- Majority of the people wants to buy the connections for family and friends on the basis of advertisements. So advertisements should be given more focus and importance by the telecom service companies.

Conclusion

There is great role of media in communicating about telecom services. Media affects the buying behavior of telecom customers and celebrity advertisements are remembered by people for long time. As now a day's telecom companies are mainly targeting youth through their advertisements and want the youth to get indulge in purchase of their services, the companies are spending a lot over advertising. A proper media-mix is been used by all the players in telecom industry, just to ensure that every single prospect should be aware of their services.

The result showed that TV advertising emerges as an important source of communication, affecting the consumer perception regarding choice of mobile telecommunication service provider. People discuss with others the advertisements which they watch on TV and persuade their

friends & relatives for adopting the same network that they are using. Creative advertising & hoardings (category 'others') are the new strategies that have attracted the customers a lot in telecom service industry.

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Demystifying NPAs on Education Loan: An Empirical Analysis

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Abstract: *The quantum of NPA of Indian Banking has undergone a significant decline. Still it is high by international standards and posing a serious problem of the Indian banking sector affecting its earning capacity and profitability. Present paper makes an attempt to analyze the quantitative trend and pattern in growth of NPA with reference to education loan scheme. An effort has been made to analyze the causes of default by surveying defaulters. Odisha was selected for the study from the point of view of accessibility of the researcher to collect the data and able to finish the research within a stipulated period. The students of different colleges in Urban, Semi-urban, Rural area are surveyed through questionnaires made for the purpose. Different factors causing NPA on student loan scheme are analyzed and suggestions made to overcome the problem.*

Keywords: NPA, Education Loan, urban area, Semi-urban area & rural area

Introduction

The education loan scheme was introduced in 1992 with the aim of enabling access to tertiary education for everyone who wants it. There are three government agencies involved in schemes. The Ministry of education for strategic policies in relation to the education loan scheme, on their website, one can find links to the other agencies, current topics, debt projections, comparison of repayment periods by gender and ethnicity, the repayment estimator and the data integration project. Study link (a division of the Ministry of Social Development) is responsible for the administration and delivery of student loans to students during the study. After the end of each academic year Study link transfers those loans to Inland Revenue for collection. Inland Revenue is responsible for collecting student loan repayment from the year after the money is borrowed and administering interest write-offs.

During the study made on the banks, it is informed by the bank officials that different banks have their own norms for the education loans and it varies from bank to bank. But the fact is that only few students apply for loan for studies in India. Mostly they apply for loan for studies abroad. The loan requires guarantors. However there are quite a large section of loan seekers particularly in rural area, who are not able to take the advantage of loans because of their inability to produce co-guarantors. From the students' point of view for approaching education loans, one has to be below age 30 to be eligible. The loans from various banks are only being provided to full time students. It is very good that the banks are giving financial support to students but banks provide these loans only to those students who give big securities to banks, but those students

who belong to poor families, find it difficult to manage security. So these securities are not beneficial for poor students. To get education loan from bank one has to show some property or the parent's salary. The banks don't just trust the identity of students and also the college offer letter. Students should not depend on loan too much because it's hard to come unless one is very good students with good academic track record.

Objectives

To study the factors responsible for growth of NPAs from lenders and borrowers perspective in urban, semi-urban and rural areas.

- Studying in problem in relation to NPAs in urban, semi-urban and rural areas.
- To give suggestions to overcome the problem of NPAs.

Limitations

- The study is restricted to the selected urban, semi-urban, rural areas of Odisha only.
- The sample is limited; it may not represent scenario of all the beneficiaries of urban, semi-urban and rural areas.
- The period of study conducted for the period of 3 months i.e. August 2010 to October 2010.

Research Universe and Methodology

With reference to the selection of the research universe the state of Odisha has been selected with specifications to the compulsions of the geographical territory, linguistic boundary, and administrative settlement commonness. Odisha is an Eastern Indian state; the state boundaries are on the Bay of Bengal Sea. South- Andhra Pradesh, West-Chhattisgarh and Jharkhand, North-West Bengal having a total area of 1,55,707 Square Kilometers with total population of 36,706,920 (as per Indian census survey-2001) , population density 236 per Square Kilometers, Sex Ratio 972 literacy rate of 63.61%. The state is comprising of 30 districts (Administrative Divisions) and 58 Sub-Divisions.

Sampling Design

In support to the objective of the research there is a primary research through questionnaire administration method in the field through stratified random sampling method covering the state through regional, geographical, economic, cultural, lingual and settlement wise. Out of 490 questionnaires served 379 students responded. The response rate was 77.35%.

Table 1: Urban areas under study

| Area under study | Questionnaire served | Response | Percentage of response to total response |
|------------------|----------------------|----------|--|
| Rourkela | 30 | 22 | 17.89 |
| Cuttack | 30 | 23 | 18.70 |
| Balasore | 30 | 24 | 19.51 |
| Bhubaneswar | 30 | 28 | 22.76 |
| Berhampur | 30 | 26 | 21.14 |
| Total | 150 | 123 | 100 |

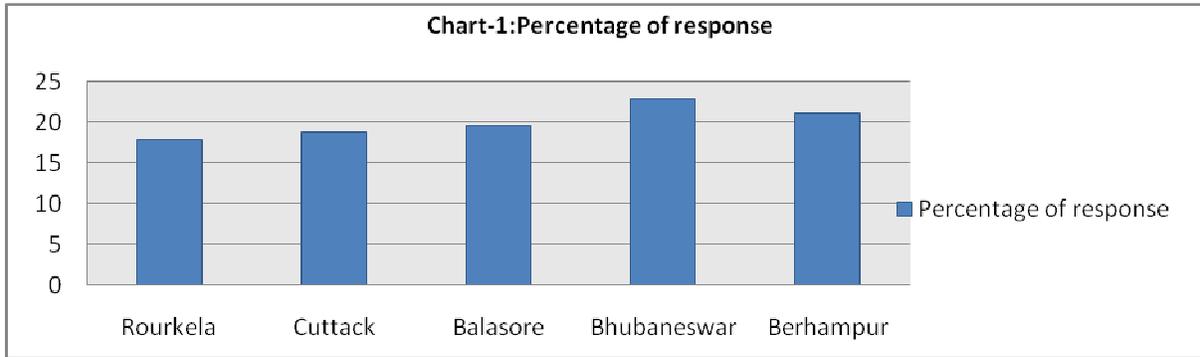


Table 2: Semi-urban areas under study

| Area under study | Questionnaire served | Response | Percentage of response to total response |
|------------------|----------------------|------------|--|
| Nabarangpur | 15 | 11 | 9.32 |
| Koraput | 15 | 13 | 11.01 |
| Padampur | 15 | 9 | 7.63 |
| Athagarh | 15 | 12 | 10.17 |
| Bhanjanagar | 15 | 12 | 10.17 |
| Khurada Road | 20 | 16 | 13.56 |
| Anugul | 20 | 15 | 12.71 |
| Aska | 25 | 17 | 14.41 |
| Paralakhemundi | 25 | 13 | 11.02 |
| | 165 | 118 | 100 |

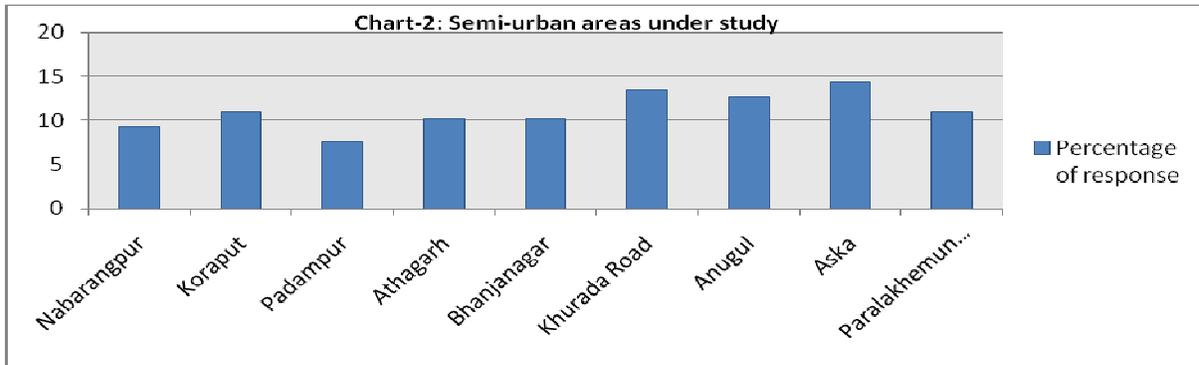


Table 3: Rural areas under study

| Area under study | Questionnaire served | Re-sponse | Percentage of response to total response |
|---------------------------------|----------------------|------------|--|
| Jaanla - Khurda District | 20 | 16 | 11.59 |
| Sundarapada - Khurda District | 25 | 18 | 13.04 |
| Mendhasala- Khurda District | 25 | 17 | 12.32 |
| Saptasajya - Dhenkanal District | 25 | 23 | 16.68 |
| Ghatagan - Keonjhar District | 20 | 14 | 10.14 |
| Chandol - Kendrapara District | 20 | 17 | 12.32 |
| Banthapalli - Ganjam District | 20 | 16 | 11.59 |
| Singla - Balasore District | 20 | 17 | 12.32 |
| Total | 175 | 138 | 100 |

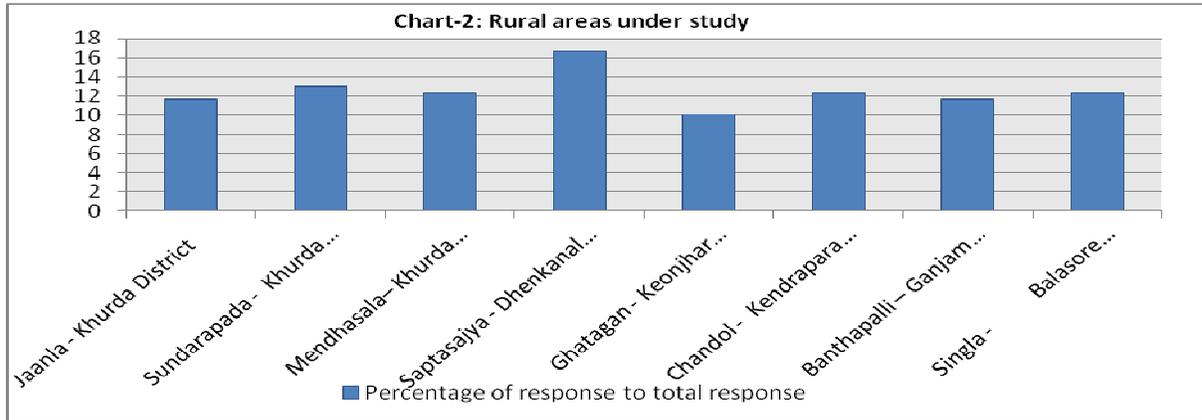
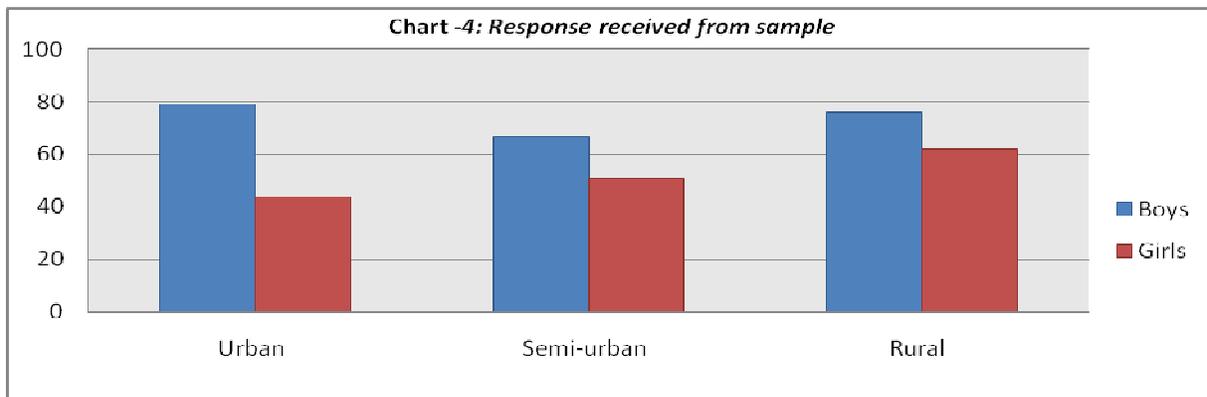


Table 4: Constituents of sample size

| Population | Questionnaire served | Response received | Boys | Girls | % of response to questionnaires |
|------------|----------------------|-------------------|------|-------|---------------------------------|
| Urban | 150 | 123 | 79 | 44 | 82 |
| Semi-urban | 165 | 118 | 67 | 51 | 71.52 |
| Rural | 175 | 138 | 76 | 62 | 78.86 |
| Total | 490 | 379 | 222 | 157 | 77.35 |



Respondents' perception with regard to NPAs on education loan

To measure the perception level of the participants with regard to NPAs on education loan the various variables identified as Academic failure, Borrowers willingness to pay and ability to pay, Default rate more in under graduate courses than post graduate courses, Students dropout, Non-professional courses, Unemployment and working at lower wage, Presence of other important loans, Dissatisfaction with institutions and education program, Intervening personal problems like divorce, widow or more dependent family members, Male borrower chances of default are more than female borrowers, Absence of parents and lower parental income, Higher debt of the borrower, Short-term programs chances of higher default than long-term programs, Multiple lenders, Wrong selection of beneficiary, Improper post monitoring policy of banks, Failure of debt collection machinery, Improper verification of documents at the time of sanction, Dishonesty by bank employee, Political interference and have been assigned as +3,+2,+1,0 and -1 for the responses of the respondents " Completely agree", " Agree", " Neither agree nor disagree", " Disagree" and " Completely disagree" respectively. Final scores for each feature are calculated by multiplying the number of response by the weights of the corresponding response.

Calculation of respondents’ perception: Ideal and Least scores

Ideal scores are calculated by multiplying the number of respondents in each category with (+3) and product with total number of attributes. Least scores calculated by multiplying the number of respondents in each category with (-1) and the product with number of attributes in the questionnaires.

Table 5: Ideal score and least scores

| Category | Equation | Ideal score | Equation | Least score |
|------------------|-------------------------|-------------|--------------------------|-------------|
| Urban boys | $20 \times 3 \times 79$ | 4740 | $20 \times -1 \times 79$ | -1580 |
| Urban girls | $20 \times 3 \times 44$ | 2640 | $20 \times -1 \times 44$ | -880 |
| Semi-urban boys | $20 \times 3 \times 67$ | 4020 | $20 \times -1 \times 67$ | -1340 |
| Semi-urban girls | $20 \times 3 \times 51$ | 3060 | $20 \times -1 \times 51$ | -1020 |
| Rural boys | $20 \times 3 \times 76$ | 4560 | $20 \times -1 \times 76$ | -1520 |
| Rural girls | $20 \times 3 \times 62$ | 3720 | $20 \times -1 \times 62$ | -1240 |

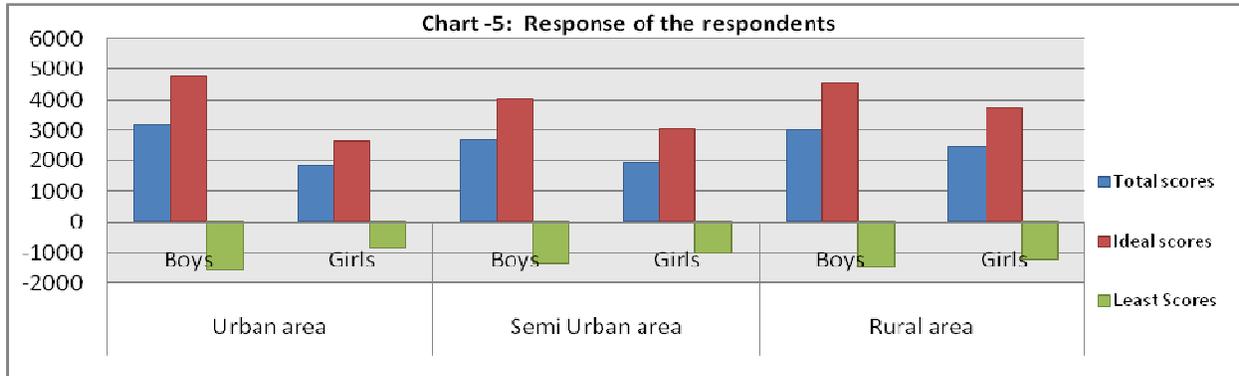
Findings

Findings of the study are as under. The tables are formed on the basis of questions contained in the questionnaires.

Table 6: Response of the respondents

| Variables | Aggregate Scores | | | | | |
|--|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | Urban area | | Semi Urban area | | Rural area | |
| | Boys | Girls | Boys | Girls | Boys | Girls |
| Academic failure | 169 | 88 | 156 | 102 | 149 | 143 |
| Borrowers willingness to pay and ability to pay | 174 | 105 | 146 | 92 | 156 | 126 |
| Default rate more in under graduate courses than post graduate courses | 150 | 100 | 140 | 97 | 112 | 123 |
| Students dropout | 173 | 92 | 145 | 83 | 154 | 110 |
| Non-professional courses | 127 | 85 | 137 | 84 | 142 | 106 |
| Unemployment and working at lower wage | 174 | 92 | 129 | 106 | 143 | 131 |
| Presence of other important loans | 167 | 92 | 119 | 99 | 158 | 103 |
| Dissatisfaction with institutions and education program | 183 | 81 | 109 | 99 | 173 | 136 |
| Intervening personal problems like divorce, widow or more dependent family members | 163 | 89 | 143 | 93 | 161 | 128 |
| Male borrower chances of default are more than female borrowers. | 139 | 85 | 136 | 111 | 129 | 133 |
| Absence of parents and lower parental income | 155 | 90 | 134 | 107 | 162 | 135 |
| Higher debt of the borrower | 151 | 94 | 108 | 91 | 136 | 135 |
| Short-term programs chances of higher default than long-term programs | 164 | 89 | 146 | 80 | 153 | 124 |
| Multiple lenders | 156 | 99 | 139 | 104 | 172 | 111 |
| Wrong selection of beneficiary | 164 | 87 | 157 | 92 | 127 | 135 |
| Improper post monitoring policy of banks | 171 | 85 | 132 | 100 | 168 | 116 |
| Failure of debt collection machinery | 174 | 105 | 114 | 106 | 166 | 114 |
| Improper verification of documents at the time of sanction | 143 | 96 | 104 | 109 | 134 | 113 |
| Dishonesty by bank employee | 151 | 81 | 129 | 98 | 131 | 114 |
| Political interference | 164 | 96 | 127 | 101 | 148 | 123 |
| Total scores | 3212 (67.76) | 1831 (69.36) | 2650 (65.92) | 1954 (63.86) | 3004 (65.88) | 2459 (66.11) |
| Ideal scores | 4740 | 2640 | 4020 | 3060 | 4560 | 3720 |
| Least Scores | -1580 | -880 | -1340 | -1020 | -1520 | -1240 |
| No. of Respondents | 79 | 44 | 67 | 51 | 76 | 62 |

Source: Annexure A, B, C, D, E and F



Interpretation: In the table-6, the ideal scores of urban, semi-urban and rural boys and girls are 4740, 2640, 4020, 3060, 4560 and 3720 respectively. As against the total scores are 3212, 1831, 2650, 1954, 3004 and 2459 for the same. The total score is more in case urban boys and girls as compare to the semi-urban and rural areas i.e. 67.76% and 69.36% respectively. In case of semi-urban areas respondents the total score of boys and girls are 65.92% and 63.86%. Similarly in rural area it is 65.88% and 66.11%. In all the above cases the total score is not touching the least score. So considering this the various attributes, which considered responsible for NPAs in education loan holds good.

Conclusion

NPAs are seriously affecting the efficient management of funds. It affects the profitability of the banks and reduces the availability of resources for mobilization besides increasing their costs. It also puts a question mark on the viability and solvency of the organization. Causes of default identified through field surveys need to be sorted out. Concerted efforts are required at the bank level to improve the credit appraisal and monitoring skills of the managers so that potential default can be identified at an early stage. The occurrences of NPA may not avoidable entirely but they can be managed effectively. The fresh incidences of NPAs should be avoided but not at the cost of fresh deployment of credit.

Suggestions

- Selection of the student is more important, before finalization of loan amount proper screening should be done.
- As far as possible the bank should give loan to the students who are pursuing the professional courses like medical, engineering and management. It increases the employability of the student.
- The students who pursue the regular courses should be provided loan.
- Age of the student should be given preference as study suggests that the older students having tendency not to pay back the loan amount as compared to younger students.
- The placement record of the institute where student's studies should be verified before sanctioning the amount.
- The course curriculum of the institute where student studies should be crosschecked for employment point of view.
- The efficiency of debt collection machinery of the lending bank should be increased.
- Proper post-monitoring should be made by the concerned bank for these loans to avoid the possibility of NPA.

- Internal moral check on employees should be initiated to avoid any misappropriation or fraud.
- Interference of politicians and bureaucrats should be controlled.
- Before giving loan the indebtedness of the loanee should be checked.

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| Annexure-A | | | | | | |
|--|-----------------------|-------|----------------------------|----------|---------------------|-----------|
| Variables | Opinion of Urban Boys | | | | | Scores |
| | Completely agree | Agree | Neither agree nor disagree | Disagree | Completely disagree | |
| | 3 | 2 | 1 | 0 | -1 | |
| Academic failure | 39 | 21 | 12 | 5 | 2 | 171-2=169 |
| Borrowers willingness to pay and ability to pay | 43 | 18 | 10 | 7 | 1 | 175-1=174 |
| Default rate more in under graduate courses than post graduate courses | 32 | 25 | 11 | 4 | 7 | 157-7=150 |
| Students dropout | 40 | 19 | 15 | 5 | 0 | 173-0=173 |
| Non-professional courses | 25 | 25 | 9 | 13 | 7 | 134-7=127 |
| Unemployment and working at lower wage | 31 | 35 | 12 | 0 | 1 | 175-1=174 |
| Presence of other important loans | 28 | 37 | 10 | 3 | 1 | 168-1=167 |
| Dissatisfaction with institutions and education program | 37 | 33 | 7 | 1 | 1 | 184-1=183 |
| Intervening personal problems like divorce, widow or | 35 | 25 | 11 | 5 | 3 | 166-3=163 |

| | | | | | | |
|---|----|----|----|----|---|-----------|
| more dependent family members | | | | | | |
| Male borrower chances of default are more than female borrowers. | 24 | 20 | 30 | 2 | 3 | 142-3=139 |
| Absence of parents and lower parental income | 28 | 30 | 13 | 6 | 2 | 157-2=155 |
| Higher debt of the borrower | 31 | 27 | 11 | 3 | 7 | 158-7=151 |
| Short-term programs chances of higher default than long-term programs | 33 | 28 | 13 | 1 | 4 | 168-4=164 |
| Multiple lenders | 31 | 30 | 8 | 5 | 5 | 161-5=156 |
| Wrong selection of beneficiary | 35 | 28 | 9 | 1 | 6 | 170-6=164 |
| Improper post monitoring policy of banks | 40 | 21 | 11 | 5 | 2 | 173-2=171 |
| Failure of debt collection machinery | 36 | 32 | 5 | 3 | 3 | 177-3=174 |
| Improper verification of documents at the time of sanction | 29 | 27 | 10 | 4 | 8 | 151-8=143 |
| Dishonesty by bank employee | 27 | 32 | 8 | 10 | 2 | 153-2=151 |
| Political interference | 39 | 21 | 11 | 2 | 6 | 170-6=164 |

Source: Compiled from field Survey

| <i>Annexure-B</i> | | | | | | |
|--|-------------------------------|--------------|-----------------------------------|-----------------|----------------------------|---------------|
| <i>Variables</i> | <i>Opinion of Urban Girls</i> | | | | | <i>Scores</i> |
| | <i>Completely agree</i> | <i>Agree</i> | <i>Neither agree nor disagree</i> | <i>Disagree</i> | <i>Completely disagree</i> | |
| | <i>3</i> | <i>2</i> | <i>1</i> | <i>0</i> | <i>-1</i> | |
| Academic failure | 20 | 13 | 5 | 3 | 3 | 91-3=88 |
| Borrowers willingness to pay and ability to pay | 22 | 18 | 3 | 1 | 0 | 105-0=105 |
| Default rate more in under graduate courses than post graduate courses | 19 | 19 | 5 | 1 | 0 | 100-0=100 |
| Students dropout | 15 | 23 | 2 | 3 | 1 | 93-1=92 |
| Non-professional courses | 20 | 11 | 7 | 2 | 4 | 89-4=85 |
| Unemployment and working at lower wage | 17 | 20 | 4 | 0 | 3 | 95-3=92 |
| Presence of other important loans | 15 | 21 | 6 | 1 | 1 | 93-1=92 |
| Dissatisfaction with institutions and education program | 15 | 13 | 12 | 2 | 2 | 83-2=81 |
| Intervening personal problems like divorce, widow or more dependent family members | 19 | 15 | 5 | 2 | 3 | 92-3=89 |
| Male borrower chances of default are more than female borrowers. | 15 | 20 | 4 | 1 | 4 | 89-4=85 |
| Absence of parents and lower parental income | 21 | 11 | 7 | 3 | 2 | 92-2=90 |
| Higher debt of the borrower | 22 | 10 | 9 | 2 | 1 | 95-1=94 |
| Short-term programs chances of higher default than long-term programs | 18 | 14 | 2 | 5 | 5 | 84-5=79 |
| Multiple lenders | 19 | 20 | 3 | 1 | 1 | 100-1=99 |
| Wrong selection of beneficiary | 15 | 21 | 4 | 1 | 3 | 91-3=88 |
| Improper post monitoring policy of banks | 17 | 15 | 5 | 6 | 1 | 86-1=85 |
| Failure of debt collection machinery | 23 | 17 | 3 | 0 | 1 | 106-1=105 |
| Improper verification of documents at the time of sanction | 20 | 15 | 7 | 1 | 1 | 97-1=96 |
| Dishonesty by bank employee | 13 | 18 | 9 | 1 | 3 | 84-3=81 |
| Political interference | 18 | 19 | 5 | 1 | 1 | 97-1=96 |

Source: Compiled from field Survey

| Annexure-C | | | | | | |
|--|----------------------------|-------|----------------------------|----------|---------------------|------------|
| Variables | Opinion of Semi Urban Boys | | | | | Scores |
| | Completely agree | Agree | Neither agree nor disagree | Disagree | Completely disagree | |
| | 3 | 2 | 1 | 0 | -1 | |
| Academic failure | 35 | 23 | 6 | 2 | 1 | 157-1=156 |
| Borrowers willingness to pay and ability to pay | 38 | 10 | 14 | 3 | 2 | 148-2=146 |
| Default rate more in under graduate courses than post graduate courses | 30 | 21 | 9 | 6 | 1 | 141-1=140 |
| Students dropout | 28 | 25 | 11 | 3 | 0 | 145-0=145 |
| Non-professional courses | 28 | 23 | 10 | 3 | 3 | 140-3=137 |
| Unemployment and working at lower wage | 24 | 27 | 7 | 5 | 4 | 133-4=129 |
| Presence of other important loans | 23 | 25 | 7 | 5 | 7 | 126-7=119 |
| Dissatisfaction with institutions and education program | 21 | 19 | 13 | 9 | 5 | 114-5=109 |
| Intervening personal problems like divorce, widow or more dependent family members | 25 | 31 | 7 | 3 | 1 | 144-1=143 |
| Male borrower chances of default are more than female borrowers. | 28 | 20 | 13 | 5 | 1 | 137-1=136 |
| Absence of parents and lower parental income | 23 | 29 | 11 | 0 | 4 | 138-4=134 |
| Higher debt of the borrower | 20 | 20 | 15 | 5 | 7 | 115-7=108 |
| Short-term programs chances of higher default than long-term programs | 29 | 25 | 10 | 2 | 1 | 147-1=146 |
| Multiple lenders | 31 | 21 | 7 | 5 | 3 | 142-3=139 |
| Wrong selection of beneficiary | 33 | 27 | 5 | 1 | 1 | 158-1=157 |
| Improper post monitoring policy of banks | 28 | 21 | 11 | 2 | 5 | 137-5=132 |
| Failure of debt collection machinery | 24 | 20 | 9 | 7 | 7 | 121-7=114 |
| Improper verification of documents at the time of sanction | 25 | 15 | 11 | 4 | 12 | 116-12=104 |
| Dishonesty by bank employee | 28 | 18 | 12 | 6 | 3 | 132-3=129 |
| Political interference | 30 | 13 | 13 | 9 | 2 | 129-2=127 |

Source: Compiled from field survey

| Annexure-D | | | | | | |
|---|-----------------------------|-------|----------------------------|----------|---------------------|-----------|
| Variables | Opinion of Semi Urban Girls | | | | | Scores |
| | Completely agree | Agree | Neither agree nor disagree | Disagree | Completely disagree | |
| | 3 | 2 | 1 | 0 | -1 | |
| Academic failure | 19 | 18 | 10 | 3 | 1 | 103-1=102 |
| Borrowers willingness to pay and ability to pay | 15 | 19 | 11 | 4 | 2 | 94-2=92 |
| Default rate more in under graduate courses than post graduate courses | 20 | 15 | 9 | 5 | 2 | 99-2=97 |
| Students dropout | 17 | 17 | 5 | 5 | 7 | 90-7=83 |
| Non-professional courses | 19 | 15 | 5 | 4 | 8 | 92-8=84 |
| Unemployment and working at lower wage | 21 | 19 | 7 | 2 | 2 | 108-2=106 |
| Presence of other important loans | 21 | 17 | 5 | 5 | 3 | 102-3=99 |
| Dissatisfaction with institutions and education program | 24 | 12 | 8 | 2 | 5 | 104-5=99 |
| Intervening personal problems like divorce, widow or more dependent family mem- | 22 | 11 | 9 | 5 | 4 | 97-4=93 |

| | | | | | | |
|---|----|----|----|---|---|-----------|
| bers | | | | | | |
| Male borrower chances of default are more than female borrowers. | 23 | 17 | 8 | 3 | 0 | 111-0=111 |
| Absence of parents and lower parental income | 21 | 20 | 5 | 4 | 1 | 108-1=107 |
| Higher debt of the borrower | 20 | 14 | 9 | 2 | 6 | 97-6=91 |
| Short-term programs chances of higher default than long-term programs | 13 | 21 | 5 | 6 | 6 | 86-6=80 |
| Multiple lenders | 18 | 22 | 7 | 3 | 1 | 105-1=104 |
| Wrong selection of beneficiary | 15 | 21 | 10 | 0 | 5 | 97-5=92 |
| Improper post monitoring policy of banks | 19 | 20 | 5 | 5 | 2 | 102-2=100 |
| Failure of debt collection machinery | 18 | 22 | 9 | 1 | 1 | 107-1=106 |
| Improper verification of documents at the time of sanction | 17 | 25 | 8 | 1 | 0 | 109-0=109 |
| Dishonesty by bank employee | 20 | 15 | 9 | 6 | 1 | 99-1=98 |
| Political interference | 18 | 23 | 5 | 1 | 4 | 105-4=101 |

Source: Compiled from field survey

| <i>Annexure-E</i> | | | | | | |
|--|------------------------------|--------------|-----------------------------------|-----------------|----------------------------|---------------|
| <i>Variables</i> | <i>Opinion of Rural Boys</i> | | | | | <i>Scores</i> |
| | <i>Completely agree</i> | <i>Agree</i> | <i>Neither agree nor disagree</i> | <i>Disagree</i> | <i>Completely disagree</i> | |
| | <i>3</i> | <i>2</i> | <i>1</i> | <i>0</i> | <i>-1</i> | |
| Academic failure | 25 | 31 | 13 | 6 | 1 | 150-1=149 |
| Borrowers willingness to pay and ability to pay | 22 | 40 | 11 | 2 | 1 | 157-1=156 |
| Default rate more in under graduate courses than post graduate courses | 22 | 35 | 10 | 5 | 4 | 146-4=142 |
| Students dropout | 23 | 39 | 8 | 5 | 1 | 155-1=154 |
| Non-professional courses | 29 | 23 | 14 | 5 | 5 | 147-5=142 |
| Unemployment and working at lower wage | 30 | 25 | 10 | 4 | 7 | 150-7=143 |
| Presence of other important loans | 33 | 25 | 13 | 1 | 4 | 162-4=158 |
| Dissatisfaction with institutions and education program | 30 | 38 | 7 | 1 | 0 | 173-0=173 |
| Intervening personal problems like divorce, widow or more dependent family members | 35 | 27 | 7 | 2 | 5 | 166-5=161 |
| Male borrower chances of default are more than female borrowers. | 23 | 29 | 11 | 4 | 9 | 138-9=129 |
| Absence of parents and lower parental income | 33 | 25 | 14 | 3 | 1 | 163-1=162 |
| Higher debt of the borrower | 25 | 29 | 9 | 7 | 6 | 142-6=136 |
| Short-term programs chances of higher default than long-term programs | 25 | 34 | 13 | 1 | 3 | 156-3=153 |
| Multiple lenders | 32 | 36 | 5 | 2 | 1 | 173-1=172 |
| Wrong selection of beneficiary | 21 | 30 | 11 | 7 | 7 | 134-7=127 |
| Improper post monitoring policy of banks | 40 | 21 | 9 | 3 | 3 | 171-3=168 |
| Failure of debt collection machinery | 32 | 32 | 7 | 4 | 1 | 167-1=166 |
| Improper verification of documents at the time of sanction | 28 | 23 | 10 | 9 | 6 | 140-6=134 |
| Dishonesty by bank employee | 23 | 29 | 11 | 6 | 7 | 138-7=131 |
| Political interference | 27 | 31 | 9 | 5 | 4 | 152-4=148 |

Source: Compiled from field survey

| <i>Annexure-F</i> | |
|-------------------|-------------------------------|
| <i>Variables</i> | <i>Opinion of Rural Girls</i> |

| | <i>Completely agree</i> | <i>Agree</i> | <i>Neither agree nor disagree</i> | <i>Disagree</i> | <i>Completely disagree</i> | <i>Scores</i> |
|--|-------------------------|--------------|-----------------------------------|-----------------|----------------------------|---------------|
| | 3 | 2 | 1 | 0 | -1 | |
| Academic failure | 25 | 32 | 4 | 1 | 0 | 143-0=143 |
| Borrowers willingness to pay and ability to pay | 21 | 29 | 7 | 3 | 2 | 128-2=126 |
| Default rate more in under graduate courses than post graduate courses | 23 | 27 | 5 | 2 | 5 | 128-5=123 |
| Students dropout | 19 | 21 | 13 | 7 | 2 | 112-2=110 |
| Non-professional courses | 25 | 15 | 10 | 3 | 9 | 115-9=106 |
| Unemployment and working at lower wage | 21 | 30 | 9 | 1 | 1 | 132-1=131 |
| Presence of other important loans | 17 | 19 | 13 | 4 | 9 | 102-9=93 |
| Dissatisfaction with institutions and education program | 23 | 30 | 7 | 2 | 0 | 136-0=136 |
| Intervening personal problems like divorce, widow or more dependent family members | 30 | 20 | 5 | 0 | 7 | 135-7=128 |
| Male borrower chances of default are more than female borrowers. | 21 | 32 | 7 | 1 | 1 | 134-1=133 |
| Absence of parents and lower parental income | 31 | 17 | 9 | 4 | 1 | 136-1=135 |
| Higher debt of the borrower | 27 | 22 | 11 | 1 | 1 | 136-1=135 |
| Short-term programs chances of higher default than long-term programs | 23 | 23 | 10 | 5 | 1 | 125-1=124 |
| Multiple lenders | 20 | 23 | 11 | 2 | 6 | 117-6=111 |
| Wrong selection of beneficiary | 23 | 30 | 7 | 1 | 1 | 136-1=135 |
| Improper post monitoring policy of banks | 17 | 29 | 10 | 3 | 3 | 119-3=116 |
| Failure of debt collection machinery | 28 | 15 | 7 | 5 | 7 | 121-7=114 |
| Improper verification of documents at the time of sanction | 23 | 19 | 10 | 6 | 4 | 117-4=113 |
| Dishonesty by bank employee | 25 | 20 | 5 | 6 | 6 | 120-6=114 |
| Political interference | 21 | 25 | 11 | 4 | 1 | 124-1=123 |

Source: Compiled from field survey

The Gendered Nature of Small Business Environment in Ghana: A Research Agenda

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Abstract: *Small businesses have been touted as drivers of economic development, and this is manifested through their contribution to innovation, job creation, and income generation. In developing economies such as Ghana, small businesses are recognized as a crucial and integral component of economic development policies. Women form the majority of operators in the small business sector in Ghana, but the performance of their businesses remains low because of the acculturation and socialization processes. Researchers in the small business sector have focused mainly on the factors that influence performance without examining the underlying acculturation and socialization processes that affect the way men and women manage their businesses. This paper proposes a research agenda, which examines the acculturation and socialization processes, associated with the factors that influence small firm's performance in Ghana.*

Keywords: Gender, small firms, performance, acculturation, socialization, Ghana.

Introduction

Small businesses play a vital role in every developing economy and have been identified as crucial in lifting countries out of poverty (Wolfenson 2001). The World Bank and other international funding agencies have therefore linked loans and grants developing countries to the implementation of policies and programmes aimed at creating stable macro-economic environments that are conducive to private investment, and in particular to the development of the small enterprise sector. For example, the IMF's Structural Adjustment Programme (SAP) implemented in Ghana in the 1980s emphasised reduction in government influence on selected economic activities, enhancement of the private sector and reduction in barriers to free-market operations (Cook and Nixon 2000). Specific reforms executed as part of the programme included devaluation of the national currency, trade liberalisation and exchange control, withdrawal of subsidies, retrenchment of labour, and reduction of government expenditure (Steel and Webster 1992). Like other developing economies, while ambitious privatisation and liberalisation programmes were being implemented, many of the supporting legal, contractual and transactional structures necessary to make the changes workable were not yet in place (Kalyuzhnova and Taylor 2001). For small firms to survive there is the need for well crafted policy framework that enhances the growth and development of the sector. In addition, the underlying cultural norms and values should be incorporated into any policy framework as culture pervades through every activity in a society. This was re-echoed by Lerner, Brush and Hisrich (1997) who indicate that the perceived acceptability of men's and women's participation in economic life varies from country to country, and is relative to the expectations and cultural norms in that society. Thus the ability of small firms to survive in any economic environment is also influenced by cultural norms and values.

A lot of studies have been carried out in developing countries with emphasis on the factors that influence performance (Boohene and Kotey 2006). What appears lacking in these studies in the small business context is an appropriately formulated framework examining the acculturation and socialisation processes that influence the activities of small firms, particularly women. It is this gap that this conceptual seeks to fill.

This paper presents an overview of the acculturation and socialisation of the small business environment in the context of a developing economy, Ghana. There are four sections to the paper.

The first section begins with a brief historical overview of the Ghanaian economy. This is followed by a discussion of the characteristics of small businesses, their role in the Ghanaian economy, the environment within which they operate, and the involvement of women in the sector. In the third section, the acculturation and socialisation process is examined to highlight gender disparities in general and in small businesses, in particular. The paper concludes by exploring the research implications for the study of gender differences in the factors that influence small business performance.

Overview of the Ghanaian Economy

The Ghanaian economy can be classified as a transitional economy. A transitional economy is characterised by economic restructuring, involving privatisation at both macroeconomic and microeconomic levels, a weak financial sector, decentralisation and deregulation of major institutions previously run by the public sector, and support for entrepreneurship and free market competition (Asfaw and Jones 1999; Kalyuzhnova and Taylor 2001).

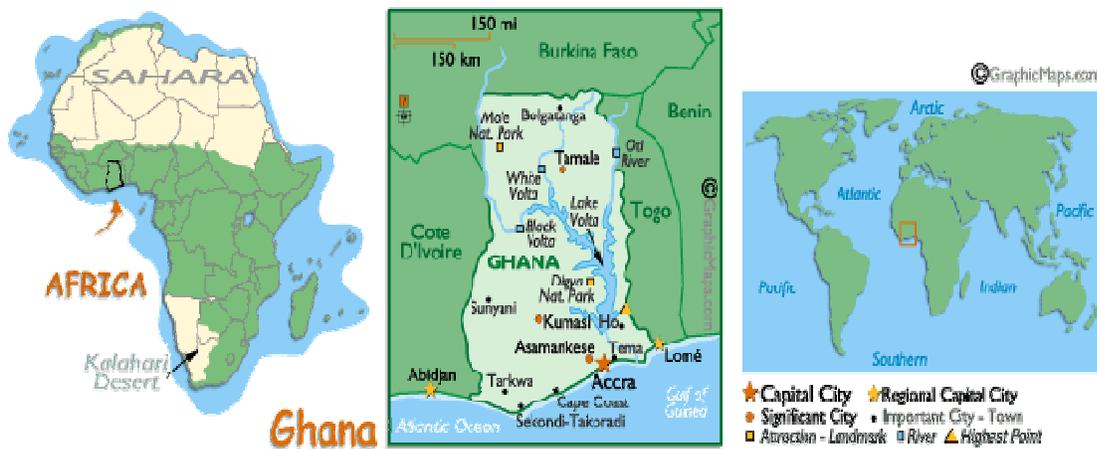
Situated on the West African coast, the republic of Ghana covers an area of 238, 535 square kilometres, approximately the area of the United Kingdom, with a coastline of 560 kilometres (Ghana Statistical Service 2002). It is divided into ten regions and has a population of about 18,912,079, the majority of whom live in the rural areas (Ghana Statistical Service 2002). It has a female to male ratio of 50.5: 49.5 per cent and a population density of 79.3 persons per square kilometre. Official sources estimate that Accra, the capital has a population of more than 3,000,000 with a population growth rate of 3.5 per cent per annum (Republic of Ghana n.d.) and a population density of 895.5 persons per square kilometre (Ghana Statistical Service 2002). As the capital, it has the most economic facilities and best social infrastructure so it is not surprising that its population density is much higher compared to the rural areas (Ghana Statistical Service 2002).

Ghana is bounded to the north and north-west by Burkina Faso, to the south by the Atlantic Ocean, to the west by Cote d'Ivoire and the east by Togo. The Republic of Ghana is a lowland country, except for a range of hills on the eastern border, and its coastal plain that is crossed by several rivers and streams. The west is heavily forested, with hills, streams and rivers, while to the north lies an undulating savannah that drains into the Volta River. The Volta River flows into the Volta Lake, one of the largest artificial lakes in the world (Government of Ghana n.d.). The climate of Ghana is tropical, but temperatures vary with season and elevation. Except for the north, two rainy seasons occur from April to June and from September to November. In the north the rainy season begins in March and lasts until September. Annual rainfall ranges from about 40 inches in the north to 80 inches in the south-east, and the average annual temperature is about 30°C (Government of Ghana n.d.). Figure 1. shows a map of Ghana, flanked by African and world maps respectively (World Atlas 2005).

Formerly a British colony known as the Gold Coast, Ghana was the first nation in Sub-Saharan Africa to achieve independence. Following a well-organised military resistance to the British army in 1957, Ghana settled down quickly to become one of the fastest growing states in Africa (Federal Research Division n.d.). After independence it exported large quantities of agriculture produce and minerals and was described as one of the most advanced colonial territories south of the Sahara (Frimpong-Ansah 1991). Endowed with considerable financial, human and natural resources it was one of the first countries on the African continent to make a bold attempt at planned economic development (Frimpong-Ansah 1991). Agriculture and related services have been pivotal to the country's economic activities, with cocoa being one of its main exports. The

cocoa industry developed so rapidly after independence that Ghana became the world's leading producer and exporter of cocoa, accounting for 40 per cent the world's output (Frimpong-Ansah 1991). Minerals such as gold, bauxite, diamond and manganese also played a significant role in the Ghanaian economy. Encouraged by this flourishing economy, the government pursued policies such as import substitution industrialisation where industrial and trade policies were fashioned to encourage large-scale capital-intensive enterprises (Osei et al. 1993). These were achieved through the structure of tariffs, interest rates policies, overvalued exchange rates, import licensing and quotas, and controlled prices (Osei et al. 1993). Nonetheless, inadequate attention to the economic viability and market prospects of these enterprises resulted in excess capacity, and many large firms were unable to survive without heavy protection or subsidies (Steel and Webster 1992).

Figure1. Africa, Ghana and World maps



Source: <http://www.worldatlas.com/webimage/countrys/africa/gh.htm>

By 1962, however, this once thriving economy had slipped into economic crisis and within twenty years, Ghana's fiscal policy had completely collapsed (Frimpong-Ansah 1991). The government's revenue base decreased to 5.6 per cent of Gross Domestic Product (GDP) compared with 20-25 per cent for other West African countries. The cocoa sector tax base shrunk to 1.2 per cent, and that of imports to three per cent. The imbalance in the external sector persistently worsened, particularly after 1975. With dwindling foreign exchange, capacity utilisation fell (Frimpong-Ansah 1991). The fall in the growth of the economy, precipitated by low commodity prices, especially for cocoa, was compounded by a sharp increase in oil prices, a severe drought, and other unfavourable policies, all of which almost caused the economy to grind to a halt. By 1983, the degree of overvaluation of the domestic currency to that of its major trading partners' was estimated at close to 1,300 per cent with inflation at nearly 123 per cent per annum (Frimpong-Ansah 1991).

In the face of this rapid deterioration in the Ghanaian economy, the World Bank and International Monetary Fund (IMF) proposed a radical programme under the aegis of Structural Adjustment Programmes (SAPs) to revive the troubled economy and restore its productivity (Bani 2003; Cook and Nixon 2000; Dawson 1993; Osei et al. 1993; Steel and Webster 1992). Foremost among the changes was the disengagement of the government from an active role in the

economy. This was on the grounds that it had caused major distortions in the market, resulting in sub-optimal allocation of economic resources, the development of a macro-economic environment not conducive to economic development, and poor overall performance. Furthermore, as part of their policy prescriptions, the IMF and World Bank proposed the divestiture of state owned enterprises (Osei et al. 1993). This led to the retrenchment of labour and a freeze on hiring in the public sector. Thus, in response to rising inflation a large number of workers retrenched from the public or formal sectors were forced to stream into the informal sector for survival. Here they had to set up small enterprises encouraged by low entry barriers and a lack of alternative employment options (Economic Commission for Africa 1996; Osei et al. 1993).

Since the introduction of the SAPs, successive governments and international donor agencies have emphasised the development of the private sector, particularly the small enterprise sector, as the engine behind the sustained micro- and macro-economic development of Ghana. For instance, Ghana's 'Vision 2020' a medium-term coordinated programme of economic and social development policies, emphasised the need to disengage the state from the economy and increase the private sector's role in the production and distribution of goods and services (Bani 2003). In addition, the Ghana Poverty Reduction Strategy II (GPRS II) currently being executed by the Government of Ghana emphasises accelerated growth through poverty reduction by assisting the private sector to grow and generate employment. Similarly, the 2006 budget read to the Ghanaian parliament by Kwadwo Baah-Wiredu, Member of Parliament and Minister of Finance and Economic Planning also stressed the development of three key priority areas, namely accelerated private sector-led growth, vigorous human resource development and good governance and civic responsibility (Republic of Ghana 2005). This approach incidentally is consistent with the United Nations Millennium Development Goals (MDG) now being implemented by the Ghana Government, the aims of which include the eradication of extreme poverty and hunger, and the empowerment of women through private sector development by 2015 (United Nations 2005).

Small Businesses in Ghana

The small enterprise sector in Ghana is considered a more reliable vehicle for balanced, equitable and harmonious socio-economic development, and it is responsible for providing employment to about 65 per cent of the urban labour force. In Ghana, small businesses constitute about 90 per cent of all registered establishments offering goods and services to a majority of the populace (Bani 2003).

Small enterprises have been variously defined, but the most commonly used criterion is number of employees. The Ghana Statistical Service (GSS) in its industrial statistics considers firms with less than 10 employees as small scale enterprises and their counterparts with more than 10 employees as medium and large-sized enterprises. In defining small scale enterprises in Ghana, Steel and Webster (1990), used an employment cut-off point of 30 employees. Osei et al. (1993) on the other hand, divided small-scale enterprises into 3 categories: (i) micro - employing, less than 6 people; (ii) very small - employing 6 to 9 people; and (iii) small with 10 to 29 employees. An alternative criterion used for defining small enterprises is the value of fixed assets in the organisation. Osei et al (1993) however, point out that the National Board for Small Scale Industries (NBSSI) in Ghana applies both the fixed asset and number of employees' criteria.

Small enterprises in Ghana cover a wide range of activities both in formal and informal sectors, and comprise businesses in retail services, wholesale, construction, manufacturing and food processing (Osei et al. 1993). Specifically, typical small enterprises include activities such as: soap and detergent making, food processing, tailoring, wood processing, furniture manufactur-

ing, electronic assembly, agro processing, and retail and wholesale trade (Dawson 1993; Osei et al. 1993; Quartey 2003).

These enterprises are distributed across urban centres and rural areas, although the majority are concentrated around a few principal cities and towns (Boeh-Ocansey 1996). The urban-based small enterprises have grown more rapidly than the rural based enterprises because of the presence of wage-earning labour force within the confines of their locality (Boeh-Ocansey 1996). Urban enterprises are further classified into organised and unorganised sectors. The organised businesses normally have paid employees with registered offices, while the unorganised businesses are mainly made up of employees who work in open spaces, at home or in temporary wooden structures, and employ little or in some case no salaried workers. They mostly rely on family members or apprentices (Boeh-Ocansey 1996). The rural businesses, on the other hand, are largely made up of family groups, individual artisans and women engaged in food production from local crops (Amu 2005; Kayanula and Quartey 2000).

Although, Ghanaians own most of these small businesses, few are foreign owned (Osei et al. 1993; Quartey 2003). Furthermore, most of these businesses are sole proprietorships with a few partnership and joint ventures (Osei et al. 1993; Quartey 2003). The owner-manager is either the founder of the business or inherited it from his/her family. In other instances the business is purchased, formed out of a merger or acquired through other means (Quartey 2003). The amount of capital available to these businesses is small, most often deriving from the personal savings of the owner's relatives or friends. Few small businesses are financed from commercial bank loans, government assistance programmes or other informal sources (Bani 2003; Osei et al. 1993). In addition, fixed assets such as building and equipment form the largest component of the firm's capital resources (Aryeetey et al. 1994; Boeh-Ocansey 1996). The proprietors and, in some cases, family workers make up the majority of the labour force and greatly influence business decisions and operations (Boeh-Ocansey 1996). Apprenticeship labour, however, is also important in some areas. Moreover, hired workers typically form the smallest segment of the small enterprise's employment. There is therefore a high degree of informality in the small firm sector in Ghana.

Role of Small Business in Ghana

According to Aryeetey et al. (1994), Boeh-Ocansey (1996) and Republic of Ghana (2005), the small enterprise sector has played an important role in government initiatives for development, from the 1983 Economic Recovery Programme (ERP) through to the current Ghana Poverty Reduction Strategy II (GPRSII).

Small businesses enable individuals to develop entrepreneurial and managerial skills that are needed as a foundation for local investment and sustained industrialisation (Bani 2003). Furthermore, the indigenous technology employed by these businesses is more likely to use local raw materials and equipment, thereby saving foreign exchange which might otherwise be spent on imports (Aryeetey et al. 1994; Bani 2003).

Largely resource based, small businesses in Ghana contribute to forward and backward linkages between agriculture and industry on the one hand and between different sub-sectors of industry on the other (Boeh-Ocansey 1996). In addition, they encourage rural-urban linkages in that some of the raw materials and finished goods they produce are consumed by the rural and urban sectors and vice versa.

In Ghana, small businesses are major sources of employment, income and personal development for the rural and urban poor and for women due to their labour intensive methods of opera-

tion (Bani 2003; Tsikata 2001). It is estimated that about three-quarters of the Ghanaian population derive their livelihood from this sector. Analysis based on the Ghana Living Standards Survey (GLSS) showed how non-agricultural self employment has grown from 19.5 per cent of the workforce in 1987/88 to 27.3 per cent in 1998/99, whilst wage employment fell from 17.3 per cent to 13.2 per cent over the corresponding period, mainly through loss of jobs in the government and state enterprises as a result of Structural Adjustment Programmes (Tsikata 2001).

Large firms may bring in foreign capital but small businesses are funded initially from dormant capital that would otherwise not be usefully employed (Kayanula and Quartey 2000; Osei et al. 1993). Besides, they make more efficient use of scarce factors of production than large-scale enterprises because small enterprises are usually labour intensive, with only small capital investments. This important feature of small enterprises has led to the conclusion that a viable small enterprise is an economically sound investment since the tendency is for the country to gain more value added per unit of investment than it would from a corresponding investment in large scale enterprises (Osei et al. 1993).

Because of their importance in the Ghanaian economy, government policy reforms have gone a long way towards improving the environment for small businesses. Policy reforms such as the liberalisation of exchange rates and import licensing provide small enterprises with access to import and export markets. In addition, the government has eliminated price controls and eased licensing requirements in order to reduce the obstacles faced by small firms in these areas (Aryeetey et al. 1994). Furthermore, a Micro Finance and Loan Centre (MASLOC) has been established to oversee the administration, coordination, and monitoring of small loans and the micro-financing scheme in the country (Republic of Ghana 2005). In spite of these seemingly impressive policies, it is suggested that small enterprises remain vulnerable and inefficient, with high failure rates (Amu 2005). They face unfavourable factors such as ease of entry, inadequate management skills, unbalanced and inadequate experience, shortage of working capital, governmental neglect of the sector and numerous government regulations and policies (Bani 2003).

Operating Environment of Small Business in Ghana

The need to support small businesses is justified by the nature of the environment within which they operate. A large proportion of small firms cannot mobilise the required resources to exploit market opportunities on their own because of their size, resource constraints and nature of operations. Lack of professional expertise compounded by low levels of awareness of their operating environment make them vulnerable to 'environmental shocks' (Bani 2003; Osei et al. 1993).

The economic environment within which small businesses operate in Ghana is fraught with uncertainties, characterised by high inflationary rates and inefficient fiscal and monetary policies, all of which adversely affect the activities of small firms (Institute of Statistical Social and Economic Research 2005). The deregulation of the financial sector during the implementation of the SAP was expected to result in a reallocation of domestic credits towards small enterprises and the substitution of more expensive forms of credit for cheaper ones (Boeh-Ocansey 1996). Despite these reforms, the absence of a vibrant banking sector that guarantees access to institutional credit continues to be a major constraint to small enterprise development (Bani 2003; Cook and Nixson 2000; Ghana News Agency 2006). In addition, repressive financial policies in the past, especially low interest rates for saving, high interest rates for borrowing, and a monopolistic banking system have minimised the interest of banks in the small firms sector (Aryeetey et al. 1994; Bani 2003). For example, regardless of the numerous complaints from businesses on the need to encourage borrowing by lowering interest rates on loans, commercial bank lending rates

continue to be high, ranging from between 19 per cent to 25 per cent. At such high rates and faced with the often cumbersome rules and regulations associated with obtaining bank loan, small firms are reluctant to borrow from the banks. For most owner-managers capital is sourced from mainly informal sources despite the fact that these carry with them their own risk and liabilities. The end result is often that businesses are not able to access the funds needed for expansion.

Ghana's economic reforms were accompanied by rehabilitation of its infrastructure, including the building or repair of trunk and feeder roads, rail lines, electricity, water and telecommunications all of which are vital to creating an enabling environment for private sector activity (Aryeetey et al. 1994; Kayanula and Quartey 2000). Even so most small firms still complain of poor infrastructure development which results in high transportation costs and delays in delivery of supplies (Bani 2003; Boeh-Ocansey 1996; Ghana News Agency 2006).

Another major environmental factor affecting small firms is increased competition from imported products, a result of the government's trade liberalisation policies (Saffu and Manu 2004). As Ghanaians prefer imported goods to home made goods, this increased availability of imported products has reduced demand for goods made in Ghana. Small firms need timely and adequate information on market indicators to compete effectively. However, in Ghana they generally lack access to the relevant information, business services and the training needed to solve problems and increase productivity (Akplu, Amoako-Kwakye, and Boateng n.d.; Aryeetey et al. 1994; Bani 2003).

The regulatory environment is also cumbersome for small firms. It takes a long time to register a business as the regulatory requirements are numerous (Akplu, Amoako-Kwakye, and Boateng n.d.; Kayanula and Quartey 2000). Many small business owners abandon the idea of registration, while others are not even aware of the regulatory requirements (Akplu, Amoako-Kwakye, and Boateng n.d.). In some cases small business owners are required to apply to as many as twenty organisations for permits before they can start their businesses. It is also difficult to register with the Registrar General's department if the business is located outside the country's capital as the department does not provide services outside the capital city (Bani 2003). Prospective owner-managers have to travel to the capital city and stay for a number of days to register their business. Whereas this requirement could be fulfilled by medium and large scale enterprises who have the resources to comply, it is sometimes an unsurmountable burden for some small enterprises (Akplu, Amoako-Kwakye, and Boateng n.d.). In addition, laws governing the enforcement of contracts are inadequate. The legal system in Ghana, which is supposed to empower corporate forms and industry associations in fulfilling their roles, is poorly developed and unable to adequately enforce compliance with contractual obligations (Kayanula and Quartey 2000).

Another factor that affects small business activities in Ghana is the unpredictability of political environment, particularly in the area of legislature reforms. New legislation takes immediate or retrospective effect or, even under the democratic dispensation bills are rushed through parliament under certificates of urgency (Boeh-Ocansey 1996; Kayanula and Quartey 2003). Failure to create a stable and conducive political environment undermines the performance of small firms and also erodes investor confidence in the private sector as a whole (National Development Planning Commission 2003).

The factors discussed above constitute the general problems faced by the small business sector in Ghana. They can be summarised as the marginalisation of the sector in terms of developmental inputs such as incentive systems, credit, and supportive fiscal and monetary policies. More specifically, Amu 2005, Bani (2003), Quainoo (2001) and Tsikata (2001) observed that there are

subtle but significant differences in the severity of the constraints men and women in this sector face, in the ways in which these constraints manifest themselves, and in the responses of the sexes to these constraints.

Women in the Small Business Sector

As in many developing economies, the majority of urban dwellers in Ghana earn their living from the informal sector, particularly small-scale non-farming activities (Greenstreet 1981; Republic of Ghana n.d.). With the urban population continuously increasing, the informal sector continues to be the most important income-earning area, particularly for women (ABANTU for Development 2004; Amu 2005; Akuffo 1996; Greenstreet 1981; Tsikata 2001). Traditionally, women in Ghana are the major source of livelihood for a majority of households although their activities are not normally included in the national accounts. Women customarily occupy key positions alongside men in the production of goods and services, and have excelled in operating small businesses (Amu 2005, Boohene, Sheridan and Kotey, 2006). However, the majority of Ghanaian female business owners are in the trading and service sectors. Entrepreneurship in service and retail are viewed as part of the non-sponsored segment of the labour market, where there is an absence of government support in terms of loans or grants. This means the majority of women-owned businesses fall into the non-sponsored category of the market. Thus, women business owners work mostly in the informal sector where resources are scarce (Tsikata 2001).

Employment of women in the informal sector in Ghana is relatively high. They constitute about 51.3 per cent of the labour force in the sector and 38.6 per cent of the economically active population (Tsikata 2001). The majority are self-employed or unpaid family workers in agriculture and agro based industries and trade (Amu 2005; National Development Planning Commission 2003; Nikoi 1993). Women's informal sector employment differs from that of men in a variety of ways. Firstly, they are concentrated in areas that are compatible with their reproductive role, such as child nurturing, often extensions of their domestic responsibilities (Amu 2005). Secondly, they are, with few exceptions, concentrated in areas with lesser growth potential such as the retail sector. This is because for the past two decades specific measures such as increases in tax rates have hurt informal sector operators, the majority of whom are women .

Moreover, the restructuring of state enterprises and the resultant job losses have affected the retail sector, which is dominated by women. The large public sector retrenchments coupled with the decline in real wages had an immediate impact on the formal business sector and a "knock-on" effects on the informal sector through the influx of re-deployees (Tsikata 2001).

Small private enterprise does not fit well with the role expectation of Ghanaian men. Up until the 1980's, men were looked down on if they engaged in small business activities. In contrast, they achieved social respect if employed in large multinational firms, the public sector, managed large manufacturing concerns or were self-employed in professional services. Accordingly, ABANTU for Development and Amu (2005) noted that in Ghana women are concentrated in small-scale trading while men are involved with large scale trading. The disparity between the sexes in the labour market participation are not due only to differences in access to markets, trading contacts and transportation but also because large-scale trading requires a level of flexibility and mobility that women do not have unless freed from their domestic chores. In contrast, women's retail trade activities are carried out in close proximity to their homes, in markets or kiosks along streets or in front of homes. The majority of women in this sector are illiterate and have few assets (Amu 2005). They lack basic skills in accounting, bookkeeping and income management and are not able to prepare the business plans and feasibility studies required by banks (Ni-

koi 1993; Quainoo 2001; Tsikata 2001). Thus, women operating in this sector face a combination of constraints which require support in public policy rather than being abandoned to the gales of unbridled liberalisation. A World Bank report in 1999 on Ghana's gender strategy suggested that although women are economically active in Ghana and is likely to be involved in businesses; their success is constrained by cultural, educational and economic barriers created by the acculturation and socialisation process (Bani 2003; Quainoo 2001). This issue is examined in the next section.

Cultural and Socialization Processes in Ghana

Miller et al. (2003) posited that economic activity, like all human endeavours, is impacted and even facilitated by the cultural milieu in which it is embedded. The impact of social factors on economic performance extends beyond business networks and ethnic enclaves. They established that the salience of societal norms of reciprocity demonstrate that business success is indirectly related to community norms. Socialisation refers to the process by which people come to adopt behaviours deemed appropriate in their culture (Burr 1998). It is usually used in relation to children, who gradually learn to adopt the behaviour appropriate to and acceptable in a variety of social settings. However, socialisation does not end with childhood, as social pressures and expectations continually moderate behaviour throughout life.

Every human society has a body of beliefs that regulate the way people behave and relate to each other. These beliefs and modes of behaviour are modified over time to suit the changing circumstances of each society (Federal Research Division n.d.; Gyekye 2003). The Ghanaian society is no exception. It is an interrelated social system where the extended family forms the core around which the traditional social organisation revolves (Federal Research Division n.d.). Relationships are built around family membership, inherited status and ancestral beliefs (Gyekye 2003). Family, school and friends function as socialising agencies to ensure that societal obligations and privileges are properly carried out, although the moral and ethical instruction of children remain the responsibility of the extended family. Values are transmitted through proverbs, songs, rituals and associated rights of passage. While social behaviour and values are partially altered to fit the needs of modern life, traditional values continue to endure (Amu 2005). There is a general belief among the older generation that the cultural identity of Ghanaians will be lost if their cultural values undergo change and that Ghanaian traditions must be closely guarded in order to preserve the country's unique identity (Loth 1999).

In Ghana, traditional gender-role identification and living arrangements are passed on to children within the household who learn from household chores the gender roles expected of them. When children are taught to behave in gender-specific ways, they begin to act in a manner consistent with their sex, allowing for the internalisation of gender specific roles (Dolphyne 2000). Males in the Ghanaian society are taught to become heads of households and breadwinners charged with responsibility for the welfare of all household members including women. In the process they are given control over the resources necessary for discharging these responsibilities (Amu 2005; Dolphyne 2000). A male is encouraged to be aggressive, and to display "machismo". These qualities assist in building their self esteem and confidence (Bortey and Dodoo n.d.).

Ghanaian women, on the other hand, are not expected to develop such qualities. They are not encouraged to display the same degree of assuredness in their abilities (Dolphyne 2000), because of the roles accorded them in society and reinforced throughout the socialisation process. They bear the primary responsibility for child-nurturing, cooking, washing and collecting fuel-wood and water (Boohene, Kotey, and Folker 2005; Nikoi 1993). They are socialised to be gentle, to

put the needs of others before theirs but never to be winners. Girls in Ghanaian social context become unattractive when they demonstrate male behaviours. Hence, it is much more appropriate for women to be quiet, to hang back, and to accept what life doles out to them (Amu 2005; Boohene, Kotey, and Folker 2005). Moreover, sanctions are imposed on women when they go beyond the boundaries governing the sexual division of labour (Dolphyne 2000). They are subjected to malicious gossip and ostracised when they behave outside the economic and social norms set by the society (Greenstreet 1981). Thus, the ideology of sex roles in some instances is utilised to structure economic spaces differently for male and female members of the society (Greenstreet 1981; Tsikata 2001).

Further, the Ghanaian educational system is designed to serve girls and boys equally (Amu 2005; Greenstreet 1981), however the education of Ghanaian females is hindered by the overall cost of education, customary fostering, puberty rites, early marriages, 'trokosi' (female ritual slavery) and the perception of parents that educating girls is not as rewarding as educating boys (Amu 2005; Dolphyne 2000; Republic of Ghana 2004). Thus, most girls do not continue their education after high school (Federal Research Division n.d.). Others do not even complete an elementary level of education because they are withdrawn from school to help with household chores and family businesses (Republic of Ghana 2004). This social attitude towards female education stems from the conviction that a woman will be supported by her husband. In some circles it is feared that a girl's marriage prospects will be diminished by high education (Dolphyne 2000; Greenstreet 1981). As a result of these perceptions, the subordinate position of women is strengthened by socio-cultural practices and a process wherein children are socialised into patriarchal ideologies which perpetuate female subordination and male domination (Tsikata 2001).

Recognising the existence of gender inequalities, government, civil society, media and academia have pushed for greater equity in access to resources among the sexes. The response has nevertheless been slow because women still face discrimination in both the formal and informal sectors of the economy (Boohene, Sheridan and Kotey, 2006, Tsikata 2001). Access to resources in Ghana such as land, education, managerial experience and training has been substantially less for women than for men. For this reason, women in the small business sector are constrained by poor understanding of savings, poor access to credit, lack of business knowledge and skills, as well as the constant pressure of household responsibilities (Amu 2005). Beyond these factors is the common perception that women's businesses should not be as large or successful as men's (The World Bank Group 1999). Consequently, studies in the small business literature have indicated that, in order to improve the performance of the small business sector in general and the status of women in particular, greater attention should be paid to values, family situation, resources, managerial experience, business skills, business strategies and educational levels all of which are influenced by cultural and socialisation practices (Bani 2003; Quainoo 2001).

Conclusion

The importance of small businesses to economic development in transitional economies, combined with the growth of women in that sector has created a need to examine the factors that influence their performance. One area that has been consistently mentioned in the popular press as a setback to the development of the small firms sector in Ghana but which has not yet been systematically investigated is the impact of the acculturation and socialisation processes on the factors that influence the performance of women owned firms in Ghana. This suggests that the socially constructed nature of gender poses significant challenges to women's enterprises (Shaw et al. 2006). Whilst various programmes have been implemented to address the problem of gender

inequalities in all spheres of the Ghanaian environment and the small firm sector in particular, the boundaries of the problem and the factors associated with it are not clearly understood. This paper proposes that to examine the factors that influence small business performance in Ghana, researchers should examine the underlying acculturation and socialization processes that influence the small business sector.

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A Study on Job Stress of the Employees with Reference to Banking Sector

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Abstract: *The study has been designed to review the perceptions and the feelings of employees working in banking sector on specific factors and their relationship with stress. A sample of 175 bank employees at different organizational levels is studied with reference to various factors of job stress. The study attempted to identify factors that were descriptive of the employees. The determinants of job stress that have been examined under this study include design of tasks, management style, interpersonal relations, workload, career concerns, and environmental conditions. The level of stress of employees is analyzed by dividing into low, medium and high, based on various stress related factors. These results indicate that a large number of employees in the sample are having medium job stress. The factors which lead to job stress are studied and analyzed. The study reveals that workload and the management style are the major factors causing job stress.*

Keywords: Job stress, Banking sector, Employee perceptions, Workload, Management style.

Introduction

The failure of any organization is considerably depends on the stress experienced by its work force. Stress on the job can be defined as the harmful physical and harmful responses that occur when the requirements of the job do not match the capabilities, resources or the needs of the employees. Prof. Hans Selye (1956) brought before the public the concept of stress in a medical sense to indicate the overloading of human body. Many studies on the job stress (Sethi et.al 1999, Sethi et.al 2004) reveal that job stress is the major source of burnout and turnover of the employees. Judge et al., (2001), Heller et al., (2002), Rode, (2004) stated that job stress causes negative relationship with the satisfaction of the employees. The essence of these studies indicates that employees with high percentage of job stress feel dissatisfaction and therefore they will not feel happy in the organization in addition to frustration and burnout. This gives negative impact on the organizations and leads to employee's turnover. Due to rapid changes in the technological and economic advancements all over the world competition increased on job environment. As a result, employees are spending most of their time for job related work purposes ignoring the quality of their life. Many of the earlier studies on job stress and quality of life shows that there exists a positive relation between the two. An examination of these studies shows that job stress is the major cause for job dissatisfaction, consequently disturbances in the quality of life and hence unhappiness. A pan – EU study (European commission, 2006) in its report clearly stated that when people are satisfied with their jobs, they will satisfy with other activities of their life and happier. As job stress is the important factor for dissatisfaction of the employees, it is very important for the HR managers to understand the concept of stress as well as the factors and their relationship that causes stress.

With the liberalization and privation of policies of the Indian government, a large number of banks came up during the past few years. Due to increase in number of banks, the employees working in them are facing many problems on their job as the managements of these banks are facing competitive pressure from other banks. As a result of this competitive pressure, the employees both male and female are facing heavy stress which ultimately causing job dissatisfaction and consequently disturbing their physical and mental health. Hence the present study has

been undertaken with a view to find out the level of stress facing the employees as well as the causes behind it.

Review of Literature

Job stress is a growing problem that results in substantial costs to individual employees and work organizations around the globe (Hart and Cooper, 2001). The overall cost of stress at work has been estimated to be in the range of 20 billion Euros in the European Union and more than 150 billion dollars in US, mainly for health care and treatment costs, absenteeism and turnover (Daniels, 2004). A large number of researchers studied the job stress and concluded that stress is the source of burnout and turnover in organizations and affects the efficiency and productivity. In the present environment, most of the organizations are expecting for larger job outcomes. As a result, the employees are forced to deviate from their normal functioning in organizations. Similar view was expressed by Beehr and Newman (1978). They described the stress as a situation that will force employees to deviate from normal functioning due to change in their psychological and/ or physiological conditions. Job stress exists in every organization either big or small. The work places and organizations have become highly complex due to the presence of stress. Job stress has significant effect over the employees' job performance and the organizations in United Kingdom and trying to cope with this scenario (Anderson, 2003).

Some of the researchers in their studies concluded that one of the factors of job stress is the high work load or work over load. According to the division of Human Resources (2000) stress due to work load can be defined as reluctance to come to work and a feeling of constant pressure associated with general physiological, psychological and behavioral stress symptoms. Alexandros-stamatios et al (2003) and Al-Aumeri (2003) are also of the same opinion that one among the various factors of stress is the pressure originating from heavy work load.

Management style of the organization is another important factor that develops stress among the employees. Lack of participation by employees in decision making, poor communication, lack of family friendly policies etc., constitute management style and leads to adverse consequences on the individual (Kahn and Quinn, 1970). Caplan & Jones., (1975) reported that the management style such as no participation of employees in decision making process, non effective consultation and communication, unjustified restrictions on behavior of the employees and office politics are the sources of stressors. According to Stammper and Johlke, (2003), the management style followed in the organizations helps in reducing or increasing stress in employees. Organizational assistance and management support work as cushion which acts positively in reducing the job stress in employees. Another study conducted by Palmer, et al (2003) on organizational factors also stated that management style in organizations, non participation in decision making, in appropriate and inadequate communication, organizational policies create job stress. Inter personal relations that exists in organization is also one of the factor related with job stress (Sigler, 1995). Inter personal relations can be known as the poor social environment and lack of support or help from co workers and supervisors. Rout and Rout, (1993) argued that occurrence of stress at the work place is due to failure in inter personal relations in association with other causes, is likely to have a marked impact on the job outcome. Vansell et al (1981) identified that when an individual is assigned a major responsibility without proper authority and delegation of power, leads to the development of stress. Several other studies have highlighted the importance of career concerns and environmental conditions in relation with job stress. Career concerns include job insecurity and lack of opportunity for growth, advancement, while environmental conditions include unpleasant physical conditions such as crowding, air pollution, dirty environment

etc. Chandra, et al, (2003) and Jamal (1994) stated that stress on job is the outcome of an individual due to working environment from which he feels unsecured. Jewell, (1998) identified that the job factors with specific job duties, environmental work factors and the factors like job complexity, job duties diversity causes stress on employees. Ivancevich, and Matteson,(2001), opined that individual stressor factors such as role conflict, role ambiguity, overload of work, embarrassment changes, the quality of inter personal relations and lack of social support etc., create job stress. Job stress and job satisfaction are the two prominent areas in the field of human resource management. Several studies also tried to prove the relation between the two. The study made by Landsbergis (1998) indicated that high level of work stress is linked with low levels of job satisfaction. Lasky, (1995) is also of the same opinion and stated that there exists negative relation between job stress and job satisfaction. The study made by Stamps and Piedmont (1986) also revealed that job satisfaction of an employee working in the organization is purely depends on the stress faced by him. Vinokur – Kaplan (1991) focused their study on work load and working conditions and stated that these two organizational factors were negatively related with job satisfaction. Ighario et.al (1992) also found that job stress affects job satisfaction and career satisfaction negatively. They also found that there exists positive relation between job satisfaction and career satisfaction. Another study made by Kuo and Chen (2004) on Taiwan information system employees found that individual demographic factors such as gender, age, marital status, educational level, length of service, annual salary affect the job stress of employees. Another study conducted by Neelameghan and Asrafali (2010) on work stress among employees of central cooperative bank, Tamilnadu, India reveal that job stress is the cause for job dissatisfaction. They also revealed that job stress is different for different employees on the basis of their educational qualifications and the length of service. Another study conducted by Michailidis and Georgion (2005), on occupational stress of employees in banks also reveal the fact that employees demographic factors such as educational levels affect the degree of stress they experience in various ways.

The substance of the above survey of literature is that there are many studies on job stress in general and a very few studies on banking sector in particular. Most of these studies showed the relation between stress and the factors causing stress, without giving much consideration on the extent to which these factors create job stress. Further most of these studies on job stress conducted in countries like USA, UK and others, giving a very little scope on Indian context. Hence, the present study may be considered as one among many bricks that will be required to bridge the gap between research needs and research efforts made so far.

Significance of the Study

The banking sector is not an exception to the job stress phase. Job stress in banking sector is the feeling with which employees as individuals and as groups experience force, pressure, or strain due to job related factors. It is a state of unhealthy situation in the banking field, in which employees fail to give their respective contributions to achieve the goals set by the bank managements. During the past few years the banking sector had undergone tremendous changes with the government policy of privatization and liberalization. As a result of government policy a large number of private banks entered in the industry, and created competitiveness among them. These banks try to snatch each other's piece of share in a cut throat competition. In a competitive environment, every bank is interested to improve its position to get a strong base for its survival. To attract the customers in large number and to improve the market share as well as profits these banks adopted various strategies like downsizing, excessive working hours, introduction of new

technologies, new schemes and plans etc. Due to these changes the employees in the banking sector are experiencing a high level of stress and it has become an integral part of employees living. Hence a study has been undertaken to know the level of job stress and also the factors as well as their impact that create stress on the employees.

Statement of the Problem

Every bank has policies to achieve its objectives. Continuous updating and monitoring of these policies should be essential to keep pace with the change in time to avoid any type of stress on the part of employees. To study the job stress of the employees working in banking sector, this study is focused on various factors which are directly or indirectly related to nature of job. These factors include design of tasks, management style, interpersonal relations, workload, career concerns, and environmental conditions. The need for the study is to ascertain specific problems of bank employees related to job stress and to find out the level of stress. The present study will help to develop more appropriate strategies to minimize the job stress of the employees and these could be incorporated into a well designed set of human resource policies and also help as one of the source for the secondary data for future research on this related area.

Objectives of the Study

The purpose of this study is to investigate the level of stress and also the specific factors associated with job stress and their impact on the employees working in banking industry. The following are the research objectives formulated to guide the study.

1. To measure the level of job stress of the employees.
2. To analyze the relation between stress and the variables that creates stress.
3. To suggest suitable measures, to minimize the job stress of the employees.

Hypothesis

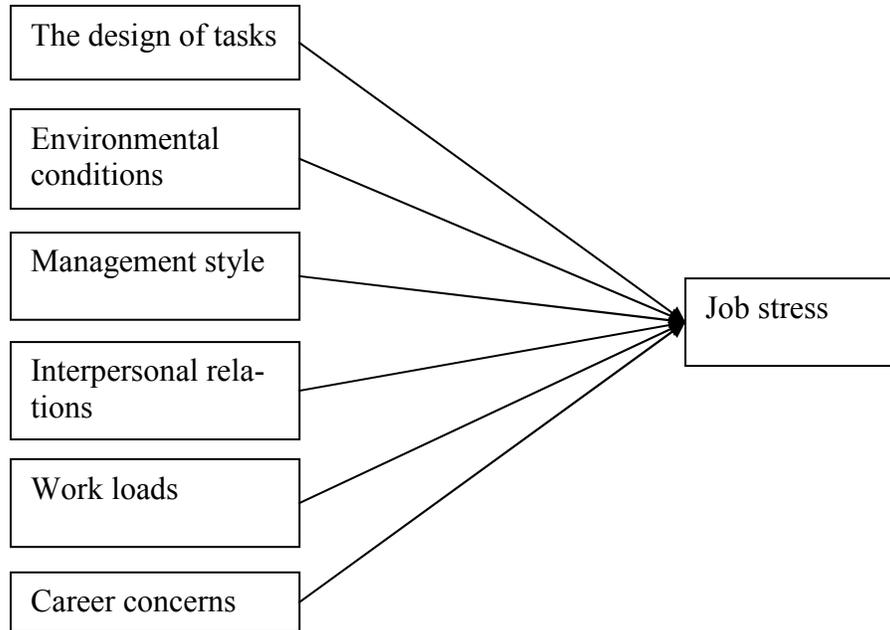
This study infers that job stress is more in male, operational and non nationalized bank employees compared to female, managerial and nationalized bank employees. As against this background, the statement of hypothesis is as follows.

1. H₀1: Stress will be higher among male employees compared to female employees.
2. H₀2: Stress will be higher among non nationalized bank employees compared to nationalized bank employees.
3. H₀3: Stress will be higher among the employees at the operational level compared to the employees at the managerial level.

Development of Research Model

A theoretical frame work for the job stress behavior is developed based on the objectives and previous literature available on this field. The job stress model is developed in consistence with the various factors that represent job stress. The development of this model will provide a sound base and will help in further examination as to what extent can these factors influence job stress among the employees working in banking industry.

Fig 1 Research Model of the Conceptual Frame Work of Job Stress



Methodology

Instrument development:

The instrument used in this study consists of three parts. The first part deals with the demographic profile of the respondents such as gender, age, working with national and non-national banks, nature of job in bank, etc. Part two deals with level of job stress measured by job stress questionnaire prepared on the basis of various job related factors. It consists of 15 questions, each of which is measured on four point Likert's scale, in which, 1 indicated "strongly disagree", 2 indicated "disagree", 3 indicated "agree" and 4 indicated "strongly agree". Part three consists of a questionnaire on the factors affecting stress, with six dimensions as proposed by National Institute for Occupational Safety and Health (NIOSH), namely 1.design of tasks 2.management style 3.interpersonal relations 4.work loads 5.career concerns and, 6.environmental conditions. Each of these job stressor is also measured on four point likert scale in which, 1 indicated "strongly disagree", 2 indicated "disagree", 3 indicated "agree" and 4 indicated "strongly agree".

Data collection:

Mailed questionnaire method was adopted to collect data from the respondents. A covering letter requesting the respondents to go into the details of the questionnaire and to fill up their responses, a questionnaire form and a self addressed stamped envelope were given to the respondents. Contents and validity of the statements were established by experts consisting of top officials and other employees of the banks. Each of the experts on the panel was asked to verify the instrument for clarity, wording, overall appearance and meaning in addition to content and validity. The instrument was pilot tested with a group of bank employees, not included in the sample. Data were collected from respondents working in various nationalized and non-nationalized banks located in

and around Nellore District in India. A total of 300 respondents were selected randomly and questionnaires were delivered to them. The data were systematically collected during the period between April 2010 and June 2010. Nearly 15percent of the responses received were with incomplete questionnaires i.e. not answered properly. Hence they were treated as unusable responses and thus eliminated from the study. A total of 175 responses were received, thus obtained a response rate of 58 percent.

Analysis of data:

The primary data collected have been sorted, classified and tabulated in a format and analyzed by using statistical package for social sciences (SPSS16.0). An appropriate statistical procedure like t-test and multiple regression analysis have been used for inference. The multiple regression analysis allows for simultaneous investigation of the effect of two or more independent variables on a dependent variable. The dependent variable for this study is the job stress of bank employees.

Results and Analysis

Profile of the respondents:

Of those responding to the questionnaire, it was found that 65 percent (113) were male while 35 percent (62) were female (Table 1). The table further shows that the employees working with the banks are male dominated. Out of which 20.57 percent (36) of the respondents are below 25 years of age, 30.85 percent (54) are in the age group of 25 to 35 years, 39.43 percent (69) are in the age group of 35 to 45 years and 9.15 percent (16) respondents are with above 45 years of age. An analysis of the age of the respondents reveals that majority of the employees are in the age group of 35 to 45 years. 58 percent (101) were nationalized bank employees, while 42 percent (74) were non nationalized bank employees. Further 45 percent (78) were at managerial position, while 55 percent (97) were at operational level.

Table 1. Demographic profile of respondents

| 1. Gender | No of Respondents | Percentage |
|------------------------|-------------------|------------|
| a) Male | 113 | 65.0 |
| b) Female | 62 | 35.0 |
| Total | 175 | 100 |
| 2. Age | | |
| (a) Less than 25 Years | 36 | 20.57 |
| (b) 25-35 Years | 54 | 30.85 |
| (c) 35-45 Years | 69 | 39.43 |
| (d) Above 45 Years. | 16 | 9.15 |
| Total | 175 | 100 |
| 3. Type of bank | | |
| (a) Non nationalized | 101 | 57.7 |
| (b) nationalized | 74 | 42.3 |
| Total | 175 | 100 |
| 4. Nature of work | | |
| (a) operational | 97 | 55.42 |
| (b) Managerial | 78 | 44.58 |
| Total | 175 | 100 |

Reliability:

The internal reliability of various items of the questionnaire was verified by calculating Cronbach's alpha. Cronbach's alpha is used to measure the reliability of the instrument that ranges from 0 to 1, with values of 0.6 as lower level of acceptability (Hair et al.1998 & Nunnaly, 1978). The Cronbachs alpha estimated in the present study for computing job stress was 0.7, and job stressor

scale was 0.9, which are much higher than the acceptable level, the constructs were therefore deemed to have adequate reliability.

Measuring the level of job stress:

To ascertain the level of job stress, Likert’s summated scale was selected with 4 points as 4- strongly agree, 3- agree, 2- disagree and 1- strongly disagree. The level of job stress of the employees may be Low or Normal or High. With a view to find out the level of job stress of sample employees, 15 statements related to job factors have been adopted i.e. the scale consists of 15 statements with 4-points. The highest possible score by the individual is 60 and the lowest possible score is 15. On the basis of job stress score the sample respondents were divided into three groups i.e. Low, Normal and, High (Table.2). Those who scored between 15 and 30 are identified as having Low job stress, between 31 and 45 are identified as having Normal job stress, and between 46 and 60 are identified as having job stress at High level.

Table 2. Level of Job Stress of bank Employees

| Job Stress | No of Respondents | Percentage |
|-----------------|-------------------|------------|
| Low (15-30) | 05 | 2.87 |
| Normal (31-45) | 131 | 74.85 |
| High (46-60) | 39 | 22.28 |
| Total | 175 | 100 |

It is clear from Table.2, that the majority of respondents i.e.,74.85 percent are having normal job stress, followed by 22.28 percent of the respondents with high job stress and only 2.87 percent of the respondents with low job stress.

Test of multicollinearity:

To determine the presence of multicollinearity among the various independent variables in the study, two major methods have been used. The methodologies include the calculation of both a Tolerance test and a Variance Inflation Factor (VIF). The results of the multicollinearity test were shown in Table 3. It is evident from this table that none of the Tolerance levels of the independent variables is less than or equal to 0.01 and all variance inflation factor values are well below 10. Further, the Durbin – Waston value for the present study was 1.5, which is at the acceptable range of 1.3 and 2.5 show that there were no auto correlation problems in the data. Thus, the measures selected for assessing the independent variables in the study do not reach the levels indicating the multicollinearity problem.

Table 3.Result of Multicollinearity

| Variables | Collinearity Statistics | |
|-------------------------|-------------------------|-------|
| | Tolerance | VIF |
| Work load | .571 | 1.750 |
| Management style | .451 | 2.217 |
| Interpersonal relations | .391 | 2.556 |
| Career concerns | .392 | 2.548 |

| | | |
|--------------------------|------|-------|
| Environmental conditions | .425 | 2.354 |
| Design of tasks | .428 | 2.337 |

Hypothesis Testing

To test the hypothesis, the data were analyzed by using independent samples t– test. Independent samples t- test is employed to compare the means of job stress between male and female, nationalized and non- nationalized, operational and managerial employees work in the banks. The descriptive statistics are shown in Table 4, while the t- test results of these variables are shown in Table 5.

Table 4. Descriptive statistics

| Variable | Category | N | Mean | Std. Deviation |
|-----------------|------------------|-----|-------|----------------|
| Level of Stress | Male | 113 | 42.10 | 5.970 |
| | Female | 62 | 40.81 | 4.648 |
| | Total | 175 | | |
| | Non nationalized | 101 | 42.37 | 5.978 |
| | nationalized | 74 | 40.65 | 4.793 |
| | Total | 175 | | |
| | operational | 97 | 40.72 | 6.806 |
| | Managerial | 78 | 42.78 | 3.111 |
| | Total | 175 | | |

The result of hypothesis 1:

The mean stress of male employees is 42.10 while the mean stress of female employees is 40.81. The corresponding standard deviations are 5.970 and 4.648 respectively. The t- test value is 1.474. The higher the mean value of the job stress of male employees in comparison with female employees is statistically significant at 5percent. Hence the hypothesis is accepted

The result of hypothesis 2:

The mean stress of non nationalized employees is 42.37 while the mean stress of nationalized employees is 40.65. The corresponding standard deviations are 5.978 and 4.793 respectively. The t- test value is 2.038. The higher the mean value of the job stress of non nationalized employees in comparison with nationalized employees is statistically significant at 5percent. Hence the hypothesis is accepted

The result of hypothesis 3:

The mean stress of Operational employees is 40.72 while the mean stress of Managerial employees is 42.78. The corresponding standard deviations are 6.806 and 3.111 respectively. The t- test value is -2.473. The higher the mean value of the job stress of Managerial employees in comparison with Operational employees has no significance statistically. Hence the hypothesis is rejected.

Factors Affecting Job Stress

To satisfy one of the objectives of the study, the surveyed data were further used for regression analysis to understand the impact of these factors that will cause job stress on employees. The set of factors such as design of tasks, management style, interpersonal relations, workload, career concerns, and environmental conditions is taken as independent variables and job stress is taken as dependent variable. The statistical representation of the regression equation is as follows.

Table 5. t- Test results

| Variables | Un standardized Coefficients | | Standardized Coefficients | t | Sig. |
|--------------------------|------------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | | |
| (Constant) | 28.503 | .704 | | 40.491 | .000 |
| work loads | 1.671 | .289 | .322 | 5.785 | .000 |
| Management style | 1.331 | .298 | .280 | 4.468 | .000 |
| Interpersonal relations | .257 | .328 | .053 | .785 | .434 |
| Career concerns | .396 | .318 | .084 | 1.246 | .214 |
| Environmental conditions | .717 | .295 | .157 | 2.429 | .016 |
| Design of tasks | .577 | .301 | .123 | 1.916 | .057 |

Table 6. Regression Analysis

| R | R Square | Adjusted R Square | df1 | df2 | Sig. F Change |
|------|----------|-------------------|-----|-----|---------------|
| .838 | .702 | .692 | 6 | 168 | .000 |

$$\text{Job stress} = b_0 + b_1 (\text{design of tasks}) + b_2 (\text{environmental conditions}) + b_3 (\text{management style}) + b_4 (\text{interpersonal relations}) + b_5 (\text{workload}) + b_6 (\text{career concerns}).$$

Where b_0 = Constant (the value of dependent variable when the value of the independent variables is zero), also called the Intercept.

$b_1, b_2, b_3, \dots, b_6$ are known as regression coefficients, which represents the estimated change in the mean value of the dependent variable for each unit change of the six independent variables. Regression results and Analysis of variance are shown in the table 6 and Table 7.

Table 7. ANOVAs Results

From the regression analysis, the above equation can be written as follows.

| Variable | Categories | T - value | Degree of freedom | Significance at 5% |
|------------|---------------------------------|-----------|-------------------|-----------------------|
| Job stress | Male & Female | 1.474 | 173 | Significant at 5% |
| | Non nationalized & nationalized | 2.038 | 173 | Significant at 5% |
| | Operational & Managerial | -2.473 | 173 | Not Significant at 5% |

Job stress = 28.503 + 0.577 (design of tasks) + 0.717 (environmental conditions) + 1.331 (management style) + 0.257 (interpersonal relations) + 1.671 (workload) + 0.396 (career concerns).

The measure of strength of association in the regression analysis is given by the coefficient of determination denoted by R^2 . The R^2 value for the present study is 0.702, which shows that 70% of the variation in job stress can be explained by the 6 factors or independent variables. The model is statistically significant at a confidence level of 99 percent.

The workload factor is in agreement with previous findings (Alexandros–stamatios .et al 2003, Al-Aumeri 2003). As expected, the result (Beta = 0.322) shows that the relationship between workload and job stress is highly significant at 1 percent. The management style is also in agreement with wide range of previous findings (Kahn and Quinn, 1970, Caplan & Jones 1975, Stammper and johlke, 2003). The corresponding Beta value is 0.280, which is highly significant at 1 percent. These results further shows that if more work load is given to employees, the possibility of them to face stress will be higher. The interpersonal relations and career concerns are not in agreement with previous findings ((Sigler, 1995, Rout and Rout, 1993, Ighario et.al 1992). The results of regression analysis shows that the relationship between interpersonal relations (Beta = 0.785), career concerns (Beta = 1.246) and job stress is not significant. The unimportance of these factors may be due to the fact that all the employees are very much co-operative and friendly, further, it is assumed that the management of these banks provides job security, opportunity for growth and advancement toward higher positions. The environmental conditions and design of tasks are in association with job stress (Chandra,. et al, 2003 and Jamal 1994). The corresponding Beta values are 2.429 and 1.916 respectively, which are significant at 5 percent.

Conclusion

Many bank employees all over the world working in stressful environments due to rapidly changing environment for competition and survival. As a result, employees feel stress and are not satisfied with their job and therefore they will not feel happy working in the banks. Hence, it is the responsibility of human recourse managers to find out the reasons when employees are unhappy with their jobs, and also to investigate and understand what makes employees to feel stress.

Based on the findings of the study, a few key points can be developed to conclude this research paper. It is very much important that the bank managements must understands the needs and wants of its employees and provide what is suitable and best for them. Continuous monitoring and upgrading of various employees related programs should be considered to reinstate and to feel the employees happy in their work. It is found that workload and management style are the key factors (coefficient values 1.671 and 1.331 respectively) that affects the feelings and creates stress among the employees. Employees who are highly affected by the workload and the attitude of management will feel unhappy and face stress in banks. The findings of the present research accept the research hypothesis, Hence it is suggested that the managements of banks must minimize conflicting or uncertain job expectations from the employees, by minimizing too much workload and too many responsibilities etc,. Further the managements must give an opportunity to the employees in decision making, in addition to changing their style by adopting effective communication strategies and introduction of various family friendly policies etc

Normal job stress among the employees is necessary to carry out their routine work smoothly in the banks. While, employees experiencing minimum level of stress may lead to inefficiency and lethargic attitude towards their job. Stress beyond certain level creates various problems in the near future and may lead to changes in their behavior and attitudes, especially causing em-

employees performance poor in their work, which would finally; affect the productivity of the banks.

Finally, it is the responsibility of both management and employees of the banks, when it comes to the issue of handling stress. When an employee is facing stress, as a result of both internal and external environments, it is the managements of the banks and customers of the banks that will experience the effect of stress experienced by employees. Hence personal managers of the banks must consider suitable concrete measures to maintain stress free work environment in banks.

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Competitiveness and Its Impact on Research and Development in Indian Automobile Industry

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Abstract: *Automobile industry is one of the leading industries in India which contributes roughly 5% of India's GDP. Automobile industry is growing at a tremendous pace with increasing demand from within the country as well as from other countries. Due to liberalization some multinational companies have come to capture the Indian market and as a result of this technological development take place through research and development. The presence of both leading domestic companies and multinational companies has led to an increase in the volume of production with the improvement of technology. The Indian automobile industry has been experiencing stable rise in their production and as a result competitiveness increases with rise in buying power and investment friendly government norms. The objectives of the paper are to examine that whether Indian automobile industry is competitive or not and to examine the impact of industrial performance and market structure on research and development. This paper also shows the Schumpeterian inverted U relationship between research and development intensity and market concentration. Research and development is affected not only by the last year profitability but also by market structure. This study is based on company level panel data of 19 years since from 1990 to 2008 collected from secondary data sources. For the analysis advanced econometric techniques like Panel regression and Vector Auto Regression (VAR) have been used.*

Keywords: Research and development intensity, market concentration, profit margin

Introduction

Automobile industry is one of the fastest growing industries in the world. Its dynamic growth phases are explained by the nature of competition, product life cycle and consumer demand. Today, the global automobile industry is concerned with consumer demands for styling, safety, and comfort; and with labor relations and manufacturing efficiency. The annual turnover of the global auto industry is around US\$ 5.09 trillion, which is equivalent to the sixth largest economy in the world (Organisation Internationale des Constructeurs d'Automobiles, 2006). The global motor vehicle industry (four-wheelers) contributes 5 per cent directly to the total Manufacturing employment, 12.9 per cent to the total manufacturing production value and 8.3 per cent to the total industrial investment.

Like the global automobile industry, the Indian automobile industry is one of the leading industries of the country. It is the key drivers of industrial growth and employment which will further gain in importance in the coming years. The Indian automobile industry is growing at a tremendous pace with increasing demand from within the country as well as from other countries. It provides direct employment to about 5 million persons and contributes 19 per cent to India's indirect tax revenue (Narayanan and Vashisht 2008). It is one of the largest industrial sectors with a turnover that contributes to roughly 5 per cent of India's GDP. The Indian car manufacturing industry in February 2009 saw a rise in car sales of 21.8% due to reduction in fuel prices, hefty discount by the manufacturers, availability of cash, and dip in inflation (Dutt 2009). Till early 1980s, the Indian automobile industry was suffering from low volumes of production, obsolete

and substandard technologies. The industry is currently growing at a remarkable pace of around 18 % per annum. The technological changes and progress successfully led to the progress of automobile sector in India. The main reason behind this tremendous progress is the economic liberalization by Indian government (Jain 2010).

With de-licensing in the 1980s and opening up of this sector to Foreign Direct Investment (FDI) in 1993, the sector has grown rapidly due to the entry of global competitors. Despite the growth of Indian automobile industry, it has been noticed that, India is not yet very competitive in the international arena or its firms are not export-oriented as the domestic market offers sufficient scope for expansion and provides reasonable rate of return. Though India's production shares in the global total production are reasonably good, this inference shows that some structural changes in technologies employed and quality are required to bring the Indian automobile industry up to the world standards.

The presence of both leading domestic and multinational companies has led to an increase in the volume of production with the improvement of technology. The Indian automobile industry has been experiencing stable rise in their production and as a result competitiveness increases with rise in buying power and investment friendly government norms. Competitiveness can be defined as 'the ability to compete in markets for goods or services'. A firm is competitive if it can produce products and services of superior quality and at lower costs than its domestic and international competitors. Competitiveness is synonymous with a firm's long-run performance and its ability to compensate its employees and provide superior returns to its owners (Buckley et al. 1988). The medium scale and small scale firms are facing problem for sustainability in making positive performance due to the stiff competition.

The innovation plays a crucial role in the competition. The relationship between competition and innovation can be positive or negative, depending on specific competition perception and specific innovation activity. Firms' perceptions about their competitive environment are important for innovation and are better measures of firm-specific competition. There are mainly two types of innovations viz; process and product innovation. Process innovation is often bundled with product innovation, and that in terms of innovation input acquisition of technology is often bundled with R&D, suggesting that the economic value of process innovation is likely embodied in product innovation. Large firms are more likely than small firms to undertake innovation input and to engage in process innovation though small firms are as efficient as large firms in converting innovation input into innovation output (Tang 2006).

The Automotive Mission Plan 2006-2016 was released in 2007, which visualizes India emerging as a destination of choice in the world for design and manufacture of automobiles and auto components with output reaching a level of \$ 145 billion accounting for more than 10% of the GDP and providing additional employment to 25 million people by 2016 (Burange and Yamini 2008).

It has been found that Indian companies are reluctant to increase research and development (<2%) efforts, even though profit margins are higher (2-10%) (Narayanan and Vashisht 2008). Hence concerted efforts are required from both industry and the government in India, for spending more on research and development (R&D) to achieve the target mentioned in the Automotive Mission Plan. The present paper also seeks to examine the impact of industrial performance on research and development.

Review of Literature

There is a vast literature on the relationship between various elements of Industrial Organization viz; competitiveness, market structure and R & D inputs and market performance. Some of the review is mentioned in the following:

Martin (1993) develops a model in which owners offer incentives to privately informed managers to prod them to invest in cost reducing R&D. Investment in cost reducing R&D is a decreasing function of the number of firms in the industry; the greater the number of competitors, the higher is the equilibrium level of the marginal cost. Private information, alone, does not change the result that competition lowers incentives for cost-reducing R&D with non-exclusive intellectual property rights.

Scott (1984) has tested the relationship between market concentration and research and development, which often may exhibit the inverted-U-relationship, found between market concentrations and spending on advertising. He examined the average relationship between market-concentration and spending on R & D after controlling for differences across industries in demand conditions and technological opportunity. When these additional factors are considered, the inverted-U relationship between concentration and spending on R & D disappears. These results highlight the importance of demand conditions and technological opportunity as determinants of technological advance.

Asian Development Bank (2003) has made a discussion on the concept of competitiveness of firms. It states that competitiveness can be defined as a firm's ability to survive under competition and being competitive implies succeeding in an environment where firms try to stay ahead of each other by reducing prices, by increasing the quality of their current products and services, and by creating new ones. A firm's competitiveness can thus be examined as a function of factors such as (i) its own resources (ii) its market power; (iii) its behaviour toward rivals and other economic agents; (iv) its capability to adapt to changing circumstances; (v) its capability to create new markets; and (vi) the institutional environment, largely provided by the government, including physical infrastructure and the quality of government policies.

Matraves (1999) has done a study on market structure, R & D and advertising in the pharmaceutical industry. This model considered one simple but general relationship between market structure and market size, focusing on the competitive roles of endogenous sunk costs in the form of advertising and research and development.

Das (2004) also showed the causal relationship between market structure and R&D by taking selected Indian industries for the time period 1978 - 1998. R&D is affected by market structure and market performance. There is a significant impact of liberalization on R&D. There exhibits also inverted U relationship between market concentration and R&D intensity. Market concentration is also affected by R&D and also affected due to liberalization. Concentration ratios are declining in Indian industries.

Hall (2007) has tried to measure the returns to R&D. In order to find out the measurement of returns he has used two different methodologies- one based on the production function and another that uses firm market value to infer returns. He tried to infer the private R&D depreciation rate from the measured returns to R&D by assuring that the net return is determined by the financial markets and therefore roughly equal across comparable firm in equilibrium.

Narayanan and Vashisht (2008) have examined various aspects pertaining to competitiveness, namely, price and quality, technology, quality and standards, cost composition and contracts by using a quantitative analysis of 45 firms all over India, of which 31 are auto-component firms and rests, are Original Equipment Manufacturers (OEMs). They found that R&D expenditure as

a share of turnover is low in the Indian auto-component sector ranging between 0 and 1.5 per cent while it is 0.5-3 per cent for the automobile sector. In fact, most of the smaller auto-component firms and a few of the bigger ones do not have an R&D facility.

Pingle (2000) reviews the policy framework of India's automobile industry and its impact on its growth. While the ties between bureaucrats and the managers of state-owned enterprises played a positive role especially since the late 1980s, ties between politicians and industrialists and between politicians and labour leaders have impeded the growth. These policies resulted in the establishment of new light commercial vehicles (LCV) manufacturers and passenger car manufacturers. All these developments led to structural changes in the Indian automobile industry.

Piplai (2001) examines the effects of liberalization on the Indian vehicle industry, in terms of production, marketing, export, technology tie-up, product up gradation and profitability. He concludes that vehicle industry has not gained much from the reforms, other than being thrust upon a high degree of unsustainable competition.

Narayanan (1998) analyses the effects of deregulation policy on technology acquisition and competitiveness in the Indian automobile industry during the 1980s and finds that competitiveness has depended on the ability to build technological advantages, even in an era of capacity-licensing. Narayanan (2006) also finds that vertical integration plays a positive role in a regulated regime, while it is not conducive for export competitiveness in a liberal regime.

Sharma (2006) analyses the performance of the Indian auto industry with respect to the productivity growth for the period from 1990-91 to 2003-04. Among the partial factor productivity indices only labour productivity has seen a significant improvement, while the productivity of other three inputs (capital, energy and materials) haven't shown any significant improvement. Labour productivity has increased mainly due to the increase in the capital intensity, which has grown at a rate of 0.14 percent per annum from 1990-91 to 2003-04.

Nag et al. (2007) has made a study on the growth pattern, trade pattern, changes in ownership pattern, role of government of selected Asian countries (viz. China, India, Indonesia and Thailand) in the automobile sector. This study has also made to understand the dynamics of Indian automobile sector in comparison with the same sector in the other selected Asian countries by using structure-conduct-performance (SCP) paradigm analysis. The paper brings out the idea that specialization is becoming segment specific in the automobile sector as each of these countries is finding its position. Finally, the success of the automobile sector in each of these sectors depend on Government's effective support on the development of the domestic system suppliers with large foreign players in this sector and government need to create proper investment environment, incentives for R&D and strong patent regime.

Objectives

The objectives of the present study are following:

- To examine whether the market in the Indian automobile industry is highly competitive or not.
- To examine the growth of R&D intensity according to firm-size in the Indian automobile industry.
- To examine the impact of industrial performance and market structure on R&D expenditure in the Indian automobile industry.

Hypotheses

In order to address the above mentioned objectives, the following hypotheses can be framed:

- Indian automobile industry is highly competitive.
- The growth of R&D intensity varies in Indian automobile industry according to firm-size.
- Current period R&D expenditure depends on the R&D of the previous periods.
- Current period R&D is affected not only by the industry’s performance but also by the other market structural factors like concentration ratio, gross fixed asset, cost margin of the last periods.

Methodology

The present study is based mainly on secondary data. All the data for the analysis have been collected from CMIE data sources. The period covered under the study is from 1991 to 2008. The study would be at industry level as well as firm level. However, the period varies according to the nature of subject dealt with and availability of data. For the analysis the firm level data is divided into three categories on the basis of firm’s annual sales and profit viz; small scale, medium scale, and large scale. The companies having two digit annual sales and almost negative profit for all time periods have been considered as small scale firm. The companies having three digit annual sales and mixed profit have been considered as medium size firm and companies having four digit annual sales and almost positive profit have been considered as large scale firm. So for the present study there are 25 firms in the industry of which 11 are large scale, 7 are medium scale and 7 are small scale firms. For proposed study, advanced econometric techniques viz; Panel regression, Vector Auto regression have been used.

The study focuses on the market structure to examine the competitiveness. Market concentration ratio has been considered as a proxy of market structure. In most of the empirical literature market concentration of the four firms have been considered. Market concentration ratio of four firms is defined by

$$CR_4 = \frac{\text{Four largest firm's sales}}{\text{Total sales of the industry}}$$

The present study has also focused the Schumpeterian inverted - U hypothesis between R&D intensity (R&D / Sales) and market concentration ratio in the automobile industry to show the nature of R&D intensity according to market concentration.

For showing the inverted U relationship, the following equation can be framed which will be quadratic in nature.

$$\frac{R\&D_{it}}{S_{it}} = \alpha + \beta_1 CR_{4,t} + \beta_2 CR_{4,t}^2 + U_{it} \dots\dots\dots(1)$$

where; R&D_{it} = Research and development of the i-th firm at the t-th period

S_{it} = Sales of the i-th firm at the t-th period

α, β₁, β₂ = Constants; β₁ > 0 and β₂ < 0 (for showing the inverted U hypothesis)

CR_{4t} = Four firm concentration ratio for t-th period

U_{it} = Random error that follows the normal distribution with zero mean and constant variances

This relationship has been examined for the small scale, medium scale, large scale and for the industry as a whole. The relationship will be inverted if and only if the sign of β_1 is positive and sign of β_2 is negative. The optimum value of market concentration ratio for which R&D intensity will be maximum can be derived from the first order condition (first order differentiation equals to zero) of maximization. For maximization, second order differentiation will be negative.

For dealing time series data, it is mandatory to check whether each variable has an impact on itself or not. R&D expenditure depends on itself and up to which lag, it is examined by using Vector Auto Regression (VAR).

$$R\&D_t = \gamma + \sum_{i=1}^k \delta_i R\&D_{t-1} + u_{it} \quad \dots\dots\dots (2)$$

Where; k is the lag length.

It has been found that R&D expenditure of the firms and as well as of the Indian automobile industry depends up to one period lag only. For the other variables like, profit margin (PM), concentration ratio (CR₄), cost margin (CM), gross fixed asset (GFA) the same exercise have been done by using VAR in similar way and it has been found that these variables are also stationary up to one period lag only.

For checking the impact of performance and market structural variables on R&D, Panel Regression has been used. The model specification can be framed by taking several explanatory variables based on the VAR analysis in the following:

$$\frac{R\&D_{it}}{S_{it}} = \alpha + \beta_1 CR_{4,t-1} + \beta_2 PM_{i,t-1} + \beta_3 CM_{i,t-1} + \beta_4 GFAS_{i,t-1} + \beta_5 RDS_{i,t-1} + U_{it} \quad \dots\dots\dots(3)$$

Where; $\alpha, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the parameters and U_{it} is the random error that follows normal distribution. All the variables are normalized by dividing sales to avoid money illusion. The justifications of the above explanatory variables are given in the following:

Concentration ratio (CR₄) is used to assess how the concentration ratio affects R&D investment of the firms in the industry. But, the decision on R&D spending depends on firm's size. Profit Margin (PM) of the last period is considered as an explanatory variable because decision of R&D spending of the firm depends on the last period's performance. One of the basic motives of R&D spending is to minimize the future cost of production of the firms. If cost of production increases then the firm are forced to reduce it in future through current R&D expenditure. So, decision of more R&D spending depends on the cost margin of the firms. Gross Fixed Asset – Sales ratio (GFAS) is used as an explanatory variable because firm's R&D expenditure depends on the firm's last period's financial strength. Gross Fixed Asset is used as a proxy for the financial strength. R&D is a dynamic process, and from VAR analysis, it is observed that current R&D is reflected by last year's R&D spending.

Findings

The growth rate of market concentration (-.007) is negatively significant¹ in Indian automobile industry. The negative growth of market concentration (CR₄) implies that total sales of the indus-

¹ Growth rate of four firm market concentration ratio have been estimated from the CMIE data and it is significant at 7% level of significance

try increases. Though growth rate of leading firms' sales increases but CR_4 will be negative only when total sales increases either due to entry of more firms or more sales of other existing firms.

It has been found that there is a significant inverted-U relationship between R&D intensity and market concentration in Indian automobile industry as a whole (Table 1). It has also been found that inverted-U relationship is established for all size of firms in the industry which supports Schumpeterian U hypothesis. It has been calculated from the result (Table 1) that R&D intensity is maximum when concentration ratio is 0.59 for all firm's size and for the whole industry also and if the concentration ratio is more than 0.59 then R&D intensity falls. As per the existing literature if the concentration ratio ranges between 0.57 - 0.60 then the industry exhibits the oligopolistic structure and the degree of competitiveness is very high. This results shows that there is a high competitiveness in the Indian automobile industry.

Table 2 shows the result of panel regression (equation 3) for different firm size. For large scale firms, it is also observed that CR_4 of the last period and R&D intensity is inversely related and significant at 1% level of significance. The large firms dominated the market and they are now at optimal market concentration at which research and development intensity is maximum. Beyond this level of market concentration the firms have to invest less on R&D. This is theoretically justified that the firms are going to the monopoly situation. The relationship between cost margin of the last period and R&D intensity are positively related and significant at 5% level of significance. If cost per unit of sales of the last period increases then R&D intensity increases because last period's cost margin forces to reduce future cost of production via increasing R&D intensity. The large scale firms like Mahindra & Mahindra, Maruti Suzuki, Tata Motor, Hero Honda, TVS Motor, Eicher Motor have reduced their cost due to research and development (Table 3). The growth rate of cost margin is negative that implies cost of production decreases. For other firms also growth rate of cost margin is very small and it is lesser than growth rate of R&D intensity. There is a positive and significant relationship between profit margin of the last period and R&D intensity as last period's profit encourages R&D spending in the large scale firms (Table 2). In, Table 3, it is observed that for all firms of the large scale, growth rate of profit and R&D is positive and highly significant except Force Motor and Hindustan Motors. It is found that current R&D spending increases 72% over last period's R&D because R&D is a continuous process, once large size firm starts they can't stop it.

In the medium scale firms there is a positive relation between CR_4 of the last period and R&D intensity. If the market size in the last period increases then medium scale firms will increase their R&D spending to capture the market for get some future profit. In the medium scale firm also last period's cost margin encourages R&D spending in order to reduce future cost of production. R&D expenditure is not so much high in case of medium size firms. The growth rate of cost margin of only Swaraj Mazda and Scooters India is negative though these two firms have maintained their high growth rate of R&D intensity that implies the cost of production reduces for these firms (Table 4). There is a negative relationship between gross fixed asset (GFA) of the last period and R&D expenditure. The growth rate of GFA of the medium scale firms is positive, though their financial strength is not so good compare to large scale firms. That's why the medium size firms are not going to increase more R&D spending. Too many spending on R&D it seems to be a liability of medium scale firms. From Table 2, it is clear that medium size firms are not emphasizing on R&D spending and it is found that current R&D spending increases only 1% over last period's R&D. In medium scale firms, the growth rate of R&D expenditure of the firms is very poor except Kinatic Motors, Scooters India and Swaraj Mazda.

The relationship between R&D and CR₄ is positive for small scale firms because the size of the market captured by small scale firms is very low. To capture the size of market the small scale firms have to spend more on R&D as per Schumpeterian hypothesis. Cost margin is not a significant determining factor of R&D spending for small scale firms. In the small scale firms the relationship between last period's profit margin R&D intensity is negative and it is significant at 1% level of significance. For small scale firms, it is observed that mostly there is a negative growth of sales and profit (Table 5). So, if profit margin of the last period decreases the firms will go for more spending on R&D. From the micro level data it is observed that absolute value of R&D spending for small scale firms are very poor but when loss increases the firms invested some expenditure on R&D. Loss of firms are either due to decrease in sales or due to high cost of production. It is observed that cost per unit of sales increases. To improve the quality of their product and simultaneously to reduce long-run cost of production firms are emphasizing on R&D as per financial capacity. From the regression result (Table 2) it is observed that there is a positive relationship between R&D and gross fixed asset of the last period that implies if financial capacity or firm's asset increases then they will spend more on R&D. Current period R&D increases 76% over the last period's spending on R&D. This is statistically significant at 1% level of significance.

Conclusion

Indian automobile industry is highly competitive, they are oligopolistic in nature. As per Schumpeterian hypothesis, in the industry R&D intensity is maximum for the CR₄ value 0.59. Mainly the large scale firms are spending more on R&D in the industry compared to medium and small scale firms. Mahindra & Mahindra, Maruti Suzuki, Tata Motors, TVS Motors, Eicher Motors, Ashok Leyland, Hero Honda, Hindustan Aeronautics Ltd are the leading firms in the industry and they have maintained high R&D growth rate and also maintained high performance. In the medium scale firms only Kinetic Motors, Swaraj Mazda and Scooters India have maintained high growth rate of R&D expenditure whereas for other firms the R&D expenditure is almost negative. It is concluded that Concentration ratio, Gross Fixed Asset, Cost Margin and Profit Margin of the last period are the significant determinant of R&D. R&D is affected by market structure viz; concentration ratio and gross fixed asset of the last period. R&D intensity is positively related with the last period's cost margin. R&D intensity is affected by market performance and the relationship depends on the firms' size.

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Appendices

Table 1: Inverted U relationship between R&D intensity and market concentration ratio

| Firm's size | Constant | CR ₄ | CR ₄ ² | Model ^a |
|--------------|--------------------|------------------|------------------------------|---------------------------------|
| Total | -1.72* (-13.98) | 6.13* (11.66) | -5.13* (-9.78) | Random effect model |
| Large scale | | 1.51* (6.94) | -1.28* (-6.99) | Fixed effect model (LSDV model) |
| Medium scale | -5.13 (-0.032) | 6.44* (2.61) | -5.47* (-2.59) | Random effect model |
| Small scale | -1.79* (-4.12) | 6.37* (3.52) | -5.37* (-2.97) | Fixed effect model (LSWDV) |

Source: Calculated from the CMIE data sources for the period 1990 – 2008.

Note: Parentheses shows the t-values for the coefficient

* denotes the level of significance at 1% or less than 1% level of significance

a Fixed effect and Random effect model depends on the value of Hausman test statistics and Least Square Dummy variable (LSDV) and Least Square without Dummy variable (LSWDV) model depends on the value of LM test statistic.

Table 2: Relationship between R&D intensity and CR, CM, PM, GFAS & RDS according to different size of firms

| Parameters | Large size firms | Medium size firms | Small size firms |
|------------|------------------|---------------------|-------------------|
| Constant | | -0.58* (-182.95) | -0.11* (-2.37) |

| | | | |
|-----------------------|--------------------|---------------------|---------------------|
| CR _{4,t-1} | -0.035* (-3.37) | 0.99* (1013.35) | 0.25* (4.39) |
| CM _{1,t-1} | 0.01** (2.19) | 0.009* (5.07) | -0.002 (-1.01) |
| PM _{1,t-1} | 0.062* (2.99) | -0.0003 (-0.37) | -0.004* (-3.12) |
| GFAS _{1,t-1} | -0.005 (-0.93) | -0.02* (-9.71) | 0.0006** (2.01) |
| RDS _{1,t-1} | 0.72* (16.04) | 0.01* (5.89) | 0.76* (13.53) |
| MODEL | Fixed effect model | Random effect model | Random effect model |

Source: Calculated from the CMIE data sources for the period 1991 – 2008.

Note: Parentheses shows the t-values for the coefficient

*denotes the level of significance at 1% or less than 1% level of significance

**denotes the level of significance at 5% or less than 5% level of significance

Table 3: Growth rate of Sales, Profit, R&D and Cost margin of the large scale firms

| Company name | Sales | Profit | R&D | GFA | CM |
|----------------------------|--------|----------|--------|-------|-----------|
| Ashok Leyland Ltd. | 0.13* | 0.19* | 0.38* | 0.11* | 0.001 |
| Eicher Motors Ltd. | 0.20* | 0.29* | 0.51* | 0.22* | -0.001 |
| Force Motors Ltd. | 0.07* | -0.19*** | 0.18** | 0.11* | 0.02** |
| Hero Cycles Ltd. | 0.09* | 0.18* | 0.18* | 0.14* | -0.006* |
| Hero Honda Motors Ltd. | 0.27* | 0.32* | 0.36* | 0.21* | -0.02* |
| Hindustan Aeronautics Ltd. | 0.13* | 0.22* | 0.73* | 0.12* | 0.03* |
| Hindustan Motors Ltd. | -0.006 | -0.12 | 0.04 | 0.009 | 0.01* |
| Mahindra & Mahindra Ltd. | 0.13* | 0.19* | 0.41* | 0.14* | 0.002 |
| Maruti Suzuki India Ltd. | 0.13* | 0.06 | 0.39* | 0.16* | 0.01* |
| T V S Motor Co. Ltd. | 0.21* | 0.16* | 0.30* | 0.22* | -0.004*** |
| Tata Motors Ltd. | 0.14* | 0.05 | 0.48* | 0.13* | -0.001 |

Source: Calculated from the CMIE data sources for the period 1991 – 2008.

Note: *denotes the level of significance at 1% or less than 1% level of significance

**denotes the level of significance at 5% or less than 5% level of significance

*** denotes the level of significance at 10% or less than 10% level of significance

Table 4: Growth rate of Sales, Profit, R&D and Cost margin of the medium scale firms

| Company name | Sales | Profit | R&D | GFA | CM |
|-----------------------------|-------|---------|---------|-------|-------|
| Atlas Cycles (Haryana) Ltd. | 0.07* | 0.03 | 0.03 | 0.08* | 0.002 |
| Cochin Shipyard Ltd. | 0.13* | 0.23** | 0.05*** | 0.04* | 0.003 |
| Hindustan Shipyard Ltd. | 0.04* | 0.17 | -0.001 | 0.01* | 0.03* |
| Kinetic Engineering Ltd. | 0.03 | -0.25** | 0.09 | 0.07* | 0.03* |

| | | | | | |
|------------------------|--------|----------|-------|-------|---------|
| Kinetic Motor Co. Ltd. | 0.03** | -0.19*** | 0.30* | 0.11* | 0.02* |
| Scooters India Ltd. | 0.12* | 0.18 | 0.12* | 0.05* | -0.03* |
| Swaraj Mazda Ltd. | 0.15* | 0.32* | 0.27* | 0.09* | -0.07** |

Source: Calculated from the CMIE data sources for the period 1991 – 2008.

Note: *denotes the level of significance at 1% or less than 1% level of significance

**denotes the level of significance at 5% or less than 5% level of significance

***denotes the level of significance at 10% or less than 10% level of significance

Table 5: Growth rate of Sales, Profit, R&D and Cost margin of the small scale firms

| Company name | Sales | Profit | R&D | GFA | CM |
|--------------------------------------|----------|----------|---------|--------|-------|
| Burn Standard Co. Ltd. | -0.02*** | -0.17 | .008 | 0.05* | 0.02* |
| L M L Ltd. | 0.01 | -0.21*** | 0.25* | 0.11* | 0.03* |
| Maharashtra Scooters Ltd. | -0.20* | -0.04 | 0.05*** | 0.08* | 0.07* |
| Majestic Auto Ltd. | -.004 | -0.06 | 0.07 | 0.06* | .003 |
| San Engineering & Locomotive Co. Ltd | 0.05** | -0.04 | 0.04*** | 0.09* | -.001 |
| Stone India Ltd. | 0.05* | -0.03 | 0.05 | 0.10* | .004 |
| V C C L Ltd. | -0.30* | 0.12 | 0.05*** | -.004* | -0.02 |

Source: Calculated from the CMIE data sources for the period 1991 – 2008.

Note: *denotes the level of significance at 1% or less than 1% level of significance

and *denotes the level of significance at 5% or less than 5% level of significance

***denotes the level of significance at 10% or less than 10% level of significance

Extent of Knowledge Penetration in Textile Industry of Punjab, India

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Abstract: *Knowledge nowadays has become an important driver of business growth. People factor in managing knowledge can not be ignored as knowledge is created and utilized by people in the firm. Activities like innovation, research and development and organizational effectiveness are largely dependent upon the availability of knowledge to employees. Knowledge available with the top management does not necessarily mean that it is disseminated throughout the firm and shared across all hierarchies. The extent to which the knowledge is available across different levels (knowledge penetration) in an organization is very important. In this study an attempt has been made to know the extent of knowledge penetration in textile industry of Punjab which is found to be low.*

Keywords: Knowledge, knowledge management, knowledge penetration

Introduction

Business scenario has undergone a massive change in recent years thus changing the outlook of economy across the world. Last decade has seen big growth in knowledge based industries and knowledge work (Kannan, 2001). It has also witnessed the ever-increasing impact of competition and change. Intangibles have become highly important factors in determining organizational effectiveness. The changing business scenario and role of information technology has made it imperative to take a new look at existing business systems, policies and structures.

Knowledge has become the most crucial resource and how an organization manages its knowledge resource, makes all the strategic difference. Nonaka (1991) asserts that in an economy where the only certainty is uncertainty, one core source of lasting competitive advantage is knowledge. He further says, "Successful companies are those that consistently create new knowledge, disseminate it widely throughout the organization and quickly embody it in new technologies and products". Researchers have tried to offer explanations in an effort to define meaning, characteristics and features of their understanding of knowledge and knowledge management.

Blackler (1995) defines knowledge as a complex and multifaceted phenomenon which is situated and complex, implicit and explicit, distributed and individual, physical and mental, developing and static, verbal and encoded. Davenport and Prusak (1998) give almost the similar interpretation, "Knowledge is a fluid mix of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knower. In organizations it often becomes embedded not only in documents and repositories but also in organizational routines, processes, practices and norms". Knowledge has two basic definitions in the context of interest. The first pertains to a well defined body of information. This body of information consists of facts, opinions, ideas, theories, principles, and models (or other frameworks). The second refers to a person's state of being with respect to body of information. These states include ignorance, awareness, familiarity, understanding, facility, and so on. These two kinds of knowledge parallel Michael Polanyi's often-quoted distinction between *explicit knowledge* and *tacit knowledge*. Polanyi (1966) posited that it was the application of tacit knowledge that led to the

premise “we can know more than we can tell”. This idea of tacit element of knowledge has been expressed by many authors (Nonaka and Takeuchi 1995; Carayannis 1999; Hildreth et al.1999; Alavi and Tiwana 2002).

Many researchers opine about Knowledge Management as an effort focused on capturing, creating and disseminating knowledge. Stewart (1997) says that knowledge Management is the process of creation, capturing and organizing, assessing and using knowledge to create customer value. Malhotra (2002) contends that knowledge management is a framework within which the organization views all its processes as knowledge processes where all business processes involve creation, dissemination, renewal and application of knowledge towards organizational sustenance and survival. Blair (2001) gives a similar opinion about knowledge management being a discipline of identifying, capturing, retrieving, sharing and evaluating an enterprise’s information assets. It can be seen from these definitions that dissemination and sharing of knowledge takes place among people working in the organization. Therefore human side of the knowledge management is very important. This is also emphasized by Forrester Research (1997) that explains that knowledge management is codifying the knowledge your company creates and disseminating it to the people who need it and whenever they need it. American Productivity and Quality Council (2002) highlights the same as, “Knowledge management is the systematic process of identifying, capturing and transmitting information and knowledge people can use to create, compete and improve”. As there is no use of knowledge that is neither shared nor made available to people for use, the extent to which knowledge travels through different hierarchies in a firm is very important.

A fuller concept of organizational learning is dependent on ensuring that staff are well acquainted with a holistic overview of their enterprise and that staff access to a wide variety of information sources is unimpeded (Sligo,1996). Further many times lower level staff is ill informed on issues of holistic nature and their access to formal sources of information shows limitations involved. If knowledge is power then staff empowerment requires fuller access to knowledge. Szulanski (2000) suggests that ‘mere possession of potentially valuable knowledge somewhere within an organization does not necessarily mean that other parts of the organization benefit from this knowledge’. Knowledge can be held by individuals in an organization or jointly possessed by groups within the organization (Leiponen 2006). Ownership of knowledge is important because it determines who can access and use knowledge in organization. If some competence is embodied in an individual, the organization can not use it without the cooperation of the individual. In contrast if knowledge is held collectively i. e. if it is either formally owned by the firm as an intellectual property or shared or distributed in the sense that it is valuable only in a specific organizational context- the firm is less vulnerable to departure of key people.

Based upon these arguments it can be stated that degree of knowledge penetration should be high and individual as well as the organization should be able to transfer knowledge to each other and use it further.

Textile is one of the most flourishing industries in Punjab. Some of the largest textile groups like Vardhman Textiles, Trident, JCT, Oswal, Aarti International, OCM and Sheetal Exports are located here. Most of these units cater to domestic as well as international market. Due to its global presence and recent economic changes, the focus towards knowledge management has become more important in this industry. As most of the units in textile industry are old, the managerial practices are conservative to certain extent. Knowledge is still the domain of top or middle level employees. This study makes an attempt to find out the extent of knowledge penetration in textile industry in Punjab.

Methodology and Findings

As the specific purpose of this paper is to study the extent of knowledge penetration in textile industry of Punjab, total 24 textile units have been taken as sample. The units have been classified in three categories namely G1 (with turnover upto 200 crores), G2 (with turnover from 201 to 500 crores) and G3 (with turnover of more than 500 crores). Data has been collected from people concerned with top management. The sample size is 240. Well structured questionnaire has been used to collect the data which has been designed after extensive study of literature and discussions with experts. All the statements have been measured using Likert’s five point scale with options ranging from (5) ‘strongly agree’, (4) ‘agree’, (3) ‘neither agree nor disagree’, (2) ‘disagree’ and (1) ‘strongly disagree’. All comparisons have been made with one way analysis of variance (one way ANOVA).

The empirical findings of the study are as under.

Most important knowledge centers in the organizations

Knowledge centers in the organizations are the hub of knowledge from where most of the relevant knowledge regarding business is captured, created and stored and can be retrieved whenever required. Table 1 presents one way ANOVA calculations of scores of knowledge centers in the organization recorded by three groups i.e. G1, G2 and G3.

Table 1: Most important knowledge centers in different sized categories of textile industry

| Knowledge centers | G1 | | G2 | | G3 | | Overall | | F-ratio |
|--------------------|-------|------|-------|------|-------|------|---------|------|---------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| Top mgt | 4.69 | 0.46 | 4.57 | 0.50 | 4.75 | 0.44 | 4.67 | 0.47 | 0.81 |
| Mid level managers | 3.46 | 1.32 | 4.04 | 1.12 | 3.83 | 1.28 | 3.69 | 1.28 | 1.31 |
| Lower level mgt. | 2.72 | 1.11 | 3.21 | 1.06 | 3.38 | 1.31 | 2.98 | 1.16 | 1.24 |
| Total | 15.89 | 2.68 | 17.24 | 1.88 | 16.03 | 2.58 | 16.31 | 2.52 | 3.04** |

** Significant at 5%

It can be seen that overall mean value is maximum (4.67) for top management followed by mid level managers (mean value 3.69) meaning thereby that it is the top management which is the centre of knowledge and to certain extent it is the mid level management. Overall mean score of 2.98 indicates that lower levels are deprived of such benefits. F ratio clarifies that response is consistent in all categories as there is no significant difference among the mean scores of G1, G2 and G3.

Bartlett and Ghoshal (1993) have written about three levels of management: front-line management, middle management and top management, emphasizing that the relative importance of each level is different. Front-line managers occupy themselves mostly with production (Fayol, 1949), and the creation of new (managerial) knowledge (Bartlett and Ghoshal, 1993) within particular functional areas or organizational units. They are required to possess some organizational knowledge with regard to other people in their departments, their senior managers, and some environmental knowledge in order to develop the appropriate competencies and knowledge (Van Den Bosch and Wijk, 2000). Their managerial knowledge is specifically based on the technical and functional knowledge domains. The managerial knowledge components include know-what, and know-how, in terms of knowing what to do within the particular function and how to do it. The components know-who, know-where, and know-when are limited to knowing who and where particular persons within the functional department or organizational unit reside, and when to approach them for consultation.

In traditional organizations, middle managers are the implementers of resource allocation decisions made at the top, whereas in more contemporary organizational forms, middle managers con-

stitute the pivotal management level, the boosting level (Vila and Syvertsen, 1999) in linking the firm's resources, skills, and knowledge (Bartlett and Ghoshal, 1993; Mintzberg, 1994). On both accounts, it can be argued that the middle manager's individual knowledge is mostly build upon the knowledge domains of company knowledge and environmental knowledge, and less on the functional and technical knowledge domains (Van Den Bosch and Wijk, 2000). Although the middle manager requires a certain amount of specialist technical and functional knowledge to allow for the linking of different resources and knowledge as a generalist (Leonard-Barton, 1995), environmental and company knowledge regarding the knowledge components of why to link what resources and knowledge, when to do as such, and whom to approach and where to find him or her is more important.

Top management's function in organizations is mainly to set forth the vision with regard to the firm's future, and the strategies and strategic logics that must bring the firm to its intended future (Bartlett and Ghoshal, 1993; Mintzberg, 1994). Since the strategies of firms are preferably build on the alignment of organization to environment, the knowledge domains of company and environmental knowledge become the most important. (Van Den Bosch and Wijk, 2000). As strategies move beyond functional compartmentalization and the scopes of organizational units, relative to middle management, the importance of functional and technical knowledge is even more decreased. In order to get acknowledged with the requirements of the most appropriate strategies and strategic logics to be build, top management requires certain amounts of know-who, know-where, and know-when. The most important knowledge component upon which their individual managerial knowledge is built, however, is know-why as knowledge regarding why it is necessitated that a firm moves in the direction it goes, or must go in the future.

In organization knowledge flow takes place between individuals at different levels of hierarchies. The knowledge *flow* and the connections between individuals define an organization's structure and managerial relationships (Galbraith 1982; Lin and Hui 1997; Heckscher and Donnellson 1994). Individual users are social actors who interact with information systems, both influencing and influenced by social dimensions of these interactions (Lamb and Kling 2003; Cummings 2004).

March (1991) conceived a model of organizational learning as a balance between the exploration of new alternatives and the exploitation of existing competencies in an organization. He explained through this model as how knowledge transfer is achieved in an organization through its formal hierarchy and through a knowledge management system. March explains that there are two knowledge levels: individual and organizational and both of these knowledge levels potentially change via organizational learning. For each iteration of the model, every individual has the potential to change any belief to conform to the corresponding knowledge of the organization with a probability of an organization to influence individuals' knowledge (termed as *exploitation*). Exploitation represents an increased probability of reports incorporating the knowledge of their managers, compared to knowledge from their reports. This exploitive knowledge flow starts at the top and moves down in a hierarchy, representative of a *top-down* knowledge management strategy (Heckscher and Donnellson 1994). This approximation of exploitative behavior serves to model individual learning from the organizational code (March 1991). Equally, for each iteration, the organizational has the potential to alter any belief to match the knowledge of the most accurate (e.g. expert) individuals with a probability of an organization to alter its presumed view of reality (termed as *exploration*). Exploration in a hierarchy represents an increased probability of managers incorporating the knowledge of their reports. Consequentially, this explorative knowledge flow starts at the bottom and moves up in a hierarchy, representative of a *bottom-up* knowledge management strategy

(Galbraith 1982; Clippinger 1999). This approximation of explorative behavior serves model organizational learning from experts (March 1991).

The model concludes that improvement in individual and organizational knowledge levels comes either from the organizational code adapting to the knowledge of expert individuals or from individuals conforming to the knowledge of the organizational code.

As this model presumed the organization to have a flat structure, this has been expanded further by Bray and Preitula (2005) who explain the knowledge transfer in a multi hierarchical organization. In a multi-tier hierarchical organization, individuals report to different managers, potentially producing fragmented connections in terms of the flow of information and organizational learning (Mayer and Gavin 2005; Singh 2005). Bray and Preitula (2005) concluded that a strategy of high exploitation gives more credence to the knowledge of the manager over the subordinates (even if subordinates have expert views), and thus places a substantial weight on organizational position over expertise. In contrast, a strategy of high exploration does consider the knowledge of the top experts (over less knowledgeable individuals) reporting to the manager when influencing the manager's beliefs.

Thus, as the number of tiers in a hierarchical organization increase, a bottom-up strategy (i.e., exploration in the hierarchy) will continue to consider the expertise of subordinates reporting to managers, of which there will be an ever-growing number, while a top-down approach will continue to place weight on the knowledge of managers based on their height within the hierarchy. Given these two different approaches, a bottom-up approach should more adopt accurate knowledge dispersed throughout the organization as compared to a top-down approach (Clippinger 1999).

Research regarding complex adaptive systems generally supports the value of a bottom-up strategy in helping systems adapt to turbulent environments (Anderson 1999; Andrus 2005; Bray 2007; Marjchrzak et al. 2007).

Unlike these discussions, the overall mean score for knowledge centers are 4.67, 3.69 and 2.98 for top, middle and lower level of management indicating the decreasing importance of these while moving down the hierarchy.

Most common problems faced during knowledge management implementation

As seen from the table 2 the overall mean scores of all statements related to problems faced during knowledge implementation are low (mean scores are 2.34, 2.31, 2.30 and 2.05 for technological immaturity, information over load, communication and cultural resistance respectively). F value in for each statements indicates that response is nearly consistent for three groups as there is no significant difference among the mean scores of G1, G2 and G3.

Cultural resistance is a big challenge but it has been observed during the study that overall culture of the companies was conducive to knowledge receptivity. E.g. in Rana Polycot for every single error; there is a small training programme for all workers concerned. And officials have never faced any problems from either the trainers or the trainees.

An immature technology is a technology that has not been in use for long enough and is relatively advance and ahead of its time. This technology lacks the ease of use for non-experts. High cost is associated with high expenditure either on technology or knowledge implementation programme. From the table above it is clear that there is no such problem faced by any of the groups. In spite of having a sound research base, the technology being used in most of the units is mature enough and employees well trained to use it. Shital group has been in the process of installing new machinery which too is mature and training programmes are conducted regularly to make people familiar with it.

Table 2: Most common problems faced during Knowledge Management implementation in different sized categories of textile industry

| Problems | G1 | | G2 | | G3 | | Overall | | F-ratio |
|------------------------------------|-------|------|-------|------|-------|------|---------|------|---------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| Cultural resistance | 2.02 | 0.91 | 2.11 | 0.99 | 2.03 | 1.23 | 2.05 | 0.99 | 0.38 |
| Technological immaturity/high cost | 2.17 | 0.92 | 2.69 | 0.86 | 2.28 | 1.09 | 2.34 | 0.95 | 0.54 |
| Communication | 2.08 | 0.50 | 2.57 | 1.06 | 2.50 | 1.13 | 2.30 | 0.85 | 0.61 |
| Information overload | 2.12 | 0.72 | 2.67 | 0.65 | 2.28 | 1.04 | 2.31 | 0.80 | 0.76 |
| Total | 15.78 | 2.05 | 18.07 | 3.06 | 16.40 | 4.20 | 16.55 | 2.98 | 4.83*** |

*** Significant at 1%

Communication goes a long way in the success of any programme. For success of knowledge implementation, the need, the importance and the advantage knowledge management needs to be conveyed to all employees. Lack of understanding of any of the above can lead to major obstacles. It too is not a problem as seen in the table above.

Information overload occurs when there is too much of data available making it difficult for learner to understand, comprehend and imbibe it resulting in ineffective learning. From table above, it can be inferred that only limited information is made available to people to overcome this hurdle.

Knowledge Enrichment Culture

The knowledge enrichment culture of a company is characterized by the way people talk of knowledge, focus on the core area of knowledge creation, use, share and contribute to the knowledge bank/ repository of the enterprise.

Table 3 shows that overall mean value is maximum (4.46) for *active learning from customer*. This shows that knowledge enrichment culture of most of the units revolves around customer knowledge. F ratio further shows that as there is no significant difference among the mean score of G1, G2 and G3, the response is almost same in all three groups. This finding clearly highlights the fact that customer has been given maximum importance by majority of textile units.

Table 3: Knowledge enrichment culture in different sized categories of textile industry

| Factors reflecting knowledge existence culture | G1 | | G2 | | G3 | | Overall | | F-ratio |
|--|-------|------|-------|------|-------|------|---------|------|---------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| Active learning from customer | 4.38 | 0.74 | 4.43 | 0.50 | 4.75 | 0.44 | 4.46 | 0.65 | 0.11 |
| Active learning from supplier | 3.20 | 1.36 | 3.41 | 0.77 | 4.03 | 1.44 | 3.40 | 1.26 | 0.39 |
| Active learning from competitor | 2.96 | 1.23 | 3.54 | 1.21 | 3.60 | 1.48 | 3.24 | 1.30 | 1.44 |
| Willingness to share knowledge | 2.96 | 0.75 | 3.04 | 0.89 | 2.50 | 0.51 | 2.91 | 0.78 | 4.77*** |
| Total | 13.51 | 1.66 | 14.43 | 1.73 | 14.88 | 1.67 | 14.00 | 1.77 | 3.19** |

***Significant at 1%, ** Significant at 5%

Further the table shows that overall mean value is maximum (4.46) for *active learning from customer*. This predicts that knowledge enrichment culture of most of the units revolves around customer knowledge. F ratio further shows that as there is no significant difference among the mean score of G1, G2 and G3, the response is almost same in all three groups. This finding is in congruence with previous finding regarding maximum importance being given to customer of the customer has been given maximum importance by textile units throughout the study.

Research also indicates the importance of customer knowledge and learning from it. Information about buyer needs for products can be acquired with firm- buyer interaction activities (Kohli and Jaworski, 1993), personal interviews and focus groups (Griffin and Hauser 1991; Ram, 1989), and problem solving sessions (Von Hippel, 1986). The obtained information can be interpreted through various analytical procedures such as identifying, structuring and prioritizing needs (Griffin and Hauser 1991,) and examining needs compatibility, complexity and divisibility (Holak and Lehman, 1990). The analyzed information can be integrated into a new product design through blending techniques such as matching product attributes with needs (Li and Calantone, 1998).

In a study of 56 industrial organizations; Sanchez and Elora (Sanchez and Elora, 1991) find that certain activities in a customer knowledge process are the most frequent method of finding out whether or not there is a suitable market for the new product, which correlates with the preponderance of the market as a source of new ideas. The authors further believe that these activities provide the greatest stimulus to innovation in the industrial firms analyzed. Cooper (1992) identifies the customer knowledge process as a critical factor in enhancing new product characteristics.

Active learning from supplier does not seem to be important characteristic of knowledge enrichment culture of units studied. This factor has overall mean score of 3.40 only which is relatively low. Most of the units studied show lack of presence through out the textile value chain. The dependence therefore is high on suppliers which are the major links in the value change. Inter firm knowledge transfer and learning is therefore an important activity.

This finding contradicts many studies which have laid stress on supplier knowledge and its importance to the firm. three dimensions of supplier focused knowledge have been suggested: (a) supplier knowledge sharing (Aoshima, 2002; Belzowski et al., 2003; Dyer and Nobeoka, 2000); (b) supplier knowledge integration to the production process (Millington et al., 1998); and (c) early supplier involvement in product design through the use of knowledge management tools (Dyer and Singh, 1998; Eisenhardt and Tabrizi, 1995; Kaufman et al., 2000; Pisano, 1994; Takeishi, 2001). Millington et al., (1998) in their study from the auto industry reveal evidence of suppliers possessing knowledge of the manufacturer's production process and how its integration into their production provides numerous benefits such as reduced costs in multiple areas, flexibility under varying demand conditions, reduced risk of disrupted deliveries, possibility of sequencing production of pre-assemblies and assemblies, and the potential for experiential learning by producing a focused set of components/products over the long run. Further many studies related to supplier suggest that increasing levels of knowledge sharing in manufacturer-supplier combinations has an important impact on competitive advantage of organizations by providing the capability to more effectively handle environmental change (Dyer and Nobeoka, 2000; Sanchez and Mahoney, 1996).

Higher levels of collaborative relationships focused on knowledge sharing provides firms with capability to reduce costs, bring products to market quicker, stabilize and improve quality, and reduce risk of disruptions, all of which cushion the effect of environmental change. Lakshman and Parente (2008) conclude in their study that there is reasonably strong evidence for the positive impact of supplier-focused knowledge management on business and product performance. Knowledge sharing through face-to-face communication is positively related to both product and financial performance, while technological knowledge sharing has a positive impact on product performance under conditions of high technological dynamism. Supplier involvement in the production process is related to product performance, and use of knowledge management tools is related to financial performance.

Active learning from competitors does not seem to be important characteristic of knowledge enrichment culture of the firms with an overall mean score of 3.24 as seen in table above. This

process involves aspects like: competitor information, acquisition, interpretation and integration (Li, and Calantone, 1998). A competitor knowledge process plays a significant role in diagnostic benchmarking (Day and Wensley 1983, 1988; Dickson 1992). In a given product market, firms can be classified into one of three positions: inferiority, parity or superiority (Li and Calantone, 1998). In the first case a firm is inferior to its competitors on key dimensions of product innovation such as technology, ownership, and resource control and product characteristics. In the second case, a firm gains comparable footing on these dimensions.

In the third case a firm is superior to its competitors. Generation of competitors' knowledge is strategically important because it provides a diagnostic framework in which a firm can benchmark its position (Li and Calantone, 1998). Further a competitor knowledge process creates information asymmetry between firms that are more or less intense in implementing the process. A firm with more competitive information is able to use its knowledge in several ways, including pitching its strengths against a competitors' weakness, internalizing a competitors' strengths by imitation or nullifying a competitors' strengths by product differentiation (Li, and Calantone, 1998). De Geus (1988) has rightly said that the ability to learn faster than your competitors may be the only sustainable competitive advantage.

Employees' willingness to share knowledge defines the content of knowledge sharing culture. This is the best way for knowledge conversion (from explicit to tacit form). The overall mean score of this factor is only 2.91 which show lack of interest of knowledge sharing among employees. Hinds et al (2003), highlight that the biggest problem in the sharing of knowledge is how to motivate community members to share knowledge. Motivation is a key element in sharing knowledge.

The findings of the present study indicate that motivation for knowledge sharing is very low. Lack of reward for sharing knowledge may be one reason behind it. From the value of F ratio it can be inferred that means are significantly different for *willingness to share knowledge* which is relatively lowest in G3 as compared to G1 and G2.

Automatic integration of knowledge into organizations' information system

It is clear from the table 4 that overall mean value is rather low i.e. 2.83 for this variable.

Table 4: Automatic integration of interactions done with customers/suppliers in different sized categories of textile industry

| Statement | G1 | | G2 | | G3 | | Overall | | F-ratio |
|--|------|------|------|------|------|------|---------|------|---------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| Automatic integration of interactions with customers/ suppliers into organization's information system | 2.85 | 1.41 | 3.00 | 0.93 | 2.50 | 0.88 | 2.83 | 1.22 | 3.38** |

** Significant at 5%

Value of F ratio indicates that mean values differ considerably for all three categories. It can be seen that all the interactions done online are not always integrated on company's information system in any of the categories (mean scores are 3, 2.85 and 2.50 for G1, G2 and G3 respectively).

When information or knowledge is fragmented within a company, customer feedback is hard to obtain. As a result, customer service suffers. Information technology-driven relationship management by a firm focuses on obtaining detailed knowledge about a customer's behavior, preferences,

needs, and buying patterns and on using that knowledge to set prices, negotiate terms, tailor promotions, add product features, and otherwise customize its entire relationship with each customer (Shoemaker, 2001).

Offering customers convenience, personalization and excellent service plays a key role in the success and differentiation of many online businesses (Kalakota and Robinson, 2001).

Further inference can be drawn that majority of the units are not techno savvy and not many interactions are done online. Lack of availability of these proves that the penetration of knowledge in this context is low.

Ready availability of marketing and customer information

It is clear from table 5 that the overall mean value (3.28) is low. From F ratio it is seen that there is no significant difference in the means of any of the categories indicating same level of agreement by three groups.

Table 5: Ready availability of marketing and customer information in different sized categories of textile industry

| Statement | G1 | | G2 | | G3 | | Overall | | F-ratio |
|---|------|------|------|------|------|------|---------|------|---------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| Information is readily available throughout the organization. | 3.32 | 1.20 | 3.20 | 0.91 | 3.25 | 0.84 | 3.28 | 1.06 | 0.37 |

As the information related to market/ customers etc is not so readily available, it shows again the low levels of knowledge penetration in this aspect. This is again an outcome of limited use of intranet and lack of automatic integration of interactions with customers etc.

Conclusions

As per the discussions above a comparison regarding extent of penetration of knowledge in G1, G2 and G3 can be drawn as under:

1. Top management is the most important knowledge centre in three groups. Mid level managers are next important knowledge centers in G2 and G3. In G1, mid level managers are not considered as important knowledge centers.
2. Not many problems are faced during knowledge implementation as all problems listed have been given least importance by G1, G2 and G3.
3. Knowledge enrichment culture in all the groups is characterized by active learning from customers. In G2, emphasis is given on both: active learning from customer as well as active learning from competitor. In G3 in addition to learning from customers and competitors, learning from supplier is also considered important. It shows that G3 has better knowledge enrichment culture.
4. As automatic integration of interactions done with customers/ suppliers is given least importance in G1, G2 and G3 showing the absence of such practices in most of the units.
5. Only some of the information relating to marketing and customers is readily available in majority of the units in three groups G1, G2 and G3 indicating low penetration of knowledge.

Regarding the extent of penetration of knowledge in textile industry of Punjab following conclusions can be made

1. Top management is the most important knowledge centre in most of the units. Mid level managers are next important knowledge centers. Lower level managers are not considered important knowledge centers, thus showing low knowledge penetration.
2. Not many problems are faced during knowledge implementation as all problems listed have been given least importance.
3. Knowledge enrichment culture in most of the firms is characterized by active learning from customers. Willingness to share knowledge is given the least importance showing lack of knowledge sharing culture in these firms.
4. As automatic integration of interactions done with customers/ suppliers is almost missing, it is showing near absence of such practices in textile industry.
5. As only some of the information is readily available throughout the organizations in most of the firms, it can be concluded that penetration of knowledge is low.

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