Development of a Credit Scoring Methodology for Assessment of Micro-Finance Borrowers

THESIS

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CERTIFICATE

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ABSTRACT

Since the early national plans, policy planners have emphasized on strengthening the link between improving accesses to financial markets and reducing poverty, a stance that has had influence globally. Newer approaches include the partial deregulating of interest rates, new institutional forms for cooperatives that put the emphasis back on intermediating the savings of their members, and a nationwide attempt, pioneered by non-governmental organizations and now supported by the state, to create links between commercial banks, non-governmental organisations (NGOs), and informal local groups. Surveys show that informal-sector lenders remain a strong presence in rural India, and are still able to derive competitive advantage over the formal and semi-formal sectors.

India has the largest number of poor in the world. Reducing poverty is a key element in our inclusive growth strategy. Numerous Schemes, for poverty alleviation, have not been able to deliver benefits commensurate with the investment made over years. Indebtedness & low employment opportunities are one of the major plausible reasons for poverty. Credit intervention is considered to be an effective tool to eliminate the curse of poverty and directed lending has taken a centre-stage of social lending since nationalisation of banks and creation of regional rural banks. NABARD experimented group lending methodology in order to improve efficacy of credit, which proliferated exponentially.

Delivering small-size of credit to poor in a cost-effective manner is still a challenge. Traditionally, micro-finance institutions (MFIs) have used subjective scoring, the use of defined parameters such as experience in the business, net margin of the business, profitability and disposable income, to analyze business and credit risk. Effectiveness and accuracy of subjective scoring is dependent on experience and skills of credit officer, which limits the growth of lending business.

In contrast, statistical credit scoring forecasts risk based on quantified characteristics recorded in a database of loan applicants. The relationship between risk and client characteristics are expressed as sets of rules in a mathematical formula that forecasts

risk as a probability. Statistical scoring not only tells if the client is risky or not; it also provides an exact measure of the predicted risk. Statistical credit scoring was introduced in high income countries in the mid- 1970s as a means of increasing access to financial services to medium and low income client segments.

For institutions that specialize in individual lending, labor intensive methods are used to assess loan applications and monitor defaulters. For large MFIs that are well run and possess adequate databases, scoring can increase efficiency, outreach and sustainability by improving the time allocation of loan officers.

Scoring can reduce time spent on collecting overdue payments from delinquent borrowers. Scoring can help reduce that time by prioritizing the visits to those borrowers who are more likely to default, leaving loan officers more time to identify and access new customers. In future, scoring could not only be used as a tool to improve risk assessment and delinquency monitoring, it could dramatically improve portfolio management for repeat customers. Credit scoring for new clients can be used as a complementary tool to better understand and quantify the sources and levels of risk. To introduce credit scoring, the institution needs to have a proven lending methodology that is capable of differentiating between lower risk and higher risk clients.

Considering the potential of micro-credit in terms of number of poor in India i.e. approximately 40 crores, micro-credit institutions need a robust and cost-effective delivery mechanism which can lower the cost of borrowing for poor. Provision on loan loss adds to interest and thus raises effective rate of interest. It is thus imperative to know what affects recovery rate in micro-finance.

With the objectives of understanding enablers of recovery in money lending and predictors of creditworthiness of micro-finance borrowers we pursued our research. Approach of our research is empirical. The first part of research was exploratory and second one was descriptive in nature.

Under exploratory research we aimed to get the perspectives of various stakeholders about higher recovery rates in money-lending and also sought their opinion about predictors of default in micro-finance. After conducting the focus group interviews we

went ahead with structured interviews of experts from seven categories comprising of lenders, facilitators, and regulators. The responses were analysed by using descriptive statistics and ANOVA and factor analysis. We found that two dimensions are very important to get higher recovery rate in money lending. One dimension was product and eco-system specific and other was information specific (lower information asymmetry about borrower leads to higher recovery rates). We also analysed experts' opinions about the variables which can influence recovery in micro-finance in terms of their importance and unanimity by using mean rank values and ANOVA. Insight gained at this stage helped us in second part of our research.

In the second part of study, descriptive in nature, we conducted survey of borrowers who were randomly selected from four districts of Uttar Pradesh. The four districts were selected from central and eastern regions of Uttar Pradesh wherein population living below poverty line in each district were 30% or more.

Our sample elements were 1025 borrowers consisting of 728 non-defaulters and 297 defaulters. Selection of borrowers was random. These borrowers were administered a questionnaire. The questions were designed on the basis of experts' survey and literature review. Responses were codified in categorical manner and were binary in nature.

We started with 20 variables which were analysed for their significance with Chi Square test and 3 insignificant variables were dropped from the list for further analysis. We also performed factor analysis to explore if there was any unloaded variable which then could be eliminated for further analysis, but we found that each of the variables was loaded on one or another factor. With remaining 17 variables we performed cluster analysis. With the results of cluster analysis providing very high accuracy of bifurcating defaulters and non-defaulters, we aimed to reduce the number of variables, so as to make the model robust, yet simple for implementation. We dropped one variable at a time and ran cluster analysis 17 times to find out elimination which of variable improves upon previous one. After identifying such variable we dropped the same. The same process was repeated with 16 variables. The exercise of elimination of variables continued in this manner till the variables were reduced to 10. We performed 99 cluster analyses in total in order to get the best set of

variables (in terms of classification efficacy) consisting of 17 variables, 16 variables and so on.

Subsequent to cluster analysis, logistic regression was performed with the set of variables, identified during cluster analysis. Seven logistic regressions were performed and we found the best result with 11 variables.

After logistic regression we performed multivariate linear regression and developed a credit score for facilitating the process of decision making on credit call. Percentage of good borrowers predicted as bad borrowers is treated as business loss while percentage of bad borrowers predicted as good borrowers is considered as credit loss. An effort was made to propose a credit score pattern which helped minimize these losses.

Lastly we performed multivariate discriminant analysis to find out a critical score. As these variables were giving more than 90% of accuracy in all of these statistical techniques, we concluded that these 11 variables were important in identifying good borrowers amongst all applicants.

The research provides an approach to identify relevant variables to develop credit scoring models in micro-finance which could be utilised by micro-finance lenders to ensure better recovery of micro-finance loans and help lender to reduce operational cost and loan losses. This will, consequently, help in reduction of interest rates being charges to micro-finance borrowers.

Our study suggests a methodology for developing credit scoring model on the basis of borrowers selected from four districts of Uttar Pradesh. As the behavioral attributes change with change in the geography and socio-economic factors, a larger area with larger sample size is required to be used to identify predictor variables.

Large sample size could be tried upon to increase the external validity of the instrument. Similar research can be undertaken in different states to identify variation in attributes affecting recovery of loans under micro-finance from state to state. The longitudinal study with controlled and experimental groups in collaboration with the lenders may have a great potential for future research with practical applicability.

The research was an attempt to extend credit scoring methodology in micro-finance in Indian context. This would provide the future researchers and practitioners with some guidance in field of credit scoring methodology for micro-finance industry.

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LIST OF ABBREVIATIONS

AAY	-	Antyodaya Anna Yojana
ADB	-	Asian Development Bank
BDO	-	Block Development Officers
BPL	-	Below the Poverty Line
CID	-	Center for International Development
CIS	-	Credit Information System
CS	-	Credit Scoring
CSM	-	Credit Scoring Models
CSS	-	Centrally Sponsored Schemes
DPAP	-	Drought Prone Areas Program
DPP	-	Desert Development Program
DWCRA	-	Development of Women and Children in Rural Areas
EAS	-	Employment Assurance Scheme
GoI	-	Government of India
IAY	-	Indira Awas Yojana
ICDS	-	Integrated Child Development services
IRDP	-	Integrated Rural Development Programme
IRDP	-	Integrated Rural Development Projects
IWDP	-	Integrated Wastelands Development Program
JGSY	-	Jawahar Gram Samridhi Yojana
JLG	-	Joint-Liability Groups
KVIC	-	Khadi and Village Industries Commission

LGD	-	Loss Given Default
MDG	-	Millennium Development Goals
MFAL	-	Marginal Farmers and Agriculture Labour
MFI	-	Micro-Finance Institutions
MPPI	-	Microfinance Poverty Penetration Index
MYRADA	-	Mysore Resettlement and Development Agency
NABARD	-	National Bank for Agriculture and Rural Development
NCAER	-	National Council for Applied Economic Research
NFE	-	Non Formal Education
NSAP	-	National Social Assistance Program
NSDP	-	National Slum Development Program
NSSO	-	National Sample Survey Office
PSB	-	Public Sector Banks
PSB	-	Public Sector scheduled commercial Banks
Pvt.SB	-	Private Sector Scheduled Commercial Banks
RD	-	Rural development
REGP	-	Rural Employment Generation Program
ROSCA	-	Rotating Savings and Credit Associations
RPS	-	Retention Pricing Scheme
RRB	-	Regional Rural Banks
SFDA	-	Small farmers Development Agency
SGRY	-	Sampoorna Grameen Rozgar Yojana
SGSY	-	Swarn Jayanti Gram Swarozgar Yojana

SHG	-	Self Help Group
SHPI	-	Self-Help Promoting Institutions
TDPS	-	Targeted Public Distribution System
TRYSEM	-	Training of Rural Youth for Self Employment
UGLB	-	Uasin Gishu District Trade Development Joint Loan B

CHAPTER-1

INTRODUCTION

1.1 Introduction

Micro-finance and its role in alleviating poverty have attracted keen interest, both from policy makers and researchers. Micro-finance is looked upon as a means of credit-based poverty alleviation and financial inclusion globally. However, provision of financial services to low-income households requires solving two central problems: the information problem (how to establish group members' willingness to repay) and the cost problem (how to cost effectively handle small financial transactions of short duration). Formal financial institutions often fail to meet the loan requirements of the poor. Actually, the formal sector faces three problems: screening problem, incentive problem and enforcement problem. Alternatively, micro-credit programmes have been successful in using peer monitoring and social sanctions to overcome these problems. In India, institutional credit agencies (banks) made an entry in rural areas initially to provide an alternative to the rural money lenders who provided credit support, but not without exploiting the rural poor. Micro-finance as a policy in India has passed through different phases. The first of these pivotal events was the bank nationalization in 1969. The second national policy intervention was introduction of Integrated Rural Development Programme (IRDP) in 1978, an instrument designed to be 'a direct instrument for alleviating India's rural poverty.' The last major event of significance was the self-help group (SHG) concept launched by National Bank for Agriculture and Rural Development (NABARD) in 1987. This chapter discusses incidence of poverty, governmental initiatives to tackle the issue of poverty and their efficacy. The status of Micro-finance and its role in poverty alleviation has also been critically examined in this chapter.

1.2 Poverty- Its magnitude in India

At the grassroots level India still continues to be a poor country in spite of years of Government driven financial and other supports to income generating and equity-enhancing distributional programmes. Poverty Ratio or Poverty Rate provides the magnitude of poverty within an economy. The existing all-India rural and urban

official poverty lines were originally defined in terms of per capita total expenditure at 1973-74 market prices and adjusted over time without changing the basket of goods and services. Poverty Ratio is the ratio of population that lives below the official poverty line. The all–India poverty line baskets were derived for rural and urban areas separately, anchored in the per capita calorie norms of 2400 (rural) and 2100 (urban) per day (Tendulkar et al, 2009). In 1993, an expert committee headed by Prof. D.T. Lakdawala, discussed other dimensions of poverty in its report. Due to criticism of official estimates released by the Planning Commission on various counts, another expert committee headed by Prof. Suresh D. Tendulkar, constituted by the Planning Commission in 2009, submitted its report on estimates of poverty since 2004-05(Tendulkar et al, 2009). Accordingly data on poverty since 1973 has been considered. Statistics, provided by the Planning Commission (Planning Commission,2008) showed that even after 26 years of independence (since 1947), India had around 55% of the population as poor (56.4% of rural, 49.0 % of urban and 54.9% on all-India basis in 1973) .

The estimates of poverty vary depending on the agency assessing it and the methodology applied by the said agency. Poverty estimates as per Planning Commission and Tendulkar Committee reports are mentioned in Table 1.1.

The number of people living below poverty line in the year 2004-2005 stood at 4072 lakh as per the Tendulkar Committee Report. Using the methodology suggested by Tendulkar Committee Report, it is estimated that the Head Count Ratio had declined by 7.3% percentage points from 37.2% to 29.8% in 2009-10 on all-India basis with rural poverty declining by 8.0 percentage points from 41.8% to 33.8% and urban poverty declining by 4.8 percentage points from 25.7% to 20.9% (Tendulkar et al, 2009). The population living below poverty line has been estimated at 3547 lakh on all-India basis (Planning Commission, 2012). It is very disgraceful for any civil society to have such a high proportion of population living below poverty line. Ghosh (2002) explained the reason for the chasm between rural and urban poverty as slower growth in income in rural India as compared to urban India. He suggested that if one wants to make a dent in rural poverty, rural income must be sizably increased by allocating more and more of the investible resources to the rural sector (Ghosh, 2002).

Table 1.1- Head Count and Percentage of People 'Below Poverty Line' in India (1973-2009)

Agency/ Report		Year of survey					
			1973[*1]	1983[*2]	1993[*3]	2004[*4]	2009[*4]
Planning Commission 11th Five Year Plan	Head Count in lakh	Rural	2612.9 (56.4)	2519.6 (45.7)	2440.3 (37.3)	2209.2 (28.3)	
		Urban	600.5 (49.0)	709.4 (40.8)	763.4 (32.3)	808.0 (25.7)	
		Combined	3213.4 (54.9)	3229.0 (44.5)	3203.7 (36.0)	3017.2 (27.5)	
Tendulkar Committee Report (2009) (Planning Commission, 2009)	Head Count in lakh	Rural			3277.7 (50.1)	3258 (41.8)	2782 (33.8)
		Urban			751.6 (31.8)	814 (25.7)	765 (20.9)
		Combined			4029.3 (45.3)	4072 (37.2)	3547 (29.8)

Source: Planning Commission (2009) and Tendulkar et al. (2009).
Figures in bracket represent percentage of people below poverty line.

At the Millennium Summit in September 2000, the largest gathering of world leaders in history adopted the United Nations Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty. The leaders agreed on setting out a series of targets with a deadline of 2015. These have come to be known as the Millennium Development Goals (MDGs). Out of eight goals set under MDGs, Goal-1 relates to poverty and hunger eradication. The proportion of people below the national poverty line, also referred as poverty headcount ratio (PHR), estimated for

1990 was 37.2%. India is required to reduce it by half to 18.6% by 2015. By the year 2004-05, the PHR came down to 27.5%. Going by the rate of change in the last 15 years, the projected PHR in the year 2015 is expected to be just short of the year's MDG-target mark (18.6%) by about 3.5 percentage points (CSO, 2010). On the basis of their performance in achieving MDGs targets, countries are classified as early achiever, on track, slow progress, and regressing/no progress, as measured by target indicators estimated from data available since 1990. India is, unfortunately, classified as a country with slow progress (ADB, 2011b).

Comfortable access to financial services is especially empowering for the poor as it not only enables them to build savings and avail credit but also helps them to insure against income shocks and adversities like illness or loss of employment. This access protects the poor from the clutches of the usurious money lenders (Subbarao, 2011).

Dynamics of Poverty

Poverty can be and generally is multidimensional where the poor suffer from deprivation in various ways: low level of income, poor infrastructure, lack of access to financial services, high level of illiteracy or low self-esteem etc. Poor can be further classified as chronic poor and transitory poor depending on their period of stay as poor. Here, a household is deemed to be chronically poor if its inter-temporal average is below the poverty line. In case of transitory poor, inter-temporal average for the household is above the poverty line, but it should fall below the poverty line at least once during the period under consideration. Transitory poor are those who fall into poverty as a result of adverse shocks like drought, flood and illness etc. They are vulnerable to poverty. Vulnerability to poverty can be defined as the probability that a household will become poor in the near future. The chronic poor, depending on the severity of poverty and disadvantages – physical or social, can be divided into two categories – destitute and non-destitute.

Most of the studies conducted on poverty focus on poverty at a particular point in time. However, dynamics of poverty is as important as the level of poverty in terms of percentage of population or in absolute numbers. Poverty dynamics is concerned with

the number of poor who escape from poverty as well as the number of poor who descent into poverty. Therefore, the poverty is both created and reduced simultaneously.

A study was conducted covering 13000 households across various states to explore the reasons for escape from and descent into poverty. Their analysis at aggregate level suggests that while some factors are significantly associated, both with escapes and descents, a large number of factors that are significant for escapes are not significant for descent and vice versa. Two policies, one preventive policy – intended to thwart descent into poverty, and another supportive policy - aimed at raising the numbers of escapes from poverty, are required for poverty reduction. One of the factors found to be significant for escape from poverty is the degree of access to non-farm income to villagers. Disaggregate analysis suggests that no single variable is consistently significant across all states. In Rajasthan, illnesses and cost associated with it, heavy expenditure on marriages/funeral feasts and the high interest loans taken from money lenders contributed to a relatively high incidence of falling into poverty (Krishna and Shariff, 2011).

Deepa et al. in their studies conclude that to expand upward mobility, policy makers must focus on the quality of economic opportunities as much as on the quantity. They also highlighted the importance of asset accumulation in escaping poverty (Narayan et al. 2009).

Financial Exclusion

According to the new poverty estimates, 37.2 % of the national population and 41.8 % of the rural population lives below the poverty line and only 27 percent of the rural households have access to formal credit facilities (Rangrajan, 2008 and Tendulkar, 2009). This implies that even after four decades of social banking, poor still bank on informal sources to meet their credit requirements. Though India has a very robust and extensive financial system comprising of commercial and cooperative banks, micro-finance institutions and self-help groups, a large number of the poor still do not have access to banking and other financial services necessary for income generating purposes and other emergency needs. As per National Sample Survey Office data (NSSO, 2006) 45.9 million farmer households, out of a total 89.3 million households

do not access credit and are non-indebted. Out of remaining 43.4 million farmer households, only 24.4 millions access credit from formal sources. This implies that 73% of farm households do not have access to formal credit sources and 32% of farm households are indebted to informal sources (Rangarajan, 2008). In a survey by the NSSO in 2003 revealed that the dependence on money lenders as a percentage had increased during 1991-2003. NSSO data reveals that 45.9 million farmer households constituting 51.4% of total 89.3 million households in the country do not access credit, either from institutional or non-institutional sources. Further a Rural Finance Access Survey 2003, conducted by the World Bank and National Council for Applied Economic Research (NCAER), revealed that 79% of the rural households have no access to credit from formal sources (Basu, 2006).

This shows that neither banks nor micro-finance institutions have been able to effectively replace money lenders in rural India to take care of financial needs of rural India.

1.3 Government's Initiative for Alleviation of Poverty: Strategies and Schemes

Given the stark reality of poverty in India that was inherited from the British Raj, the Government has implemented multi-faceted approach to tackle poverty since the First Plan (1951-56). Growth with social justice has been the basic objective of developmental planning in India since independence. There have been several initiatives to tackle the problem of poverty since the early 1950s (Radhakrishna and Ray, 2005a and 2005b). There are generally two types of special programs: self-employment programs and wage employment programs, to eradicate poverty.

Formulation of specific programs for poverty alleviation began during the first Five-Year Plan period in the 1950s. Historically, Government of India accorded priority to the building of large scale industries with public sector funding with an intention to create wage employment with an underlying rationale of labour absorption by the industry. Poverty-targeting policy initiatives were launched through large public expenditure in the form of subsidies for various inputs like fertilizers, power etc. from time to time in different Five Year Plans. However, by 1980's the policy planners realised that the impact on employment generation and poverty reduction was less

than anticipated due to 'trickle-down effect'. This realization led to the formulation of various schemes of ***directed lending*** to facilitate better accessibility of credit to the underprivileged.

A majority of rural development programmes introduced up to 1979 in India were piecemeal, target driven or sectoral in nature. With a view to overcoming these drawbacks, a comprehensive and holistic self-employment programme, called the Integrated Rural Development Programme (IRDP) was introduced for the first time in the country in 1978 to bring poor people above poverty line.

There has been a large proliferation of poverty alleviation programs under the Centrally Sponsored Schemes (CSS) over the years. The first government initiative for reducing poverty was the Community Development Program (launched in 1952) aimed at integrated development at the local level through cooperation of the people. Experiencing less than expected impact in terms of poverty reduction, a rethinking on poverty alleviation programs led to more active targeting of poverty in rural areas in 1970 through various CSS. Subsequently, keeping in view the chronic and multi-dimensional nature of poverty in India, the Government of India (GoI) has introduced various programs to address poverty through a multi-pronged approach.

The Government of India adopted various strategies for poverty reduction. These strategies evolved over the period since independence, based on the experience and results achieved by the various stake-holders. These strategies are summarized in Table 1.2 in chronological order. It may be observed that the paradigm has shifted from community development to pro-poor growth during last 50 years. The initial emphasis was on community development, which was shifted to infrastructural growth with an aim of trickle-down effect on poverty. In late 70s an integrated approach was adopted but this too was finally shifted to pro-poor growth.

Table 1.2- Poverty Reduction Strategies across Time

Period	Dominant Development Paradigm	Poverty Reduction Strategies
1950s	Growth through industrialization	Community development
1960s	Agriculture intensification, Human capital development	Trickle-down
1970s	Redistribution with growth	Basic needs, Integrated rural development
1980s	Structural adjustments, private	Growth, human resources development, safety nets, NGOs
1990s	Human development, growth	Labour-intensive growth, human resources development of the poor, targeted programmes and safety nets
Post 2000	Pro-poor economic growth	Facilitating opportunity, promoting empowerment, enhancing security

Source: Krishnaiah (2003)

The proportion of people below the poverty line (BPL) declined perceptively in the late 1970s and 1980s from 51% in 1977-78 to 39% in 1987-88, yet 260 million Indians remained below poverty line in 1999-2000. It is not income growth alone that has brought about poverty reduction through the trickle-down process. There have been direct interventions too in a major way for poverty alleviation in India (Radhakrishna and Ray, 2005a, Radhakrishna and Ray, 2005b). Although growth is important for reducing chronic poverty, targeted anti-poverty programmes have a crucial role in reducing risk and vulnerability and increasing incomes of the chronic poor (Dev,2006).

The poverty alleviation programs, thus, became integral part of the government policy. Major poverty targeting programs of the Government of India are listed in Table 1.3. The table illustrates various schemes launched by various ministries/ departments of Government of India.

Table 1.3- Poverty Alleviations Programs Launched by Government of India

Ministry/Department	Schemes
Ministry of Rural Development	1. Swarn Jayanti Gram Swarozgar Yojana (SGSY)
	2. Jawahar Gram Samridhi Yojana (JGSY)
	3. Employment Assurance Scheme (EAS)
	4. Sampoorna Grameen Rozgar Yojana (SGRY)
	5. Indira Awas Yojana (IAY)
	6. National Social Assistance Program (NSAP)
	7. Annapoorna Scheme
	8. Pradhan Mantri Gram Sadak Yojana
	9.Integrated Wastelands Development Program (IWDP)
	10. Drought Prone Areas Program (DPAP)
	11. Desert Development Program (DPP)
Ministry of Urban Development and Poverty Alleviation	1. National Slum Development Program (NSDP)
Department of Public Distribution, Ministry of Consumer Affairs	1.Targeted Public Distribution System (TDPS) and Antyodaya Anna Yojana (AAY)
Department of Education, Ministry of Human Resource Development	1. Non Formal Education (NFE)
	2.National Program for Nutritional Support to Primary Education
	3.Operation Blackboard Scheme
	4.Sarva Shiksha Abhiyan
Department of Fertilizers	1.Retention Pricing Scheme (RPS)
	2.Concession Scheme for de-controlled fertilizers
Ministry of Agro and Rural Industries	1.Prime Minister's Rozgar Yojana
	2.Rural Employment Generation Program (REGP)
	3.Khadi and Village Industries Commission (KVIC)
Ministry of Social Justice and Empowerment	1. Special Central Assistance To Special Component Plan For Scheduled Castes
Department of Women and Child Development. Ministry of Human Resource Development	1. Integrated Child Development services (ICDS) Scheme

Source: Compiled (ADB, 2011a).

In the context of Green Revolution, the Small Farmers Development Agency (SFDA) and the Marginal Farmers and Agriculture Labour (MFAL) programs were launched. The latter was subsequently merged into SFDA. By the end of the Fifth Plan (1974-79), the Planning Commission realized that SFDA had not been successful in

attacking the problems of rural poor. With a view to overcome these drawbacks, the Government launched a drive to reduce poverty by introducing various programmes viz. Integrated Rural Development Programme (IRDP), Development of Women and Children in Rural Areas (DWCRA), Training of Rural Youth for Self Employment (TRYSEM) etc.

The IRDP was expected to cover nearly 15 million poor households who were expected to be lifted above poverty by the end of the Sixth Plan (1980-85) period. It was found that not even 20 per cent of these poor households had crossed the poverty line as a result of IRDP. In a survey conducted by NABARD, an overall leakage was found to be 20% under IRDP program. It was higher at 26% when the purpose of loan was animal husbandry. It was seen that not even 20% (15 million) poor households in rural India might have crossed the poverty line as a result of IRDP. The surveys also examined the effectiveness of IRDP in terms of its objective to help the poorest of the poor and found that when there is large scale failure of any scheme, it is the poorest of the poor, the landless agricultural labourer, who as a group, fared the worst (Rath, 1985).

Historically, efforts to deliver formal credit and financial services to the rural poor in developing countries, even by creating rural banks or directing commercial banks to proliferate credit in the rural areas, have not succeeded.

However, almost all these programs have failed because the relatively wealthy and powerful, rather than the poor, received most of the loans (Adams, Graham, and von Pilschke, 1984; Adams and Vogel, 1986; World Development Report, 1986).

In his paper Virmani (Virmani, 2006) wrote:

"In 1993-94 the Central government expenditure in the budget category "subsidies" was Rs. 12,682 crore of which Rs. 10,099 crore were for food and fertiliser subsidies. The latter would have been enough to bring all the poor to the consumption level of the person/household at the 25% level. During the same year the Central and State governments together spent another Rs. 14,160 crore on the budget categories 'Rural development,' 'Welfare of SC, ST and OBCs' and 'Social Security and Welfare.' This expenditure would have been enough to bring all the poor to the consumption level of the person/household at the 30% level. These two sets of expenditures (Rs. 25850) would have been more than

sufficient to eliminate poverty in 1993 if transferred directly to the poor and disadvantaged (SC, ST, handicapped, old, poor farmers).

In 1999-2000 the total subsidies provided by the Central government were Rs. 25,690 crore of which Rs. 22,680 crore were for food and fertiliser. During the same year the Central and State governments together spent another Rs. 28,080 crore on 'Rural development (RD)', 'Welfare of SC, ST and OBCs' and 'Social Security and Welfare.' Either of these was sufficient to bring all the poor to the consumption level of the person/household at the 30% level. Given that poverty was between 26.1% and 28.6% either of these if transferred directly to the poor and disadvantaged (SC, ST, handicapped, old, poor farmers) would have eliminated poverty. Together these subsidies and poverty alleviation expenditures (Rs. 53,770 crore) would have been sufficient to eliminate poverty in 1999-2000, even if administrative costs and leakages used up half the allocation (and the small fraction of RD expenditures on water supply were excluded)".

Considering the dynamic nature of poverty and that it was contextual, micro-credit was introduced as a mechanism for the poor to strengthen poverty reduction activities (Pischke, 1996). Micro-finance was recognized as the most essential and missing ingredient (Otero and Rhyne, 1994; Khandekar, 1998).

As per the study by Nayak et al. (2002), the performance of various schemes is mentioned in Table 1.4. From the table, it can be observed that the degree of administrative abuse is high in case of employment generation while impact low. Only exception to this is 'National Credit Fund for Women', which is operated under the name of 'Rashtriya Mahila Kosh'. Programs for strengthening infrastructure have experienced medium to high level of political manipulation and administrative abuse. This implies that the schemes which have subsidy amount in-built in the schemes attracted involvement of influential personnel, be it politicians or administrative authorities.

Later, implementing the recommendations of S. R. Hashmi Committee report, IRDP and its five allied programs viz. (1) Training Rural Youth for Self Employment (TRYSEM), (2) Development of women and Children in Rural Areas (DWCRA), (3) Ganga Kalyan Yojna (GKY), (4) Supply of Improved Tool Kits for Assistance to Rural Areas (SITRA) and (5) Million Wells Scheme (MWS) were restructured and redesigned into a single micro-finance driven self-employment programme called

Table 1.4- Performance of Social Safety and Empowerment Schemes

Type & Name of Scheme	Degree of Political Manipulation	Degree of Administrative Abuse	Impact on Productive Assets
Income Transfer Types			
National Old Age Pension Scheme (NAOPS)	Low	Low	N/A*
Rural Housing Scheme (IAY)	High	High	N/A
Infrastructure Strengthening Types			
Accelerated Rural Water Supply Program (ARWSP)	Medium	High	Low
Drought Prone Areas Program (DPAP)	Medium	Medium	Medium**
Employment Creation Types			
Rural Employment Program (SGRY) (formerly Food for Work)	Low	Medium	Low
Employment Assurance Scheme (EAS)	Medium	High	Low
Self-employment Types			
Integrated Rural Development Program (IRDP)	Low	High	Low
National Credit Fund for Women (RMK)	Low	Low	High

Source: Nayak et al. (2002)

Swarnajayanti Gramin Swarozgar Yojna (SGSY) on April 1, 1999 with the following objectives:

- Focused approach to poverty alleviation;
- Capitalization of advantages of group lending and
- Overcoming the problems associated with multiplicity of programs.

The program design of SGSY emphasizes the linkages between banks and SHGs with the subsidy as the enabling element. With the implementation of SGSY micro-finance has become synonymous with SHGs linkages with banking.

1.4 Micro-finance

Asian Development Bank (ADB, 2000) defines Micro-finance as "the provision of a broad range of financial services such as deposits, loans, payment services, money transfers, and insurance to poor and low-income households and their microenterprises. Micro-finance services are provided by three types of sources:

- Formal institutions, such as rural banks and cooperatives;
- Semi-formal institutions, such as non-government organizations and
- Informal sources such as money lenders and shopkeepers.

These financial services include savings, credit, payment facilities, remittances and insurance (Ledgerwood, 1999; Wright, 1999; Christen, and Rosenberg, 2000). Micro-finance, therefore, encompasses micro-credit, micro-savings and micro-insurance (Roth, 2002). Access to financial services generally refers to the availability of quality financial services at reasonable costs (Kumar et al., 2007). Traditional financial systems such as money lenders have always existed for the poor, and the concept of micro-finance as a development intervention is not new (Roth, 2002; Harper, 1998; Hollis, and Sweetman, 1998; Seibel, 2005).

Consultative Group to Assist the Poor (CGAP) summarizes the chronological development of micro-finance as given in Table 1.5. As evident from the Table, micro-finance is prevalent since ages in the form of informal lending. In the 16th century pawn shops were authorized by the Pope to charge interest and thus making lending as a commercially viable proposition. In 18th century an Irish fund was created to offer collateral free loans, a feature which is one of the important characteristics of micro-finance. Though the cooperative model of micro-finance was started in Germany in 19th century, it was only in 1970s that formal form of micro-finance took its shape.

TABLE 1.5- The History of Micro-finance

Since the beginning of time…
Informal savings and credit groups have operated for centuries across the developing world.
Middle Ages

In Europe an Italian monk created the first official pawn shop in 1462 to counter usury practices. In 1515 Pope Leon X authorized pawn shops to charge interest to cover their operating costs.
1700s
Jonathan Swift initiated the Irish Loan Fund System, which provided small loans to poor farmers who had no collateral. At its peak, it was lending to 20 percent of all Irish households annually.
1800s
The concept of the financial cooperative was developed by Friedrich Wilhelm Raiffeisen and his supporters in Germany. From 1865, the cooperative movement expanded rapidly within Germany and other countries in Europe, North America, and eventually in developing countries.
Early 1900s
Adaptations of these models begin to appear in parts of rural Latin America.
1950–1970
Efforts were made to expand access to agricultural credit through use of state-owned development finance institutions, or farmers' cooperatives, to channel concessional loans and lend to customers at below-market interest rates. These development banks lost most or all of their capital because their subsidized lending rates could not cover their costs, including the cost of massive default.
Early 1970s
Experimental programs extended tiny loans to groups of poor women to invest in micro-businesses, and micro-credit was born. Early pioneers include Grameen Bank in Bangladesh; ACCION International, which started out in Latin America; and the Self-Employed Women's Association Bank in India.
1980s
Micro-credit programs throughout the world improve on original methodologies. Micro lenders, such as Bank Rakayat Indonesia, defy conventional wisdom about financing the poor. Cost-recovery interest rates and high repayment permitted them to achieve long-term sustainability and reach large numbers of clients.
Early 1990s
The term "micro-credit" begins to be replaced by "micro-finance," which includes not only credit, but also savings and other services, such as insurance and money transfers.
Today
The borders between traditional micro-finance and the larger financial system are starting to blur. In some countries, banks and other commercial actors are entering micro-finance. Increasing emphasis is placed on building entire financial systems that work for the poor.
Source : Helms (2006)

Micro-finance is recognized worldwide as an effective tool in enhancing social and financial inclusion and mitigation of poverty and is now promoted as a means to solve the crushing poverty, ubiquitous all around the world. Micro-finance uses direct engagement with the poor and expects the individuals and their immediate community to generate economic growth through market-driven business initiatives.

Micro-finance offers several innovative solutions to problems of adverse selection, moral hazard and transactions costs (Khuval, 2010). Credit unions and lending cooperatives have been around since hundreds of years. Actually in some form or the other, the concept of "micro-finance" always existed in nearly every society. But as a more formal process, the history can be traced back to the writings of abolitionist/legal theorist Lysander Spooner who wrote about the benefits of numerous small loans (for entrepreneurial activities) to the poor as a way to alleviate poverty. Some of the initiatives, which founded the micro-finance revolution of today, can be enlisted as follows:

- In Indonesia, the Indonesian People's Credit Bank (BPR) or The Bank Perkreditan Rakyat was set up in 1895.
- In 1959, Akhter Hameed Khan, the founder of Pakistan (now Bangladesh) Academy for Rural Development, introduced the revolutionary idea of micro-credit (micro-finance), thereby opening a new door for millions of destitute and underprivileged people. His Comilla Cooperative Pilot Project is considered a model of micro-credit and rural development initiatives in developing countries.
- In 1971, Al Whittaker and David Bussau established Opportunity International, which provides opportunities for people in chronic poverty to transform their lives by creating jobs, stimulating small businesses, and strengthening communities.
- In 1973, ACCION International started to focus on providing economic opportunities to poor people instead of working on construction/infrastructure projects, in order to create lasting improvements in the lives of those they were helping (Khandelwal, 2007).

However, the pioneering role of modern micro-finance is often credited to Prof. Mohammad Yunus, who began experimenting with lending to poor women in the

village of Jobra (Bangladesh) in the year 1976 and then went on to create Grameen Bank in 1983 based on the success of demonstrated action research.

During 1987, an action research project on SHGs was started by Mysore Resettlement and Development Agency (MYRADA) with NABARD providing a research and development grant. Encouraged by the action research, NABARD launched a Pilot Project in 1991-92 for linking 500 SHGs with banks (Kropp, and Suran, 2002). Since then, micro-finance has grown manifolds in India.

Besides individual lending, leading models of micro-finance include:

- Grameen banking, perhaps the most widespread, with characteristic forms of small group organization and strict procedures;
- Self-help groups, with larger and more autonomous groups and a mixture of social and financial intermediation;
- Regulated financial institutions, usually small and operating in favorable regulatory environments;
- Credit cooperatives, some of which, as in Sri Lanka, have made an effort to include the poor.

In India, the dominant models for delivery of micro credit are:

- The SHG-Bank Linkage Programme;
- The NGO/MFI model and
- The Joint-Liability Group Model (Now introduced by NABARD also).

Other models include the cooperative model and the recent innovation of banks' lending with the NGO/MFI as an administrative partner with risk sharing. An analysis of the trends in the SHG-Bank Linkage programme reveals that NGOs and other Self-Help Promoting Institutions (SHPIs) are gradually playing less of a financial intermediation role and are limited to social mobilization which in turn affects their commercial effectiveness. A holistic approach of NGOs/MFIs are lacking for socio-economic development of borrowers. The emergence of MFIs and NGOs willing to facilitate financial intermediation presents an important opportunity for the accelerated delivery of insurance (Ananth and George, 2003). Various 'State of the

Sector' reports published by NABARD have been consolidated for analysis of performance of micro-finance since 2007. The composition of self-help groups formed under SGSY and non-SGSY have also been analysed. The figures are tabulated in Table 1.6 & 1.7. The Progress under SHG-Bank Linkage Program has been very impressive with the compounded annual growth rate of 24% in outstanding and 8.5% in number of SHGs.

During 2011-12, the number of SHGs declined though outstanding increased implying that few of SHGs were liquidated and rests have been provided with higher amount of loan. Further, as the outstanding grew the delinquency rates in terms of non-performing assets (NPA) also increased. However percentage of NPA has been higher in SGSY category across banks over years consistently. It clearly shows groups formed SGSY were not faring well in terms of recovery. Underlying reasons may be the improper identification of borrowers and their ulterior motives.

In principle, micro-finance can relate to the chronic (non-destitute) poor and to the transitory poor in different ways. Lack of access to credit is readily understandable in terms of the absence of collateral that the poor can offer to conventional financial institutions. In addition there are various complexities and high costs involved in dealing with large numbers of small, often illiterate, borrowers.

The poor thus have to rely on loans from either money lenders, at high interest rates, or friends and family, whose supply of funds will be limited. Micro-finance institutions attempt to overcome these barriers through innovative measures such as group lending and regular savings schemes, as well as the establishment of close links between poor clients and staff of the institutions concerned. However, the range of possible relationships and the mechanisms employed are very wide.

Despite reported problems and concerns arising from rising default rates, the micro-finance sector has posted good growth.

Table 1.6- Growth of SHG

		SHGs (amount in Rs. Crores)							
		Commercial Banks		Regional Rural Banks		Cooperative Banks		Total	
		No.	Amount	No.	Amount	No.	Amount	No.	Amount
2007	Total	1,893,016	8,760.38	729,255	2,801.76	272,234	804.35	2,894,505	12,366.49
	Share	65.40%	70.84%	25.19%	22.66%	9.41%	6.50%	100%	100%
	NPA		N.A.		N.A.		N.A.		N.A.
2008	Total	2,378,847	11,475.47	875,716	4,421.05	371,378	1,103.39	3,625,941	16,999.91
	Share	65.61%	67.50%	24.15%	26.01%	10.24%	6.49%	100%	100%
	NPA		2.10%		4.48%		4.81%		2.86%
2009	Total	2,831,374	16,149.43	977,834	5,224.42	415,130	1,306.00	4,224,338	22,679.85
	Share	67.03%	71.21%	23.15%	23.04%	9.83%	5.76%	100%	100%
	NPA		2.40%		4.20%		6.80%	-	2.90%
2010	Total	3,237,263	20,164.71	1,103,980	6,144.58	510,113	1,728.99	4,851,356	28,038.28
	Share	66.73%	71.92%	22.76%	21.91%	10.51%	6.17%	100%	100%
	NPA		2.67%		3.56%		3.88%		2.94%
2011	Total	3,053,472	21,883.26	1,281,493	7,430.05	451,798	1,907.86	4,786,763	31,221.17
	Share	63.79%	70.09%	26.77%	23.80%	9.44%	6.11%	100%	100%
	NPA		4.88%		3.76%		7.04%		4.72%
2012	Total	2,617,199	25,810.29	1,293,809	8,613.58	443,434	1,916.13	4,354,442	36,340.00
	Share	60.10%	71.20%	29.72%	23.70%	10.18%	5.28%	100.00%	100.00%
	NPA		6.41		4.95		6.84		6.09
CAGR	2007-12	6.7%	24.13%	12.10%	25.19%	10.50%	19.00%	8.50%	24.10%

- Source: NABARD (2008, 2009, 2010, 2011, 2012)

Table 1.7- Classification of Break-up of SHG Growth

	Out of Total SHGs- Under SGSY & other Sponsored Schemes(amount in Rs.

		Crores)							
		Commercial Banks		Regional Rural Banks		Cooperative Banks		Total	
		No.	Amount	No.	Amount	No.	Amount	No.	Amount
2007	Total	468,059	2,255.31	172,012	807.76	47,241	209.96	687,312	3,273.03
	Share	68.10%	68.91%	25.03%	24.68%	6.87%	6.41%	100%	100%
	NPA		N.A.		N.A.		N.A.		N.A.
2008	Total	638,283	3,225.92	223,191	1,332.33	55,504	258.62	916,978	4,816.87
	Share	69.61%	66.97%	24.34%	27.66%	6.05%	5.37%	100%	100%
	NPA		3.72%		11.08%		7.30%		5.72%
2009	Total	645,145	3,961.53	258,890	1,508.10	72,852	392.09	976,887	5,861.72
	Share	66.04%	67.58%	26.50%	25.73%	7.46%	6.69%	100%	100%
	NPA		4.40%		6.60%		6.70%		5.00%
2010	Total	798,304	4,072.03	368,795	1,725.94	78,295	453.11	1,245,394	6,251.08
	Share	64.10%	65.14%	29.61%	27.61%	6.29%	7.25%	100%	100%
	NPA		4.96%		5.46%		5.16%		5.11%
2011	Total	761,781	4,906.34	425,492	2,325.43	98,441	597.61	1,285,714	7,829.38
	Share	59.25%	62.67%	33.09%	29.70%	7.66%	7.63%	100%	100%
	NPA		7.41%		6.38%		6.26%		7.01%
2012	Total	643,100	4,903.52	476,063	2,598.80	97,165	552.51	1,216,328	8,054.83
	Share	52.87%	60.88%	39.14%	32.25%	7.99%	6.87%	100.00%	
	NPA		9.09		6.30		8.62		8.16
CAGR	2007-11	12.95%	21.45%	25.41%	30.26%	20.15%	29.89%	16.95%	24.36%

- Source: NABARD (2008, 2009, 2010, 2011, 2012)

The role of micro-finance in poverty reduction is simple. It helps the poor in enhancing their productive activities that will allow income growth, provided there are no other binding constraints. This is a route out of poverty for the non-destitute chronic poor. For the vulnerable poor, micro-finance provides access to credit in times of need and in some schemes, the opportunity of regular savings by a household. The avoidance of sharp decline in family expenditures by drawing on such credit or savings allows 'consumption smoothing'. However, in reality, poor, chronic as well as vulnerable, both may require funds for financing promotional and protectional

purposes whenever there is income shortfall or other shocks. In fact, it is one of the most interesting generalizations which emerges from the micro-finance and poverty literature that the poorest of the chronic poor (the core poor) will borrow essentially for protectional purposes, given both the low and irregular nature of their income. This group, it is suggested will be too risk averse to borrow for promotional measures (that is investment in the future) and will therefore be only a very limited beneficiary of micro-finance schemes (Hulme, and Mosley, 1996).

1.5 Criticism of Schematic lending

IRDP had been one of the biggest drives to eradicate poverty through self-employment generation. However, there are studies which question the effectiveness of the scheme. Pradhan et al. (2002) noted the following deficiencies in the implementation of the said scheme:

- Non-poor got benefits and poor were left out;
- Over-crowding of certain activities;
- Violation of guidelines and Misappropriation of funds and
- Corruption at various levels of implementation of the programme.

As Dreze (1990) has pointed out, the IRDP promoted a very deep dependence on corrupt government officials at every stage. It was principally an instrument for powerful local bosses to opportunistically distribute their largesse. No attempt was made to ascertain whether the loan being provided would truly lead to the creation of a viable long-term asset and to work out the necessary forward and backward linkages to ensure that the loan enabled achievement of proposed goals under the scheme. Little information was collected on the intended beneficiary. In chasing targets of high credit supply, the "quality of lending" was completely undermined. Working for the poor does not mean indiscriminately thrusting money down their throats. Unfortunately, IRDP did precisely that.

In another study of the impact of the Integrated Rural Development Program (IRDP) by Rath (1985) found that the beneficiaries were misclassified and that only 3 percent of the rural poor were able to cross the poverty line. In a study by Apte (1982; 1985) it was revealed that a large credit project for purchase of milch animals initially found

surprisingly high loan recovery rate of 84%. However, subsequently it was discovered that more than 80% of the beneficiaries had liquidated their loans by selling animals.

An evaluation study (Planning Commission, 2006) of the anti-poverty programmes in Uttar Pradesh and Bihar revealed that a sizeable proportion of the rural poor had never been covered under any of the programmes, On the other hand, a sizeable proportion of those who had received coverage were not poor. Beneficiaries were forced to buy poor quality assets and had to pay bribes and later return the loans, and hence in a sense were worse off. In respect of the anti-poverty programmes in general, the villagers informed that they often had to depend on some middlemen for getting the benefits of any of the government programmes. Villagers complained about the harassment at the hands of government officials. The people saw government functionaries as inaccessible, inefficient and corrupt.

The committee **on Innovative Finance and Micro Finance (Planning Commission, 2007)** constituted by Planning Commission felt that the SGSY groups had weaknesses such as:

- availability of subsidy had led to weakening of the concept of self-help as most people joined groups for availing subsidy only;
- pressure for achieving targets has led to formation of groups that lack understanding of group concept and working;
- survival rate of the groups, after the project loan has been sanctioned, is poor. This happens because members usually lose interest after receiving their subsidies;
- norms and working of the groups promoted under SGSY are not in tune with SHG – Bank Linkage Programme. This has produced a lot of confusion among SHG members, bankers, NGOs etc;

It is recommended that subsidies provided under SGSY be restructured. The committee felt that subsidy can be given in a way so that it helps in lowering the cost of credit rather than the quantum of credit. The subsidies can be placed with the groups so that the groups are able to charge lower rate of interest from members on the loan raised by them from banks.

Asset-based self-employment creation schemes need a high level of targeting in order to be successful. Because of the general paucity of subsidy resources and the very large number of eligible households, mis-identification of beneficiaries will necessarily deprive the truly needy of program resources and assistance (Deolalikal, 1995). Anti-poverty programmes are designed with the assumption that they will assist 'poor'. However, available data indicate otherwise (Heyzer, 1994; Karmakar, 1999; Tiwari, 1999; Veerashekerappa, 1994).

The failure of rural credit programs is mainly a result of three particular problems. Firstly, the cheap government loans led to a distortion of incentives and were therefore not used for productive investment. As such these loans were often wasted for unprofitable projects or simply used for consumption. Secondly, most of the money targeted to the poor did not reach this group but benefited the better-off. Thirdly, the main problem that eventually caused the breakdown of many programs was the low repayment rate. The absence of any form of collateral provided borrowers with high incentives to default and transformed the loans effectively into grants (De Aghion et al., 2002).

In a study, authors observed that due to lack of flexibility and high transaction costs, rural banks are un-attractive to small rural borrowers (Basu and Srivastava, 2005). Various aspects of formal borrowing are mentioned in Table 1.8.

Table 1.8 - Aspects of Formal Borrowing and its Costs

	Bank	RRB	Coops	Schemes	Others
Interest rate (median) % p.a.	12.5	11	11	14	14
Loan amount received as % of amount applied	91.8	88.2	83.5	86.6	93.9
Percentage households reporting bribes	26.8	27	9.7	27.27	23.21
Bribe as % of amount approved	10.1	18.2	19.9	42.3	8.3
Time taken to process a loan application (weeks)	33	28.5	24	89	14.3

Source: (Basu and Srivastava, 2005)

Priority sector lending still faces challenge of sustainable recovery performance. Under priority sector lending, field functionaries often cite poor recovery and high

cost associated with recovery for their underperformance. At the same time indigenous money lenders have continued their presence in the market. In order to facilitate the process of appraisal, sanction and disbursal of credit by formal financial institutions, it is imperative to understand the factors which attract the borrowers to indigenous money lenders.

Money lenders have also innovated upon the products and offering like input financing, consumer finance etc. to keep their business intact. Money lenders can and do provide very flexible and fast service tailor-made to the needs of the borrowers but they are often accused of charging exorbitant interest rates (Mitra, 2009). In absence of credit facility from the formal organizations, the poor often take recourse to borrowing from informal sources like friends and relatives and absence of support from them, they approach local money lenders.

Though it is not clearly known how the concept of micro-finance disseminated from India but the origins of indigenous micro-finance in India predate covering three major strands: money lenders, chit funds or rotating savings and credit associations (ROSCAs), and merchant bankers – each with a complex and interlinked structure. Money lenders are the oldest of the three strands, with a variegated and checkered history. They have remained lenders of last resort, at the opposite end of the central bank (Seibel, 2005).

In a study conducted in the Kalibasti slum of Delhi about the credit availability to slum dwellers, it was found to be well served by money lenders. The study further concludes that money lenders are obliged to remain small in order to maintain knowledge of their clients, and also to avoid attracting unwanted official attention. The smallness of these money lenders also allows them to offer great flexibility in their products and scheduling; this is what makes them ideal lenders to the poor, and MFIs should learn from these characteristics (Patole and Ruthven, 2002).

The lack of intermediation between the formal and informal credit market was discussed by Bell(1990) who had suggested that considering the better information about borrowers available with informal sector and access of larger funds to formal sector, money lenders should be channelized as agents by the Institutional players like banks (Bell, 1990).

These are strong and positive results and probably are the clearest evidence showing that micro-finance is working in the way intended to bring sustained relief from poverty. Micro-finance is not a panacea to global poverty nor is any other intervention. To eradicate poverty there has to be holistic intervention, may it be health services, education or financial services. As Professor Yunus (Chawdhary, 2009) puts, "Micro-credit is not a miracle cure that can eliminate poverty in one fell swoop. But it can end for many and reduce its severity for others. Combined with other innovative programs that unleash people's potential, micro-credit is an essential tool in our search for a poverty-free world". Micro-credit, which is one of the main components of micro-finance, is related to small credit doses available to poor. For any lender, repayment of disbursed loans carries the highest importance, irrespective of the amount of loan. Therefore, while making an effort in providing credit to poor it should be ensured that the assets are created or the purpose is met for which the loan has been disbursed. Poor must acknowledge the role of credit in smoothening their consumption pattern and enhancing their income generating capacity.

Considering the number of poor in India, a system must be developed which can improve the processing of loan applications in terms of cost and time. The success of targeted poverty schemes in India is dependent upon proper identification of beneficiaries, transparency, supervision of field staff and social mobilization. There are several reasons for ineffective implementation of anti-poverty programmes which are often cited by public at large. These are: lack of unbiased identification of beneficiaries, failure to implement schemes with true spirit, inadequate accountability of implementing officials. Even credit driven anti-poverty schemes have experienced leakages of subsidy provided either as interest subvention or capital subsidy. The reason cited by most of practitioners are schemes being target driven rather than impact driven. At times, lending to poor under schematic lending is assumed to be a directed lending rather than a commercially viable activity. SHGs, which have been experimented by NABARD wherein subsidy element is not present, are performing better than SGSY which has adopted the same lending methodology as NABARD but carries subsidy elements.

It is therefore necessary to devise a technique to identify borrowers who can be predicted as good credit risk among poor so as to make the lending to poor as

commercially viable option at a cheaper rate. One of the major components in processing of a loan application is pre-sanction appraisal which involves assessment of creditworthiness of the loan applicant. There is need of an objective assessment mechanism which can assist the decision maker, thereby making the lending to poor as a viable proposition.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

The micro-finance industry has been able to show successful results in terms of repayment rates even when a typical micro-finance "client" tends to have poor or no credit history, low income, little education and no sizeable collateral. In many ways, MFIs face the same challenges as the commercial banks when offering financial services to marginalized people in developing countries – higher risk, lower margins, agency costs and clients being dispersed over a wide geographical area with modest infrastructure, which results in higher transaction costs. Lending to the poor involves various risks, and in particular risk of default. Credit risk is one of the most important risks to be addressed by any lender. An effective method of credit scoring and information sharing can greatly increase the speed of loan processing and can reduce the cost and delinquency of micro-loans as well.

In this chapter we attempt to undertake detailed literature survey of various studies in the area of micro-finance in India and abroad with specific reference to repayment, so as to identify gaps in research for formulation of objectives for our research.

2.2 Micro-finance

Basel Committee on Banking Supervision (Bank for International Settlements, 2010) emphasizes micro-credit as the heart of many micro-finance business models prevalent all over world. Micro-credit has a number of distinctive features such as:

Micro-borrowers – Clients of micro-credit are low-income (both the underemployed and the entrepreneur with an often informal family business), geographically concentrated, who are provided very small, short-term, and unsecured loans. These loans have more frequent repayments and carry higher interest rates than conventional bank loans.

Credit risk analysis – As micro-credit borrowers often lack formal financial statements, loan officers help prepare documentation using expected cash flows and

net worth to determine the amortization schedule and loan amount. They also assess the borrower's character and willingness to repay. Information about the micro-borrowers is obtained from credit bureau, wherever they exist, for analyzing the prospective client. Credit scoring when used complements rather than supplements, the more labour-intensive approaches to credit analysis.

Use of collateral – Micro-borrowers often lack collateral that is traditionally required by banks. Where the lender does take some sort of collateral, it is for leverage to induce payment rather than to recover losses. In the absence of collateral, underwriting depends on a labour-intensive analysis of the household's repayment capacity and the borrower's character.

Credit approval and monitoring – Because micro-lending tends to be a highly decentralized process, credit approval by loan committees depends heavily on the skill and integrity of loan officers and managers for accurate and timely information.

Controlling arrears – Strict control of arrears is necessary given the short-term nature, lack of collateral, high frequency of payments, and contagion effects of micro-loans. Traditionally, monitoring is primarily in the hands of loan officers who have the knowledge of the client's personal circumstances.

Progressively increasing lending – Micro-lending uses incentive schemes to reward good borrowers with preferential access to larger loans in future, which raises the risk of over-indebtedness, particularly where credit information systems are absent or deficient. Irrespective of changes in the general level of interest rates, micro-finance customers expect rates to decline as the customer's track record improves. This feature affects interest rate risk management.

Group lending - Micro-lenders also use group lending methodologies besides lending to the individual poor. These loans are granted to small groups of people who cross guarantee other members of the group. Peer pressure also helps to ensure high repayment levels, as the default of one group member could adversely affect the availability of credit to others.

Contagion effects **-** Repayment of micro-loans can be affected due to unsecured to under-secured nature of micro-loans. The quality of individual loan portfolios can also deteriorate due to contagion effects, where borrowers who notice increasing delinquency in the institution may stop paying, if the institution is less likely to offer future loans due to credit quality problems.

Political influences - Micro-credit, which has the objective of poverty reduction, may be used as a political tool in some countries, tempting politicians to demand forbearance or waiver of loans to poor customers during times of economic stress. Waiver of loans affects the repayment culture of micro-finance borrowers.

The market for micro-credit has expanded over the years, with micro-finance institutions (MFIs) extending loans to more than 200 million clients worldwide by the end of 2010 (Deutsche Bank, 2012). However, growth in lending was accompanied by increased delinquency in credit portfolio of MFIs. The literature has brought forward a number of explanations as to why high market growth goes hand in hand with deterioration in portfolio quality. Two main reasons have been identified: first, as the potential pool of new clients shrinks, MFIs in the fast growing markets find it difficult to acquire new low-risk borrowers among the poor. As a consequence, MFIs tend to grant credit to higher risk borrowers, expand into urban areas and target wealthier clients. Second, fast growing MFIs cannot keep up with hiring and training new staff, so that the case-load of loan officers increases, while quality of monitoring decreases (Deutsche Bank, 2012). The capacity to select more trustworthy individuals may be one of the reasons behind success of micro-finance (Becchetti and Conzo, 2011).

Micro-credit thus has many features associated with credit management such as pre-sanction appraisal, cost effective delivery of small loans, post-sanction monitoring and default risk management of these unsecured loans. Like any other loan, recovery in micro-loans plays an important role in sustainability of micro-finance institutions. As micro-loans are very small in amount and do not have underlying collaterals, it becomes more important to explore determinants of repayment. The poor are often illiterate, have limited collateral and no official credit histories and are often dispersed across a rural geographical area. The novelty of micro-finance consists in the use of new incentive mechanisms such as group loans based on the borrower's subjective

valuation. The group-lending methodology tries to minimize the information asymmetry between lender and borrower, adverse selection and moral hazard. Group-lending has become synonymous with micro-finance with the exponential growth in delivery through lending models like Gramin Model, Self Help Group and Joint Liability Groups etc.

2.2.1 Group Lending: A Methodology to Deliver Micro-Credit

Group lending encompasses a variety of methodologies, but all are based on the principle of joint liability. In essence, the group takes over the underwriting, monitoring, and enforcement of loan contracts from the lending institution (Wenner, 1995). Group characteristics like its size, gender and demographic composition, diversity of asset portfolio within group members, social interrelatedness within group besides loan amount, level of credit rationing and community characteristics were found to be the key factors affecting repayment in group-based lending in a study performed in Bangladesh and Madagascar, an island country in the Indian Ocean, off the southeastern coast of Africa (Sharma and Zeller, 2000). It was also found that screening and monitoring are more effective in groups formed on their own as compared to those formed with the facilitation of an outside agent. These result in higher repayment rates unless the group is formed through collusion of members with the intention of default (Sharma and Zeller, 2000). "Traditional" micro-lenders target women who operate small-scale businesses and use group lending mechanisms (Armendariz and Morduch, 2010).

Group lending addresses the asymmetric distribution of information by transferring the burden of default risk to the contracting borrowers and thus transfers the costly screening to be done by the borrowers themselves (Armendariz and Morduch, 2010). Screening borrowers' risk is critical, since it affects loan repayment and lenders' profit thereby. Lending to joint-liability groups (JLGs) thus allows the lender to overcome moral hazard (Stiglitz, 1990) and adverse selection (Ghatak, 1999) due to information asymmetries. JLGs help enforce repayment, as social interactions make strategic default more costly (Besley and Coates, 1995). Social ties (Besley and Coates, 1995) and group homogeneity (Besley and Coates, 1995; Stiglitz, 1990) help facilitate peer monitoring and peer pressure or result from an effective peer selection of group members and consequently improve repayment. Group loans perform better

than individual loans in years of good harvest and worse in drought years when peers are expected to default (Bratton, 1986). Group lending also mitigates moral hazard because individuals in highly networked communities can observe each other's choice of project ex-ante and monitor behavior ex-post to avoid strategic default (Bolton and Sharfstein, 1990).

Studies on group dynamics in group loan improves the repayment performance as a impact of peer selection, peer monitoring, peer pressure and insurance (Zeller, 1998; Wenner, 1995 and Wydick, 1999). However Diagne et al. (2000), found that peer monitoring, peer pressure and joint liability had little or a negative impact on repayment performance and that peer selection was found to be limited.

If membership of the group or Credit Association is constantly changing and smaller groups are merged with existing ones for administrative efficiency, the self-selection and enforcement functions of the joint-guarantee mechanism lose effectiveness (Mknelly and Kevane, 2002). Zhang (2008) indicated that group lending without the cooperation of group members achieved similar repayment performance as individual lending. The results of a study conducted by Giné and Karlan (2011) showed that the shift to individual liability did not negatively affect loan repayment.

2.2.2 Critical Dimensions of Group Lending

Like any other lending methodology, group lending too has to deal with information asymmetry, adverse selection, moral hazard etc. It is the ability of group lending to deal with these issues in an effective and efficient manner which has made the technique so popular across the world. These have been studied by various researchers and their findings are discussed here as under:

A. Information Asymmetry

Basu (2006) in her report points out that the problems caused by uncertainty are exacerbated by non-availability of reliable information about borrowers. In lending, information asymmetry arises from the fact that banks do not have sufficient information regarding the riskiness of the clients' investment projects. This induces them to set an interest rate at a high level to compensate for the risk of not knowing

which investor is "risky" and which one is "safe". The high interest rate drives the safe investors out of the credit market, and the ones left shall be the most risky investors (Armendariz and Morduch, 2010). Information asymmetries in the credit market are tackled with the traditional means like credit rationing and collateral requirement (Stiglitz and Weiss, 1981) but these methods lead to the exclusion of poor borrowers.

B. Adverse Selection and Moral Hazard

Adverse selection is a consequence of market imperfections in the form of information asymmetry between economic agents. Adverse selection arises when borrowers have characteristics that are unobservable to the lender but affect the probability of their being able to repay the loan. A lender can try to deal with this information problem directly by trying to assess these characteristics (of borrowers), or indirectly by offering loan terms that only good borrowers will accept. The concept of "group lending" effectively overcomes the problems of collateral and adverse selection arising due to information asymmetry through peer monitoring.

The theory of moral hazards refers to the possibility of a person being less concerned about negative consequences of undertaking a risk as a result of having some form of insurance. When it comes to lending, moral hazards refer to situations where lenders cannot observe borrowers' actions or even the realization of project returns, and generally the problem can be separated into two types: ex-ante moral hazard and ex-post moral hazard.

Ex-ante moral hazard includes the actions or efforts undertaken by the borrower, which are unobservable to the lender, that are taking place after the loan has been granted and paid out, but before the returns of the investment or project have been realized.

Ex-post moral hazard refers to problems that arise after the borrower has received the loan, made the investment and after the project or investment returns have been realized. Even if the returns are positive, there is a possibility that the borrower may "take the money and run" due to the fact that the lender does not know how large the borrower's profits are. Chowdhury (2005) shows that group lending without proper

monitoring arrangements can provoke serious moral hazard problems. One of the major features of micro-finance is group lending where the concept of joint-liability helps mitigate problems caused by adverse selection and moral hazard. It is observed that peer monitoring, peer selection and diversification of financial risk can help mitigating problems caused by moral hazard. Some argue that the reduction of moral hazards can be achieved by the practice of regular repayment schedules, collateral substitutes, dynamic incentives etc.

Another important and apt method of reducing the risk of information asymmetry is information sharing. Credit history, social history and other idiosyncratic information can be shared between MFI's that enable them to screen good lenders out thereby reducing the cost involved in the screening and selection process.

In a study by Cason et al. (2012) it is shown that when monitoring costs are lower for peer monitoring than lender monitoring, group lending performs better compared to individual lending. This is reflected in higher loan frequencies and repayment rates. This occurs even though repayment rates with individual lending considerably exceed the theoretical prediction, which might reflect social preferences such as reciprocity. However, if we hold the cost of monitoring constant across the different monitoring regimes, then the performance of individual and group lending schemes are equivalent.

Given the asymmetric information that exists between lenders and borrowers, lenders must have a mechanism to ensure that they not only evaluate default risk that is unknown to them ex-ante in order to avoid adverse selection, but also that can evolve ex-post in order to avoid moral hazards (Richard et al.,2008). The theory of asymmetric information argues that it may be impossible to distinguish good borrowers from bad borrowers (Auronen, 2003), which may result in adverse selection and moral hazards problems. Adverse selection and moral hazards had led to substantial accumulation of non-performing accounts in the banks (Bester, 1994; Bofondi and Gobbi, 2003).

C. Contract Enforcement

Contract enforcement, particularly in credit relationships, is widely perceived to be a central problem in developing countries. In a study of borrowers of Uasin Gishu District Trade Development Joint Loan Board (UGLB) in Kenya, Wakuloba (2008) found that the UGLB employees were unanimous in their belief that failure to prosecute defaulters was an important cause of loan default. Default leads to losses which may lead to failure of a MFI. If the MFI fails, all borrowers will be subject to the punishment of credit denial, independent of whether or not they have repaid. This leads to the possibility of a debtor run. The risk of debtor runs may partially account for why MFIs stress their high repayment rates. If a MFI borrower expects other borrowers to default, he is likely to default too. So we can explain the MFI emphasis on publicizing high repayment rates in two ways, namely – as a response to the adverse selection problem in collateral values and as a way to prevent debtor runs. Besley and Coate (1995) suggest that larger punishments and social sanctions may be used to further deter strategic default. In rural India, transaction costs and supervision costs including compliance costs are very high. Government has still not been able to develop a legal and regulatory framework to incentivize repayment with proper contract design and strong enforcement of loan contract (Basu, 2006).

D. Social Capital

The development and existence of social capital is deemed critical to the success of micro-finance for poverty-alleviation programs (Leigh Anderson and Locker, 2002; Pretty and Ward, 2001; Woolcock, 2001). Social Capital can facilitate access to credit and affect repayment behaviour of borrowers (van Bastelaer, 2000). De la Huerta (2010) observed that in a village fund setting with joint liability, repayment is positively associated with cooperative behaviour and with the strength of social sanctions. Both cooperative behaviour and the ability to use social sanctions are common in environments in which social cohesion is strong. Social ties must be strong enough to enforce agreements. Strong social ties support repayment through social penalties; if ties are too weak they have the opposite effect (Ghatak and Guinnane 1999). Strong social ties maintain repayment through coping with shocks (Feigenberg et al. 2010). However, in the case of Vietnam, it was observed that any direct effect in the form of peer pressure is rather unlikely due to absence of joint liability rule. Defaulting borrowers are simply excluded from the group, but the group

is not held liable for their debt (Dufhues et al., 2004). Defaulting borrower who is publicly known may be shunned by his fellow villagers. By circulating information, social capital can magnify reputational sanctions (Durlauf and Fafchamps, 2005). Abbink et al. (2006) found in their study that closer-knit groups have higher repayment rates but only in the beginning. Several studies reported that social ties have positive effects on repayment (Besley and Coate, 1995; Cassar et al., 2007; Karlan 2007). Zeller (1998) found that groups with higher levels of social cohesion have better repayment rates. Ahlin and Townsend (2007) reported that strong social ties have adverse effects on repayment performance. Godquin (2004) also found that social ties had a negative impact on the repayment rate. Strong church-based personal bonds can weaken the enforcement of repayment (van Bastelaer and Leathers, 2006). Sharma and Zeller (1997) reported that high share of relatives in the group negatively affects repayment. Moral hazard and collusion in tightly knit credit groups is a well known problem, and for this reason, some micro-finance institutions do not allow family members to be part of the same credit group, as imposing social sanctions on the group may become impossible (Ahlin and Townsend, 2007; Bhatt and Tang, 1998).

Social ties of the group leader have a positive effect on repayment via controlling moral hazard, whereas this is not true for the ties of other members (Hermes et al. 2005). The effect of social ties among members is statistically insignificant (Kritikos and Vigenina, 2005; Wydick, 1999). Dufhues et al. (2011) suggest that bonding social capital influences the repayment performance positively through income and access to informal credit, by the route of shame and via peer pressures of loan guarantors and their kin or friends. Ties must be close enough to allow for credible social sanctions and exertion of pressure from peer but not too close to promote collusion or impede social sanctions. In an empirical study of 612 group borrowers and 52 individual borrowers in Canada, Gomez and Santor (2001) reported that the group lending and the presence of neighbors have a positive correlation with self-employment earnings.

2.3 Credit Risk and Its Management

Risk is an integral part of financial intermediation. Hence, risk management must be at the heart of finance. Ability to predict loan default has an obvious practical utility. Indeed, the identification of default risk appears to be of paramount interest. Micro-finance risk is defined broadly as "the potential for events or ongoing trends to cause future losses or declines in future income of an MFI or deviate from the original social mission of an MFI."

The most important factor in determining lending practices is credit risk (Daniels, Ramirez, 2008). According to Duff and Einig (2009), research considering credit risk has been one of the most active areas of recent financial research, with significant efforts deployed to analyze the meaning, role, and influence of credit ratings. Credit risk is defined as "the risk to earnings or capital due to borrowers' late and nonpayment of loan obligations (Fernando, 2006)." Credit Risk has always attracted prime importance, among all the risk micro-finance industry carries. Banana Skin Report (2009) reported credit risk as the biggest and the fastest rising risk. Credit risk is still at the top of the list in the Banana Skin Report (2011). There are two broad means of evaluating credit worthiness: appraisal of repayment capacity and asset backed lending. The first approach focuses on investigating the integrity, moral character, management ability and debt repaying capacity of a potential borrower either through human experts or statistical models, while the latter focuses on the quality and quantity of assets that can be mortgaged and/ or pledged as collateral and quickly liquidated in the event of default (Weneer et al. 2007).

Credit risk can be managed by identifying loan assets with minimal default risk and by carrying marketable collaterals against these loan assets so that in case of default the collaterals can be liquidated to meet loss given default (LGD). To identify credit-worthy borrowers, informal lenders use their information about the borrowers and judge them in a subjective manner**. A quantitative tool can be significantly useful to a lender which can facilitate the process of screening of the borrower.**

2.3.1 Credit Scoring

Credit Scoring is one of the ways to tackle credit risk. Credit scoring analyzes the characteristics and performance of past loans to predict the performance of future loans. The goal of credit scoring for micro-finance and other financial purposes is to

discriminate between bad and good loans (Gool et al., 2009) The concept of credit scoring and related concepts of behavioural and profit scoring (see for example, Sarlija et al., 2009; Banasik and Crook, 2010; Fritz and Hosemann, 2000), are not that old, compared with credit and other business concepts.

Credit scoring applications in banking sector have expanded during the last couple of decades (Banasik and Crook, 2010; Chen et al., 2009), especially due to the large number of credit applications for different bank products, providing a wide range of new product channels which can be used by these banks.

There are three basic methods of scoring (Schreiner, 2003; Caire, 2004; Caire et al., 2006; Sur, 2008) namely the statistical method, the judgmental approach (expert system) and the hybrid method combining the previous two. There is an important opportunity in cutting the operating cost of the micro-finance transaction by simplifying the task of the loan officer in the appraisal process and in consequence reduce the cost of appraisal. During the use of the credit scoring, its true performance is gradually revealed. The initial use of credit scoring is always delicate, since the effects on screening bad risks (non-performing borrowers) will be seen in several months or more. Primary benefits of scoring, particularly statistical, include delinquency reduction, increased consistency and clarity in decision making, improved efficiency in the lending process, and development of differentiated products and implementation of risk-based pricing. Ratings are ordinal predictions of the default risk of an obligor. As with any prediction problem, the evaluation of the predictive accuracy is an essential factor (Walter, 2012).

The two most commonly used scorecards are application and behavior scorecards. Application scorecards predict the probability of first- time loan applicants defaulting at a future point in time based on demographic, business, and financial data, loan characteristics, and (if available) credit bureau data. Behavior scorecards predict the probability of an existing account going bad at a future point in time based on repayment information. They are used to define risk-based loan terms that reward good clients with lower interest rates and larger loans.

Credit scoring is a tool designed to help manage the credit granting problem which, if implemented, can lower the delinquency rate in micro-credit. Irrespective of the

Credit Information System (CIS) being a public or private system, bank lending is higher and credit risk is lower in countries that share information about borrowers (Japelli and Pagano 2000). With increased awareness about the benefits of their own reputations the borrowers build among lending institutions, they (borrowers) have increased incentives to repay. This further improves the pool of borrowers and thus lowers the lending costs (Vercammen, 1995). Participation in a credit bureau has the effect of lowering interest rates for clients. Reduced arrears also have the same effect (Luoto et al., 2004). Clients of MFIs in Peru that use the Infocorp CIS have experienced a reduction in waiting time for loan processing from one week to one day (Campion and Valenzuela 2001).

Traditionally, MFIs have used subjective scoring to analyze businesses and credit risk. A number of qualitative indicators are also used as selection criteria. Loan officers require a lot of time and training to be able to understand and apply the parameters and policies of subjective scoring. In contrast, statistical credit scoring forecasts risk based on quantified characteristics recorded in a database. The relationships between risk and client characteristics are expressed as sets of rules in a mathematical formula that forecasts risk in terms of default probability (Schreiner, 2002). The various studies showing strengths and weaknesses of credit scoring are provided in Table 2.1.The table covers studies conducted during the period of 1986-2008. It may be observed from Table 2.1 that credit scoring has advantage of quantifying risk of default and thereby increases accuracy of decision making in identifying good borrowers. This allows risk based pricing of loan products. However, credit scoring does not model unwillingness to repay and catastrophic reason of defaults. It has been observed by authors that the cost of micro-finance borrowers may go up in case of certain groups as a consequence of risk-based pricing of loan products. As accuracy of credit scoring in predicting good borrowers is data dependent which tends to improve over long period, it becomes imperative to have sophisticated tools and techniques of data mining and analysis to develop a robust scoring system. This might not be possible for all the MFIs operating globally

Table 2.1- Strengths and Weaknesses of Credit Scoring (CS) for Micro-finance: An Overview of Existing Literature

Strengths		Weaknesses	
Description	**Author**	**Description**	**Author**
General concept			
CS quantifies risk of default and can be tested, leading to a quantitative risk culture and attitude to continuously learn from data.	Schreiner (2003), Freytag (2008),	CS does not model unwillingness to repay, inability due to crises, catastrophes etc. or lack of institutional discipline even though these risks often cause default.	Freytag (2008), Rhyne (2002)
CS allows adjusting interest rates and fees according to risk (risk-based pricing).	Schreiner (2003)	CS might reduce access to credit if lender only lends to clients who have information on all characteristics.	Freytag (2008), Feldman (1997)
CS increases accuracy of credit scoring decision, leading to better performance of loan portfolio	Dennis (1995)	CS might cause relative higher costs of credit for certain groups.	Collins et al. (2001)
CS does not subjectively discriminate among applicants.	Dennis (1995)		
CS can increase efficiency of credit process, by reducing loan officer time in making subjective analysis.	Kulkosky (1996)		
Statistical aspects			
Development of models for micro-finance indicates that CS can improve default prediction in general.	Schreiner (2004)	Reject inference remains problematic for CS in micro-finance.	Schreiner (2004)
Experience with CS in micro-finance shows strong performance of CS for extreme high or low risk cases.	Schreiner (2003)	Continuity in the score is not always guaranteed (completely different score when one year older etc.)	Capon (1982)
		CS for micro-finance requires large, centralized electronic data of high-quality, which many lenders do not have.	Freytag (2008),Schreiner (2004)

Source: Various publications mentioned in the table under the head of authors.

2.3.2 Credit Scoring Models

The history of credit scoring is short, and the literature is very limited. Books that have been introduced are limited; textbooks looking at classification problems are also limited, whilst, in recent years, a number of international journal articles have discussed different credit scoring techniques in different fields (Abdou and Pointon, 2011). To introduce credit scoring, the institution needs to have a proven lending methodology that is capable of differentiating between lower risk and higher risk clients. Evidence regarding Credit Scoring Models (CSMs) for retail banking markets in developing countries is limited. Viganó (1993) for Burkina Faso (a country in West Africa) and Schreiner (2004) for Bolivia have studied micro-finance and developed credit scoring model using discriminant analysis and logistic regression respectively. Schreiner's (2004) study is practitioner-oriented and discusses the benefits of credit scoring as well as its implementation in general. Viganó (1993) specifically addresses

the problem of selecting the relevant borrower characteristics for the CSM. Thanh and Kleimeier's (2007) paper illustrates the methodology to identify borrower characteristics which should be part of a credit scoring model. Table 2.2 provides an overview of credit scoring models which have been published by various authors with reference to developing countries:

Table 2.2- Credit Scoring Models for Developing Countries

Author (Date, Country)	Number of Inputs (Included)	Technique(s)
Vigano (1993, Burkina Faso)	53(13)	Discriminant Analysis
Sharma and Zeller (1997,Bangladesh)	18(5)	TOBIT Maximum Likelihood Estimation
Zeller (1998, Madagascar)	19(7)	TOBIT Maximum Likelihood Estimation
Reinke (1998, South Africa)	8(8)	Probit Regression
Schreiner (1999, Bolivia)	9(9)	Logistic Regression
Vogelgesang (2001, Bolivia)	28(12)	Random Utility Model
Vogelgesang (2001, Bolivia)	30(13)	Random Utility Model
Diallo (2006, Mali)	17(5)	Logistic Regression,Discriminant analysis
Gool et al. (2012)	16 (16)	General binary logit model, AUC heuristic approach

Sources: Compiled from papers as quoted in the table 2.2

As is evident from the Table 2.2 regression is most widely used technique for developing credit scoring model. However random utility model has also been considered in a study conducted in Bolivia. Various studies have considered number of variables as large 53 and as low as 8. After elimination, number of variables included by these authors goes down in the range of 8 to16.

Given the substantial growth of micro-credit and increased attention to credit risk management, the development of a well-functioning credit assessment framework is essential. The benefits of credit scoring are clear. It reduces the cost, time, and effort that credit officers spend on loan assessment. However, Schreiner (2003) recalls a Bolivian example of a finance company that relied exclusively on its CSM and went bankrupt. Credit Scoring should be implemented to facilitate the subjective assessment of the borrower. CSM uses historical loan and borrower data to identify

which borrower characteristics are best able to distinguish between defaulted and non-defaulted loans.

During the developmental stage of CSM, all potentially relevant borrower characteristics have to be identified and coded. We have conducted survey of literature to find out the potential characteristics and other determinants which are important for reducing delinquency.

2.3.3 Determinants of Repayment

Lending is always surrounded by default risk or uncertainty about repayment. Repayment incentives largely depend on the terms and conditions of the loan. The literature on factors influencing loan repayment performance among financial institutions targeting the poor is very sparse and limited mainly to micro-finance in low-income countries (Derban et al., 2005).

In a study conducted in Piura (a city in northwestern Peru), it was observed that informal lenders are able to screen out undesirable applicants. Informal lenders select their borrowers based on their prior knowledge of the person and on the information they obtain during a careful investigation of the activities of the applicant. An additional screening device in the informal sector is to ‘‘test’’ borrowers by giving them small loans at first and progressively offering them larger loans and at better terms (Guirkinger, 2008).

Several studies (Greenbaum and Thakor, 1995 and Hoque, 2000) show that default on repayment may be a result of the borrowers’ unwillingness and/or inability to repay. In contrast, Hulme and Mosley (1996) argue that the important factors that contribute to loan repayment performance are the design features of the loan which include access methods, screening methods and incentive to repay. A few researchers also found that loan characteristics play an important role in determining repayment performance (Roslan and Mohd Zaini, 2009; Njoku, 1997; Ugbomeh et al., 2008). Copisarow (2000) found that defaults generally arise from poor program design or implementation and not from any essential problem with the borrowers. Borrowers’ characteristics are important determinants of repayment and so are the institutional

characteristics and that both these determinants should be assigned due importance so that loan default can be minimized (Derban, Binner, and Mullineux, 2005).

In his study, Zeller (1998) found that gender, age or size of families should not influence the determination of repayment ability. Matin (1997), analyzing the determinants of the repayment performance of Grameen Bank borrowers, observed that education and the area of operated land (treated as proxies for wealth of the borrower) had a positive impact on repayment. The membership period was positively associated with default while loan size did not have a significant impact on repayment performance.

Access to basic literacy services and health services had a positive and significant impact on repayment performance. The positive impact of access to basic literacy on the repayment performance is even higher than the impact of access to health services. Access to non-financial services can also increase the value of the relationship with the MFI and increase the opportunity cost of strategic default (Godquin, 2004). Public perception of credit programs is an important determinant of repayment. In a study conducted to analyze the causes of low repayment for South Africa's Khula Enterprise Finance credits, it was found that a major contributing factor for default was beneficiaries' perception that the micro-loans were free government grants (Makina and Malobola, 2004).

Godquin (2004) suggests that the provision of non-financial services such as training, basic literacy and health services has a positive impact on repayment performance. Awoke (2004), found that most of the default arose from poor management procedures, loan diversion and unwillingness to repay loans. According to Derban et al. (2005), the causes of non-repayment could be classified as the inherent characteristics of borrowers and their businesses, the characteristics of lending institution and suitability of the loan product to the borrower and the systematic risk from the external factors such as the economic, political and business environment. Roslan and Mohd Zaini (2009) found that borrowers that did not have any training in relation to their business have a higher probability of default.

Swain and Swain (2007) reported in their study that non-repayment and delayed repayment of farmers' loan was observed due to diversion of funds towards

consumption in the eventuality of adverse shocks. Other important reasons for non-repayment of loans were complex banking procedures, longer distance to reach the bank, time constraints, and careless mindset. The repayment performance can be improved not only by the financial dimensions of the credit, such as interest rate, late fees etc., but also by sending reminders for repayment. Such features, if inbuilt with the product, will reduce credit risk (Cadena and Schoar, 2011). Among the commonly reported individual/borrower specific socio-economic and demographic factors is the borrowers' age (Kohansal and Mansoori, 2009; Papias and Ganesan, 2009; Afolabi, 2008; Oladeebo and Oladeebo, 2008; Oni et al., 2005), level of education (Oladeebo and Oladeebo, 2008; Eze and Ibekwe, 2007), gender (Papias and Ganesan, 2009; Roslan and Karim, 2009; Eze and Ibekwe, 2007; Arene, 1992), experiences – including experiences in farming, credit use, cooperative membership (Njoku, 1997; Arene, 1992). Some commonly reported variables are discussed below:

I. Literacy/Education

Education of the household head is significant and lowers the chance that a borrower defaults. The higher the education, the higher is the ability to create income and thus the ability to repay the loan on time (Dufhues et al. 2011). Borrowers with raised levels of education exhibit a weak probability of delinquency. Education considerably reduces the occurrence of delinquency problems (Bassem, 2008). Khandker et al. (1995), in their study in Bangladesh, found that training increases repayment performance. Their study has also shown a positive correlation between repayment performances with education. In a study, Oladeebo and Oladeebo (2008) suggest that experience and the level of education were the major significant socio-economic factors determining loan repayment in the study area. Several studies have hypothesized that women, as compared to men, show a stronger preference for educating their children (Thomas, 1990; Sallee, 2001; Behrman and Rosenzweig, 2002). If preferences toward education are gender-related and if micro-finance improves access to loans by women then micro-finance may empower women to influence household schooling decisions. Such steps will improve the pool of prospective borrowers due to improved literacy level. Schicks (2012) indicates that improving borrowers' financial literacy can reduce their risk of over-indebtedness.

II. Over-Indebtedness and Multiple Borrowing

In Germany, over-indebtedness has been defined as the inability of households to repay all debts fully and on time (Haas, 2006). With increasing concerns about negative effects of micro-finance on customers, at a time where trust in the positive impact of micro-finance is weakening, over-indebtedness is one of the most pressing challenges facing the micro-finance industry (Duvendack et al., 2011; Karlan and Goldberg, 2011).

Gonzalez (2008) identifies three different situations considered here as over-indebtedness. One situation occurs when the borrower is not willing to repay the loan, even if he/she has the ability to do so, and default occurs. Another situation occurs when the borrower has to undertake costly and extraordinary actions in order to repay the loan, beyond those anticipated at the time when agreement for the transaction was completed. Exceptional cost is an effort or an outcome for the borrower beyond what had been planned at the time when the contract was agreed upon, which allows the household to generate extraordinary repayment capacity. The last situation occurs when the borrower is willing to repay the loan, but he does not have the ability to do so in full at pre-decided time and consequently arrears, partial repayment, or full default are observed.

While short term access to informal lenders may allow a household to keep current in its payments with a formal lender (Gonzalez-Vega and Maldonado, 2008) a multiplicity of loans from lenders who are not aware of these multiple commitments, may increase over- indebtedness. Banks may have, however, incentives to invest in too risky a portfolio of loans because, in the case of failure, their high leverage and limited liability allow them to transfer most of the losses to depositors (Chaves and Gonzalez-Vega, 1994). The borrowers' opportunistic behavior can cause over-indebtedness. The information asymmetry and incentive incompatibility problems that make opportunistic behavior possible have been widely studied in the literature (Stiglitz and Weiss, 1981; Varian, 1992). Under uncertainty, the borrower and the lender choose loan contracts based on their best imperfect information about the future state of nature and, therefore, about the borrower's repayment capacity. Some empirical studies conducted on over-indebtedness are provided in the Table 2.3

Table 2.3- Empirical Studies on Over-indebtedness

Sl.No.	(Author)	Findings
1	Bolivia 1997–2001(Gonzalez 2008)	85% of Households had at least one occurrence during the four years
2	Ghana 2009 (Grammling 2009)	12% over-indebted, another 16% at risk
3	Karnataka, India 2010 (Krishnaswamy 2011)	Over-indebtedness reportedly high in mass default towns, but low in non-default towns
4	Tamil Nadu, India 2005–2009 (Guérin, Roesch, Subramanian, and Kumar 2011)	More (possibly much more) than 20% over-indebted
5	Multi-country study (Kappel, Krauss, and Lontzek 2010)	14 potential early warning indicators for over-indebtedness. Highest risk countries in sample: Bosnia–Herzogovina, Cambodia, Peru

It is observed from the Table 2.3 that over-indebtedness is a serious problem and Krishnaswamy (2011) found in his study that over-indebtedness is high in mass default towns while it is low in non-default towns. In his study in Bolivia, Gonzalez (2008) also observed that 85% households had at-least one occurrence of over-indebtedness in four years.

Matin (2001) and Chaudhury and Matin (2001) reported that as an increasing number of households took loans from multiple institutions in Bangladesh and that the repayment performance declined in such cases. In a saturated market, borrowers find it easier to obtain credit in excess of their repayment capacities (over-borrowing). They can do so by going to several MFIs (multiple borrowing), which are not aware of the client's credit record and are willing to lend in order to increase their business volume. In fact, empirical evidence shows that over-borrowing is closely related to multiple borrowing (Schicks and Rosenberg, 2011). With multiple borrowing, the borrower can choose to default strategically on one or several of the loans. Multiple borrowing is not a new phenomenon. As highlighted in the book titled 'Portfolios of the Poor', poor households regularly borrow from multiple sources to smoothen their cash-flows (Collins, Morduch, Rutherford, and Ruthven 2009).

Research by Wilson, Summers and Hope (2000) finds current payment behaviour a good predictor of future payment behaviour, suggesting that arrears status *per se* is not the only way of measuring credit risk.

III. Collateral

One feature that many micro-finance institutions have in common is that they do not require their borrowers to put up any collateral in the form that traditional commercial banks do. But micro-finance institutions often have some type of collateral substitutes. The use of collateral in debt contracts can be costly to lenders, borrowers and (in some cases) even society at large (Berger et al., 2011). Morduch (1999) shows an example of a collateral substitute following the Grameen model: the borrowers are required to contribute 0.5 percent of every unit borrowed to a group fund that will serve as insurance in case of default, death or other significant events.

Buchenau and Meyer (2007) point out that collateral can be items of subjective value with little or no market value and as such the interpretation of collateral substitutes can be rather loose. Collateral substitutes serve as a means to secure repayment, since collateral, regardless of the form, by its very nature pose an incentive to repay the debt.

Becchetti and Garcia (2011) reported that the bank (Banca Etica) has a remarkably low share of non-performing loans in spite of an extremely high share of uncollateralized loans (around 42%). They found that collateralization depends positively on ex-ante borrower's risk (proxies by non-performing past track record) and negatively on relationship lending. Group lending, widely familiar nowadays in the developing world in financing the poor, is characterized traditionally by two features: lending without collateral and enjoying higher rate of repayment. Bond and Rai (2002), studied the use of collateral substitutes in micro-finance. According to them, in general, collateral serves to reduce the risk of strategic default in circumstances where borrower's cash flows can be diverted. Two commonly used techniques of micro-finance lending are the use of social sanctions and credit denial as punishments to be imposed on defaulting borrowers. However, they are unlikely to be perfect substitutes: effective imposition of social sanctions requires the successful navigation of a delegation problem and credit denial lacks a market value.

IV. Gender

Morduch (1999) argues that one of the main reasons for the success of micro-finance in the public eye is the targeting of women. Women are argued to be poorer than men on average (Burjorjee et al., 2002; FINCA, 2007), have less collateral, and hence, are

more credit-constrained (Khandker, 1998; SEAGA, 2002). Christen (2001),Copestake (2007),Cull et al. (2008) and Dichter and Harper (2007) argue that commercialization might lead to 'mission drift' where MFIs turn to more profitable customers, that is mainly urban, upper poor and male. Armendariz and Morduch (2010) and Mayoux (1999) argue that female targeting and financial sustainability are perfectly compatible, since female targeting within micro-finance has often been attributed to increased efficiency through high female rates.

Impact in terms of poverty reduction was better when females were provided with micro loans as compared to the situation when males were given micro loans (Pitt and Khandker, 1998). However in another study, female borrowers (Gender) did not prove to have a significantly better repayment performance.

Finally, women may differ with respect to risk aversion or ability. Muhammad Yunus (Yunus, 2004) writes that "Women have greater long-term vision and are ready to bring changes in their life step by step. They are also excellent managers of scarce resources, stretching the use of every resource to the maximum". Mohammed Yunus' Grameen Bank started to shift its focus on women since they saw increasing repayment problems in male centers (Armendariz and Morduch, 2010). Sanyal (2009) found that economic tie through MFI programs, group lending network structures, and participation improved women's social capital and normative influence. Thus, micro-finance facilitated women's collective empowerment.

Empirical evidence obtained by D`Espallier et al. (2009) usually confirms that women do indeed repay better than men. Khandker et al. (1995) found that 15 per cent of male borrowers had missed payments before the final due date, while all but 1 per cent of women had perfect repayment records. Similar patterns have been found elsewhere: in Malawi, for example, Hulme (1991) found on-time repayments for women customers to be 92 per cent as against 83 per cent for men, and Gibbsons and Kasim (1991) found that in Malaysia, the repayment comparison is 95 per cent for women against 72 per cent for men.

V. Distance from the Bank

Small business lending has historically been very costly, because of the paucity of information about small firms and the high costs of the personnel required for obtaining the information. Information about small businesses is thought to be "soft", and has had to be collected by lenders over time through relationships with firms (Berger and Udell, 1995; Petersen and Rajan 1994). Collection of such information requires lender's direct contact with the small business and therefore, lender has to have a local presence. In addition, much of this information is "soft" and difficult to communicate, the decision to offer credit has to be made very close to where the information is gathered from. This would result in increase in the cost of having large scale, geographically spread-out lending operations, implying strong diseconomies of scale in lending to small businesses. Concerns may then be raised when banks merge and centralize operations, for that would imply a fall-off of credit to small businesses (Berger and DeYoung, 1999; Berger, Saunders, Scalise, and Udell, 1997 and Strahan and Weston, 1998).

Oke et al. (2007) argue that distance between the dwelling place of clients and bank was inversely related to repayment such that one kilometer increase in bank distance will reduce the rate of micro-credit repayment by 0.92 per cent. The nearer a client was to a bank, the better was the repayment rate. Karlan (2007) found that the physical distance between group members affects repayment: the higher the fraction of the group living within a 10-minute walk of each other, the less likely the members are to be in default at the end of the loan cycle. Wydick (1999) reported that distance between clients businesses and lack of knowledge about each other's performance increases the chance of encountering repayment problem.

VI. Loan Size

Pham and Lensink (2008) reported in their study that larger loans have higher probability of default. They also suggested that a married borrower tends to have a lower probability of default. Hietalahti and Linden (2006) also found that big loan size increases the incidence of repayment problem and also leads to high dropouts. Loan size was found to be significant in affecting the repayment behaviour (Ndanitsa et al., 2011) and suggested that larger loan reduced the problem of default. In a study, Oladeebo and Oladeebo (2008) suggest that the amount of loan is one of the factors determining loan repayment in the study area.

VII. Flexible Repayment Schedule

The typical repayment schedule offered by a MFI consists of weekly repayment which is believed to reduce default risk in the absence of collateral, but at the same time increases MFI's transaction costs. Frequent repayment schedule not only enables them to form the habit of saving regularly but also improve clients' trust in loan officers and their willingness to stay on track with repayments. However, Jain and Mansuri (2003) suggest that the need to raise funds for frequent repayment makes clients seek informal sector loans. The MFIs, in turn, benefits from the superior monitoring technology of money lenders and therefore prefer a repayment schedule which makes it more likely that the client also takes out informal sector loans.

Armendariz and Morduch (2010) report anecdotal evidence from Bangladeshi micro-finance providers suggesting that micro-finance contracts with less frequent repayment saw higher client default. McIntosh (2008) uses spatial variation in loan administration by FINCA Uganda to show that when groups of clients were allowed to select biweekly loan repayment, group dropouts fell and repayment performance was actually slightly improved. Flexible Micro-credit services will enable clients to receive higher amount of loan and therefore increase the household's income and reduce repayment problem (Mamun et al., 2011). Instead of reducing access to loans, more flexible installment schedules could be the best solution to avoid over-indebtedness in borrowers who experience adverse shocks. This includes ex-ante flexibility of repayment conditions as much as ex-post flexibility with renegotiations and rescheduling (Hamp and Laureti, 2011).

Field and Pande's (2008) randomized evaluation of repayment terms for the clients of a typical, urban micro-finance institution in India found no effect of repayment frequency on default or delinquency. By accessing loans from several MFIs or alternating between loans, a borrower is less constrained by the rigid loan repayment schedules typical of micro-finance loans. Some evidence shows that multiple borrowing is associated with better repayment rates in some environments (Krishnaswamy 2007). While the benefits can be substantial, competition can introduce new market dynamics that are not always easy to see. Roodman (2009) observed:

"The popular forms of Micro-credit have thrived precisely because they imposed restraint on both lenders and borrowers, such as through joint liability and those rigid weekly payments. However, the arrival of competition has at times severely tested these methods by enabling people to quietly borrow from more than one MFI at a time".

VIII. Number of Dependents

Wakuloba (2008) reported that the cause of default was found to be statistically independent of family size (number of dependents). Bandyopadhyay (2007) found that the number of dependents has no significant impact on default risk. Dependency ratio was found statistically significant to affect repayment (Ndanitsa et al., 2011).

IX. Dynamic Incentives

In the absence of joint liability which is prevalent in group loans, creating dynamic incentives seem to be the only viable means of lending to the poor. Progressive lending is a type of dynamic incentive in which access to larger amounts of credit becomes available after each successfully repaid loan. Incorporating dynamic incentives in micro-loan contracts may be implemented in the following manner:

(i) Threat of termination in case of non-repayment. Offering rewards for timely repayment, such as increasing the loan amount or offering better terms in future loan contract. These are used to alleviate moral hazard problems. Introducing a dynamic incentive raises the cost of default by excluding from future rounds of lending (Gine et al., 2006).

(ii) Frequent repayment schedules that also help in addressing moral hazard by acting as imperfect signals on the progress of borrowers' projects.

(iii) Intensive monitoring with relationship development that allows lenders to gather information about the use of micro-loans from borrowers, albeit at a cost.

Dynamic loan incentive, in this way, works as a successful enforcement mechanism for the micro-finance institution (Godquin, 2004; Abbink et al., 2006). Established literature (Petersen and Rajan, 1994; Berger and Udell, 1995; Boot, 2000) suggests

that relationship banking, involving repeat lending to the same borrower, helps to reduce information asymmetries and lowers loan spreads. In the study of Diagne et al. (2000), the most important factor inciting lending groups to repay is dynamic incentive or the future credit they can access. Interestingly, we come across one study which reported that repeat loans were not significant to affect repayment (Ndanitsa et al., 2011).

Micro-credit is small and typically short-term in nature whose achievement is its success in providing uncollateralized loans with relatively low default rates. Micro-lending is growing as a flexible means of widening access to financial services, both to help alleviate poverty and to encourage private-sector activity. It is viewed as a policy innovation enhancing the repayment probability of loans (Buera et al. 2012). Micro-credit can be viable, if mechanisms are in place enforcing the self-selection of potential borrowers and self-motivation of existing borrowers. Various theories have been proposed to its success like joint-liability lending (Besley and Coate, 1995), high-frequency repayment (Jain and Mansuri, 2003; Fischer and Ghatak, 2010) and dynamic incentives (Armendariz and Morduch, 2010). Loans issued on terms of joint liability have lower administrative costs.

Although empirical tests of the relative importance of these alternative mechanisms have not produced an unambiguous answer as to what leads to high repayment rates (Ahlin and Townsend, 2007; Field and Pande, 2008; Gine and Karlan, 2010; Carpena et al., 2010; Attanasio et al., 2011), there have been numerous studies which attempt to highlight the determinants of repayments. The mechanism of lending involves implementation of innovative processes which can meet the challenges of information asymmetry, adverse selection, moral hazard and contract enforcement. The potential for moral hazard leads MFIs to use innovative mechanisms, such as regularly scheduled repayments. The role of dynamic incentives in improving repayment in micro-finance has been tested in various studies. The mechanisms that allow micro-lending to successfully penetrate new segments of credit markets include direct monitoring, regular repayment schedules, and the use of non-refinancing threats. These mechanisms allow the programmes to generate high repayment rates from low-income borrowers without requiring collateral and without using group lending contracts that feature joint liability.

Studies have been conducted to find out predictors of repayment. As most of the information about the applicant in micro-finance is soft in nature, it poses a great challenge to find these predictors. These are demographic characteristics like age, gender or literacy status of a micro-credit borrower or behavioral traits like past track record of previous loans, over-indebtedness etc. which influence repayment performance. Sometimes, even exogenous factors like political intervention in terms of frequent announcements of loan amnesty and large interest cuts further created incentives to default; hope of a future loan amnesty program even incentivized creditworthy borrowers not to repay their loans. The primary objective of Micro-finance Institutions (MFIs) is to provide financial services to the poor in order to dampen financial constraints and help alleviate poverty. Each MFI tries to maximize its repayment performance, whether or not, it is profit oriented. High repayment rates are indeed largely associated with benefits both for the MFI and the borrower. Screening of credit worthy borrowers, i.e. to differentiate between "good" and "bad" borrowers, is the first and the most important step in avoiding or reducing the problem of delinquency. Screening can be done either by subjective appraisal or by applying quantitative techniques like credit scoring.

2.4 Research Gaps

Broadly the review of existing literature in the field of micro-finance with specific focus on repayment performance led to the identification of the following research gaps:

- Number of studies on various aspects like impact, efficiency and other empirics of micro-finance have been conducted in India and elsewhere, but there are very few studies on the predictors of repayments in India.

- Individual variables have been studied as determinants of repayment performance in micro-finance and such literature is available. Even NABARD and MFIs use credit scoring based on group dynamics. But no model has been developed to screen the borrowers who can be group members to reduce credit risk.

- Role of credit scoring in micro-finance and its development as a screening tool have been studied in countries like Bolivia, Burkina Faso etc. but we have not come across any study with an objective of development of credit scoring methodology in India.

2.5 Research Objectives:

The review of the existing literature helped to gain insight into the depth of knowledge already existing in this field of micro-finance. At the same time, it also helped to identify gaps in the extant literature. In the backdrop of research gaps identified during review of literature, the specific objectives of the current research are:

- To get insight of factors responsible for informal financial sector's repayment performance.
- To identify predictors of repayment in micro-finance.
- To propose and develop a credit scoring methodology for assessment of micro-finance borrowers.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The purpose of our research was to identify attributes influencing recovery in money lending and factors affecting recovery in micro-finance.

At first stage, two rounds of focus group interview and experts' opinion poll was conducted. At second stage we performed survey research with the sampling elements as micro-finance borrowers.

3.2 Research Design and Methodology

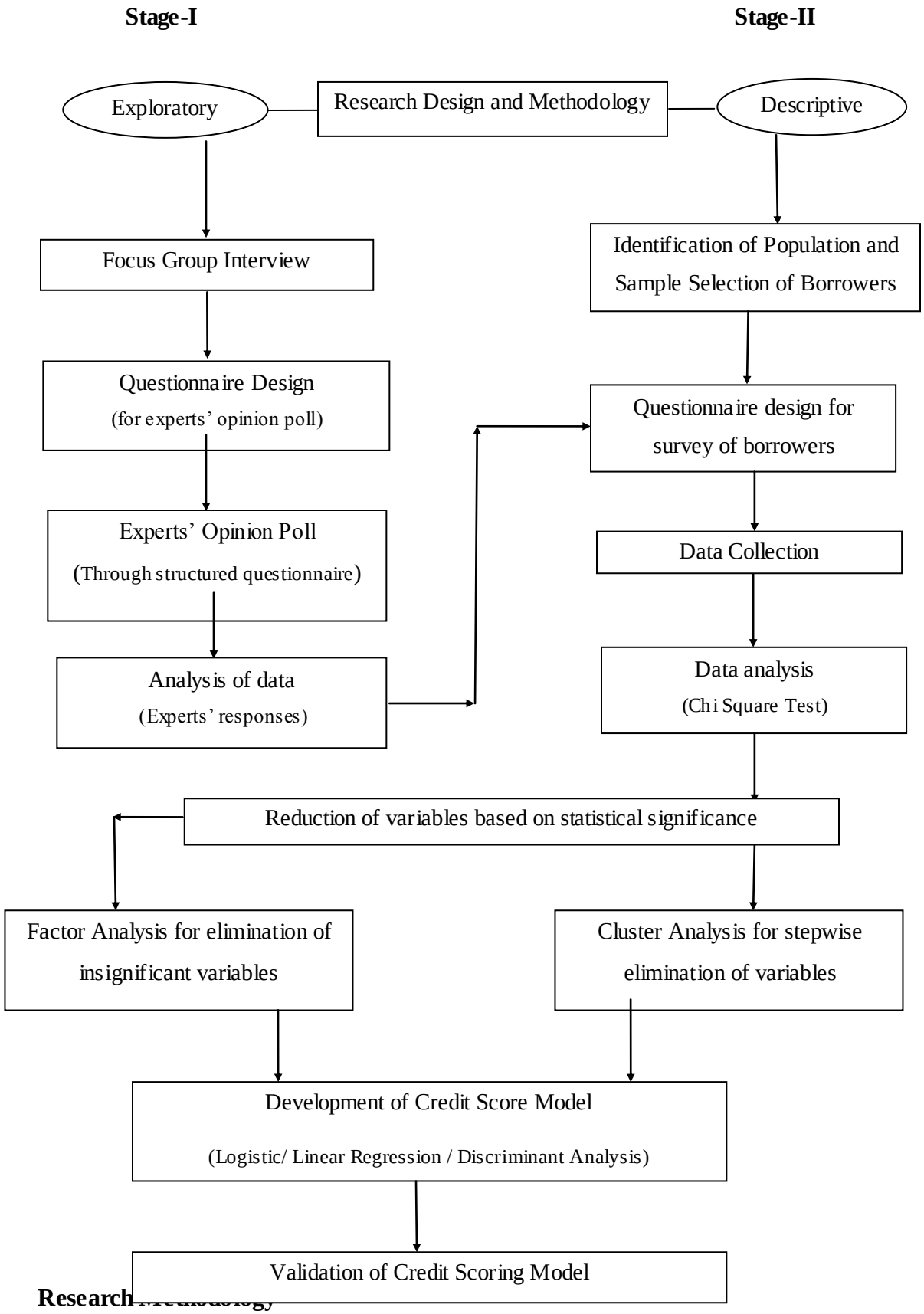
Research Design

In our study a combination of exploratory research and descriptive research design was used to facilitate empirical exploration of the research questions. The exploratory study was designed at the initial stages of the research in order to better comprehend the nature of the problem. This part of the study was concerned with identifying key performance variables/parameters of recovery as perceived by professionals who had played active role in policy formulation, delivery and monitoring of credit delivery under micro-finance. The exploratory study was undertaken with a view to understand experts' view on recovery in money lending and their perspective on various factors that affect recovery in micro-finance. The purpose of understanding the reasons of higher rate of recovery in money lending, which continues to be the prominent source of credit at grassroots, was to understand their relevance for strengthening the effectiveness of micro-finance.

Further descriptive design in the study was applied to establish a relationship between factors affecting recovery in micro-finance with an objective to develop a credit scoring methodology for assessment of micro-finance borrowers. Borrowers were surveyed and the data collected relate to the demographical or the behavioral variables of borrowers of micro-finance.

A diagrammatic representation of the framework for research is provided in Fig 3.1.

Fig.- 3.1- A Diagrammatic Representation of the Framework for Research



3.2.1. Exploratory Study

Exploratory study constituted focus group interview and experts' opinion poll (survey based research). For the purpose of focus group interview we adopted judgmental, purposive and expert sampling method. The experts had either been involved in delivery of micro-credit or influenced the policy regulating/supervising of micro-finance. The experts for exploratory study were selected from the following institutions:

- Public Sector Banks (PSBs),
- Private Sector Banks (Pvt.SBs),
- Cooperative Banks,
- Regional Rural Banks (RRBs),
- Regulators (Indian Civil Services, Reserve Bank of India and NABARD),
- Micro-finance Institutions (MFIs)
- Block Development Officers (BDOs)

The rationale and reasons for selecting experts from above mentioned categories are as under:

- Banks and MFIs are directly responsible for delivery of micro-finance.
- Block Development Officers act as facilitators for mobilization of poor under various government sponsored schemes and also screen the applicants at their end in terms of eligibility.
- Regulators are responsible for policy making and monitoring of performance under micro-finance.

These experts had 10 or more years of experience in micro-finance field. The experts from public sector banks and regional rural banks were serving in senior and top management cadre.

Other stakeholders like local political leaders, social activists were not considered, as they have proximate relations to the borrowers and their opinions may be biased.

3.2.1.1. Focus Group Interview:

The focus group interview was conducted at Lucknow in a very informal ambience with one expert each from above referred seven categories. This process was repeated for second round of focus group interview with seven new participants, one from each category. The interview process was moderated by the researcher himself.

The focus group interview started with an engagement question and ended with exit question. The purpose of engagement question was to introduce participants to make them comfortable with the topic of discussion. The insight gained from extensive literature survey was used to start discussion. Exit question was posed to check, if anything was missed in the discussion. The discussion evolved around mainly two topics: one to 'explore reasons for better recovery in money-lending' and second 'to identify ways and means to improve repayment in micro-credit'. Entire round of focus group interview was completed in a congenial atmosphere with free-flow of information. The responses were scribbled down by the researcher. The focus group interview was unstructured and was exploratory in nature. Findings of focus group interviews were used as a guiding factor for designing the questionnaire to conduct experts' opinion poll. No recording was done in order to facilitate free and candid flow of opinion during the discussion.

3.2.1.2. Expert Opinion Poll:

Based on responses received during focus group interview as well as on the basis of review of literature, a questionnaire was designed to get experts' opinion from a sample consisting of 298 participants drawn from various categories as mentioned earlier. The objective was:

- To identify important predictors for repayment in micro-finance and
- To identify the factors responsible for better recovery rates in money lending.

We approached a total of 350 experts out of which 250 were approached in person and remaining 100 persons were contacted through mail. We received responses from 236 out of 250 experts approached personally and 62 responded by email/post. In all 298 responses from experts were received.

Snow-ball sampling technique was used to get the responses from the experts. Snowball sampling is defined as a technique for gathering research subjects through the identification of an initial subject (respondent) who was used to provide the names of other experts. The technique offers advantage in terms of access to the category of experts who are not easily accessible. Experts were identified for inclusion in the sample by referral from other experts. This technique was very helpful in getting responses from experts. The breakup of experts from different identified institutions is given in Table 3.1.

Table 3.1- Distribution of Experts by Profession

Participants from	**Number**	**Percentage (%)**	**Percentage of Experts amongst Micro-lenders**
Public Sector Banks	96	32.2	41.56
Private Sector Banks	27	9.1	11.69
Regional Rural Banks	49	16.4	21.21
Cooperative Banks	48	16.4	20.78
MFIs	11	3.7	4.76
Sub Total (Micro-lenders)	**231**	**77.5**	**100**
Block Development Officials	40	13.4	
Regulating Bodies	27	9.1	
Total	**298**	**100**	

Out of total 298 experts who participated in survey 231 experts (77.5% of total experts) belong to lending institutions comprising of banks and MFIs. Remaining 67 (22.5% of total experts) were part of organizations facilitating or regulating micro-finance viz. block development officials and official from NABARD and Indian Administrative Services. Banking Sector (public sector, cooperative sector and regional rural banks) is still the main source of credit to poor and specially those who belong to rural background. As on March 2010, the outstanding amount of SHG Loans was Rs.20165 crores for public sector banks, Rs.6145 crores for regional rural banks and Rs.4851 crores for cooperative banks (NABARD, 2009 and 2010). Thus public sector constituted majority of lending in the form of self-help groups. Therefore the experts are comparatively higher in numbers from banking sector.

3.2.1.3. Designing of Questionnaire:

Experts were given a questionnaire which had two parts: One on factors responsible for better recovery performance in money-lending and other on the variables influencing recovery performance in micro-finance. In the first part of the questionnaire, experts were asked to rank factors in term of their comparative importance. The factors affecting recovery in money lending along with their coded names used in statistical analysis are mentioned in Table 3.2.

Table 3.2- Factors Affecting Recovery in Money Lending

Factor	Variable Name
Ease of getting loan	Var_EOGL
Promptness in getting loan	Var_Prompt
Availability of repeated loan	Var_Availability
Use of social influence for recovery	Var_UseS
Use of muscle power for recovery	Var_UseM
Availability of better information about the borrower	Var_Deeper
Threat of social outcast in case of non recovery	Var_Threats

Experts were requested to provide their rank order about various attributes, as mentioned in the Table 3.2, affecting recovery in money lending. These attributes were taken for study based on literature survey and qualitative findings of focus group. The experts were asked to rank each attribute with respect to other attributes in terms of its impact on recovery. The descriptive statistics was analysed and factor analysis was performed to observe underlying structure among attributes. Van Voorhis and Morgan (2007) in their paper suggest the sample size of 300 as reasonable for factor analysis. In our study, responses were received from 298 experts, a number which could be considered as a reasonable size of sample for factor analysis.

The second part of the questionnaire was on getting the experts' perception on the variables influencing recovery performance. These variables are listed in Table 3.3.

Table 3.3- Variables Affecting Recovery in Micro-Finance (Experts' Survey)

Variable	Variable Name
Age	Var_Age

Gender	Var_Gen
Literacy (reading and writing ability)	Var_Lit
Period of stay at same place	Var_Per
Marital Status	Var_Mar
No. of Kids	Var_Kid
Concern for Kids education	Var_Edk
Concern for Girls education	Var_Edg
Ownership of a house	Var_Hou
Ownership of agriculture land	Var_Agr
Attitude towards family planning	Var_Fpl
Past track record of repayment	Var_Rep
Purpose of loan	Var_Pur
Distance from bank	Var_Dis
Opinions about applicant from existing borrowers	Var_Opn
No. of dependents	Var_Dep
Period of engagement in the same activities.	Var_Emp
Eligibility for action under State Recovery Acts.	Var_Sra
Opinion of reputed persons of the area to which applicant belongs	Var_Op2
Existing indebtedness of borrower	Var_Deb
Availability of collateral	Var_Col
Involvement of spouse in earning activity	Var_Spo
Availability of Subsidy	Var_Sub
Engagement in Self Employment	Var_Ent
Availability of Personal Guarantee	Var_Pgu

Experts were asked to provide their perception on the variables listed in the questionnaire in terms of their influence on recovery in micro-finance. The choices for response were neutral, important or very important. These variables were selected from the insights gained from literature review as well as from focus group interview.

3.2.2 Descriptive Study

Our research consists of a cross-sectional study, which examines many micro-finance borrowers at one specific time. The objective of our study was to identify variables (demographic or behavioral) of micro-finance borrowers which can help a lender to predict the chance of default.

3.2.2.1 Identification of Research Population:

Descriptive research was used so as to describe the characteristics or behaviors of Micro-finance borrowers. A critical part of the methodology that is important for both the qualitative and the empirical study discussed here was the choice of geographical area for the research. We first look into the reasons behind choosing the geographical area for the study.

Rationale for choosing districts of Uttar Pradesh for Study

Uttar Pradesh was chosen as the state for this research. The choice was made due to multiple reasons. Uttar Pradesh is also the most populous state of the country where micro-finance industry has great business opportunity. As per the 'Micro-finance India: State of the Sector Report 2010 and 2011', Uttar Pradesh ranked in the last five states in terms micro-finance Poverty Penetration Index (MPPI). MPPI was derived by dividing the share of the state in micro-finance clients by the share of the state in population of the poor. A value of MPPI more than 1 indicates that groups mobilized were more than in proportion to the poor population. Higher the number above 1, better the performance. Comparative ranking of bottom five states in terms of MPPI are given in Table 3.4. If one looks analytically, in last two years there are only three states viz. Uttar Pradesh, Jammu & Kashmir and Bihar that remained amongst bottom five states in terms of MPPI. However Uttar Pradesh and Jammu and Kashmir are the two states whose MPPI is almost same while Bihar has improved its MPPI from 0.14 to 0.30.

As Jammu and Kashmir has its distinct socio-political issues and Bihar has improved significantly, we focused our research on Uttar Pradesh. Besides, Uttar Pradesh is one of the states having least rural household coverage (0-20%) under SHG-Bank linkage programme (NABARD, 2011).

Table 3.4- Micro-finance Poverty Penetration Index (MPPI) for Bottom Five States

Year 2010		Year 2011	
State	**MPPI**	**State**	**MPPI**
Jammu and Kashmir	0.13	Mizoram	0.11
Bihar	0.14	Jammu and Kashmir	0.15

Punjab	0.22	New Delhi	0.24
Madhya Pradesh	0.27	Bihar	0.3
Uttar Pradesh	0.32	Uttar Pradesh	0.31

Source: Micro-finance India: State of the Sector Report 2010 and 2011.

Uttar Pradesh has been classified under Central region by NABARD in its report and the region has highest percentage of non-performing loans at 10.74% (non-performing SHG loans to total SHG loans). It is evident from the data that Uttar Pradesh has tremendous potential in terms of micro-credit but failed to exploit this business opportunity. The reason may be the delinquency in the existing portfolio which might have made proposition unattractive to the formal financial institutions with the commercial outlook. This provides an opportunity to explore the reasons and devise a tool to discriminate good borrowers out of total borrowers.

Thus, selection of Uttar Pradesh was judgmental; the judgment was based on the above-mentioned rationale. Besides the above noted reasons, the researcher's familiarity (his 14 years of banking experience in Uttar Pradesh out his total work experience of 21years) with the geography and acquaintances in the various echelons of stakeholders made easy accessibility to experts.

Descriptive study was conducted in the four districts of Uttar Pradesh namely, Sitapur, Lakhimpur, Gonda and Raebarely. These were selected from Central and Eastern regions of the state. These two regions constitute 76% of total districts classified as medium developed, low medium developed or most backward in terms of composite development index (Diwakar. 2009). Population living below poverty line in these districts constituted above 30% against state average of 29.85% (Government of Uttar Pradesh, 2009). The borrowers, defaulters and non-defaulters, who have availed micro-finance from banks, were selected from these districts.

3.2.2.1.1 Sampling

After identifying the research population, we adopted a mix of judgmental and random sampling. Sampling was judgmental to the extent that, we selected only the lead bank of respective districts as sampling units. Further, the sample elements i.e. micro-finance borrowers were chosen randomly.

First we approached the controlling officer of the lead bank to seek his support for getting the responses from the borrowers. With the help of controlling officer we picked 10 bank branches in each district. Till this point it has been a judgmental approach where the knowledge and rich experience of the controlling officer was used for facilitation. After finalization of branches, researcher approached the branch heads of identified branches and the two self-help groups (SHGs) from performing and non-performing categories each were selected from the loan book of each bank branch. The members of selected SHGs were approached by researcher with the support of sub-staff of the local branch. The selection of SHGs was done using random sampling. We got responses from 67 performing self help groups (728 non-defaulters) and 24 non-performing self help groups (297 defaulters).

The ratio of non-defaulters versus defaulters in our study stood at 2.45:1 against a range of 0.8:1 to 9.0:1 observed in various studies as mentioned in Table 3.5. Table 3.5 summarizes the algorithms and data conditions of sample sizes and sample balances from a structured literature review of academic publications which have employed multiple comparisons of credit scoring algorithms and methodologies (our study also employs comparison of multiple techniques).

3.2.2.1.2 Designing of questionnaire

The questionnaire was designed on the basis of insights gained from experts' opinion poll as well as from review of literature. The questionnaire was first designed using English language and was later translated into Hindi. It was then verified by Rajbhasha Adhikari (Officer-Official language) of a Public Sector Bank.

Table 3.5- Summary of Algorithms and Sample Size used in Various Studies

Study	Methods[1]						Dataset and samples				
	LDA	LR	NN	KNN	CART	Other	Data sets	Good cases[2]	Bad cases[2,3]	Goods : bads	Indep. Vars.
Boyle, Crook,	X				X	hyb.	1	662	139	4.8:1	7 to 24

Hamilton, and Thomas 1992						LDA					
Henley (1995)	X	X		X	X	PP, PR	1	6851	8203	0.8:1	16
Desai, Conway, Crook, and Overstreet (1997)[4]	X	X	X			GA	1	714	293	2.4:1	18
Arminger, Enache, and Bonne (1997)	X	X	X				1	1390	1294	1.1:1	21
West (2000)	X	X	X	X	X	KD	2	360	270	1.3:1	24
								276	345	0.8:1	14
Baesens et al. (2003)	X	X	X	X	X	QDA	8	466	200	2.3:1	20
						BC		455	205	2.2:1	14
						SVM		1056	264	4.0:1	19
						LP		2376	264	9.0:1	19
								1388	694	2.0:1	33
								3555	1438	2.5:1	33
								4680	1560	3.0:1	16
								6240	1560	4.0:1	16
Ong, Huang, and Gwo-Hshiung (2005)	X	X	X	X	X	GP, RS	2	246	306	0.8:1	26
								560	240	2.3:1	31

1 BC = Bayes Classifiers, CART = Classification and Regression Trees, GA = Genetic Algorithm, GP = Genetic Programming, KD = Kernel Density, KNN = K-Nearest Neighbour, LDA = Linear Discriminant Analysis, LP = Linear Programming, LR = Logistic Regression, NN = Neural Networks, QDA = Quadratic Discriminant Analysis, PP = Projection Pursuit, PR = Poisson Regression, RS = Rough sets, SVM = Support Vector Machines.

The variables identified for the survey research from the focus group interviews and reviews of literature, were coded into questions which directly or indirectly answer the characteristics of the borrowers. Questionnaire had a mix of categorical and open ended questions. These responses were meant to discriminate defaulters from non-defaulters. The questionnaire was administered by the researcher himself through discussion with the members of each SHG. The sub-staff of the branch (peon or part-time sweeper who had a long stint with the branch) helped in locating the SHGs. The

responses received from members were noted down on the printed questionnaire. The variables which were inferred from the questionnaire are coded as under in Table 3.6.

Table 3.6- Variables Affecting Micro-finance (Borrowers' Survey)

Variable	Variable Name
Gender	V_Gen
Age	V_Age
Period of stay at same place	V_Res
Marital Status	V_Marital
No. of Kids	V_Kids
Concern for Kids education	V_KidsEdu
Concern for Girls education	V_GirlsEdu
Ownership of a house	V_House
Frequency of meeting of group members	V_Meeting
Average distance between members of group	V_DistMembers
Group constituted by	V_ConstdBy
Number of family members in a group	V_Family
Employment before availing loan	V_Empl_Bf_Loan
Employment after availing loan	V_LevelBussAftLoan
Experience of borrower	V_Exp
Average distance between bank and borrower	V_DistanceBank
Purpose of loan	V_Purpose
Level of diversion of funds	V_Diversion
Previous access of loan from money lender	V_LoanML
Default on repayment of loan obtained from money lender	V_DefaultML

3.2.2.1.3 Techniques used for Data Analysis

The responses were coded in binary values i.e. 0 and 1. Each response was assigned the value based on the judgment of the researcher. The predictor which was perceived to be enabler of recovery was assigned 1 or otherwise 0.

These binary coded responses were analysed for each of the variable to get their significance in terms of two groups namely defaulters and non-defaulters. Insignificant variables were dropped from the list for further analysis. Significance of each variable was checked using Chi-square test. Three most insignificant variables were dropped from the list for further analysis. After identifying significant variables, following statistical techniques were used on these variables with two objectives: one

to identify variables to be used as predictors of default and second to develop a credit scoring methodology for assessment of micro-finance borrowers. Step-wise illustration of research process undertaken in our study is given in Table 3.7.

Factor Analysis

We introduce factor analysis as our first multivariate technique because it can play a adjunct role in the application of other multivariate techniques. Factor analysis provided a tool for analyzing the structure of interrelationships (correlations) among a large number of variables by defining sets of variables that are highly interrelated. With the reduced set of variables (17), we performed the factor analysis to get an insight for further data reduction and unloaded variables were to be considered for elimination.

Cluster Analysis

We performed cluster analysis subsequent to factor analysis on the variables considered for further analysis. Cluster analysis is a major technique for classifying information into meaningful subgroups. A cluster is a group of relatively homogeneous cases or observations. Hierarchical cluster analysis is the major statistical method for finding relatively homogeneous clusters of cases based on measured characteristics. Agglomerative hierarchical cluster analysis starts with each case as a separate cluster, i.e. there are as many clusters as cases. It subsequently combines the clusters sequentially, reducing the number of clusters at each step until only one cluster is left. The clustering method uses the dissimilarities or distances between objects when forming the clusters.

As Formann (1984) recommends rough estimate for a sample size of at least '2^m' where 'm' equals the number of clustering variables, we aimed to reduce the number of independent variables to achieve simplicity in model without compromising effectiveness.

Table 3.7- Framework of Research
Research Type- Empirical based on primary data

Research Design	Methodology	Experts	Area of Study	Sampling	Sample Size	Tools & Techniques	Findings
Exploratory	Focus Group Interview- 2 round	Experts	Uttar Pradesh	Judgmental & Purposive	7	Observation, Compilation of responses	Inputs for experts' opinion survey.
	Expert Opinion Survey	Experts			298	Factor Analysis, Descriptive and ANOVA	Important dimensions of money-lending enabling better recovery and Predictors of recovery in micro-finance.
Descriptive	Borrowers' Survey	Borrowers	Uttar Pradesh	Judgmental & Random	1025	Chi-Square, Cluster analysis, Logistic, Linear Regression and Multivariate Discriminant Analysis	Identification of significant variables, Level of Effectiveness in distinguishing defaulters and non-defaulters, Development of models on three techniques namely Logistic, Linear Regression and Multivariate Discriminant Analysis

We eliminated variables stepwise from 17 to 10 by analyzing various combinations of variables in terms of their discriminating power by performing a number of cluster analyses. We stopped performing cluster analysis at 10 variables. Reduction of variables not only improved the results but also offered simplicity in terms of implementation.

Logistic Regression

Logistic regression has several similarities with linear regression. Logistic regression coefficients are analogous to beta coefficients in the linear regression equation, the

standardized logit coefficients are analogous to beta weights, and a pseudo R^2 statistic is available to summarize the strength of the relationship. Logistic regression does not assume linearity of relationship between the independent variables and the dependent variables. It does not require normally distributed variables, does not assume homoscedasticity, and in general has less stringent requirements than linear regression. It can be performed on dichotomous independent variables whose outcome as dependent variable is also dichotomous.

We performed a logistic regression on the sample for each combination of variables selected under cluster analysis to observe the effectiveness of the model. Logistic regression (LR) is a form of generalized linear model.

Logistic regression has the ability to predict default probability of an applicant and indentify the variables related to his behavior. The regression equation of Logistic regression is:

$$\text{In}\,(p/(1-p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_n X_n \qquad (1)$$

Where $x_1 \ldots . x_n$ represent independent variables and $a_1 \ldots \ldots a_n$ indicate logistic regression coefficients for *n* variables.

The probability p obtained by Equation (1) is a bound of classification. The customer is considered non-defaulter if it is larger than 0.5 or defaulter on the contrary.

Multiple Linear Regression

Multiple Linear Regression analysis is used to arrive at a score which can distinguish between defaulters and non-defaulters reasonably well. Multiple regression analysis is a statistical technique that allows us to predict applicant's score (dependent variable or criterion variable) on the basis of their value based on several other variables (independent variables or predictor variables). Multiple regression analysis helps us in identifying a set of predictor variables which together provide a useful estimate of a applicant's likely score on a criterion variable.

We performed linear regression on binary inputs and tried to get a score for predicting a chance of default.

Multiple Discriminant Analysis

Multiple Discriminant Analysis was also performed to develop a credit scoring model. Cross-validation was performed by the software by leaving one data point at a time and then predicting the membership of each data points. Discriminant analysis is used to classify observations into two or more mutually exclusive groups using the information provided by a set of predictors (analogous to independent variables in regression). The linear discriminate function is as under:

$$LDF = a_0 + a_1x_1 + a_2x_2 + \ldots\ldots a_nx_n \quad (2)$$

Where $x_1 \ldots x_n$ represent independent variables and $a_1 \ldots\ldots a_n$ indicate discrimination coefficients for *n* variables.

Conclusions

Research design provides a framework for collection and analysis of data. An efficient research design is necessary for accurate results. Empirical research has been done on primary data collected directly from the field. The research design is broadly subdivided into two categories, namely Exploratory and Descriptive.

Under Exploratory Design, two methodologies have been followed. The first one involves two rounds of focus group interview and the second one comprises of experts opinions survey. Experts were mainly the experts from the concerned domain. A sample size of 7 was used for focus group interview and 298 for experts' opinion survey. The area of study is Uttar Pradesh and judgmental and purposive sampling has been used. Inputs for experts' opinions survey were obtained from focus group interview. Important dimensions of money–lending were obtained from experts' opinion survey which could lead to better recovery in micro-finance. Experts' survey has also provided input for predictors of default in terms various attributes of borrowers and other variables.

Under descriptive research design, borrowers' survey was conducted. The sampling used here is again judgmental and random. A sample size of 1025 borrowers was studied. As a result, significant variables were identified and their effectiveness in separating defaulters from non-defaulters was analysed for development of a credit

scoring methodology for assessment of micro-finance borrowers with the application of three techniques namely Logistic, Linear Regression and Multivariate Discriminant Analysis.

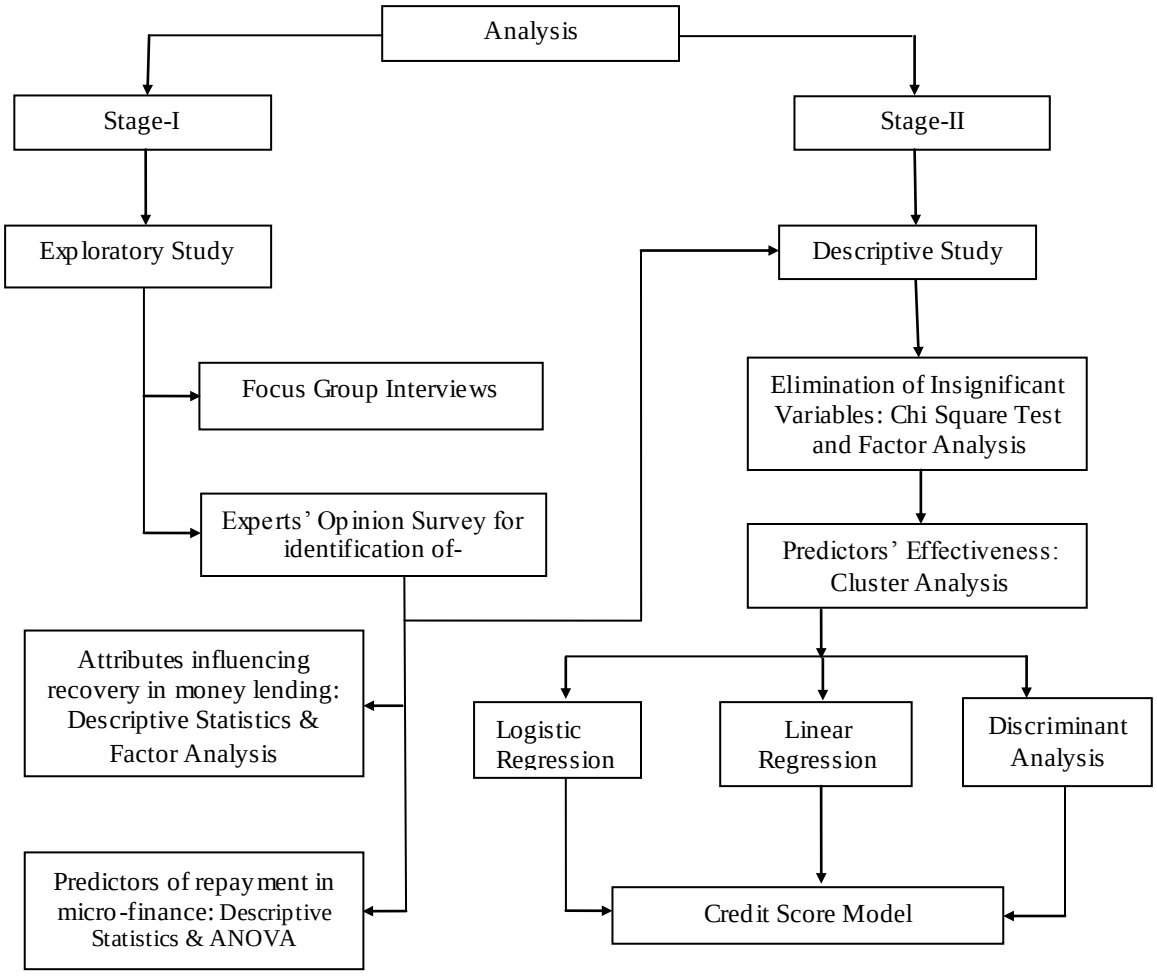
CHAPTER-4

ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents results of the detailed analysis of the surveys conducted for exploratory and descriptive study. The purpose of study was to develop an effective methodology to screen prospective micro-finance borrowers for credit decision by MFIs. The analysis involves various tools and techniques to critically examine various factors responsible for better recovery rates in money lending and identifying various variables affecting recovery in micro-finance. Finally, after analyzing the role and relationship of variables as predictors for credit-worthiness of micro-finance borrower, a methodology for credit scoring has been proposed. A flow-diagram explaining different stages of study is provided as follows:

Fig. 4.1- Flow Chart of Data Analysis



4.2 Exploratory Study

At the outset two rounds of focus group interviews were conducted with experts to gain an insight about the attributes which influence recovery rates in money lending. Experts' opinion poll was collected for study from the functionaries belonging to seven different institutional categories namely public sector banks, cooperative banks, regional rural banks, private sector banks, micro-finance institutions, block development officers and regulators.

Experts' perspective on recovery in money-lending

The two separate rounds of focus group interviews were conducted with different experts. A consensus emerged among experts about the factors that influence recovery prospects in money lending. These are:

- Collateral
- Guarantee, if any
- Ease in documentation and processing of loan
- Availability of loan without undue delay
- Social Pressure
- Availability of information about the conduct and habits of the prospective borrower
- Assurance of repeated loan
- Access to consumption and emergency loan
- Recourse to use of force in case of default
- Fear of social ostracism

Out of above-mentioned factors highlighted by the experts, the collateral and guarantee were not considered for further study as the aim of the study was to find out attributes which in turn may be incorporated in micro-credit products. Micro-credit is generally collateral free except where immovable assets created out of group loans or when micro-credit is for housing.

In the next stage of the exploratory study, an opinion poll of experts (n=298) was conducted in terms of their perceptions about the degree of importance of seven

attributes finalized in the earlier focus groups interviews. The experts were asked to rank the following attributes of recovery rates in money lending provided by indigenous moneylenders:

- **Ease of getting loan**

It is often observed that getting loan from any formal financial institution involves a lot of paper work whereas obtaining loan from money lender requires minimal documentation. Ease of getting loan is defined here as ease in completing formalities and documentation to avail loan and the intent of this was explained to experts.

- **Promptness in getting loan**

Getting loan in time is considered to be important for micro finance borrowers as they may not have alternative source of finance. Promptness in getting loan is related to time taken by the financier to disburse the loan, once the formalities have been completed by the applicant. If the loan is sanctioned without undue delay it is considered that the loan has been disbursed promptly.

- **Availability of repeated loans**

Availability of repeated loan is a kind of dynamic incentive to a borrower. This implies that on recovery of a loan, borrower becomes eligible for future loan and in certain situation on better terms and conditions.

- **Use of social influence for recovery**

Use of social influence is defined in our research as making use of influence of opinion leaders and influential persons of villages like sarpanch or pradhan, social activists, doctors or others whose say has an influence in the village of the borrower.

- **Use of muscle power for recovery**

The intimidation of a victim to compel the individual to do some act against his or her will by the use of psychological pressure, physical force, or threats can be defined as coercive action. Use of power and pelf for recovery through coercive measure may force individuals to repay. Whether or not the use of muscle power for recovery in

case of default plays any role in improving recovery rates in money lending, was also considered for comparative ranking as an attribute.

- **Availability of better information about borrower**

Information asymmetry deals with the study of decisions in transactions where one party has more or better information than the other. Indigenous moneylenders being proximate to borrowers do possess better and deeper information about the borrower as compared to formal lending institutions. Does this attribute play an important role in improving recovery rate in money lending? The attribute was ranked in terms of importance by the experts.

- **Threat of social ostracism in case of non-recovery**

Ostracism means being excluded from society - depending on the context, it might mean people would not speak to you, or not serve you in shops, not work with you, not allow you to take part in such things as group activities, etc. Use of ostracism is a very extreme situation and ostracized people feel isolated and lonely. They often become less active physically and emotionally. We have also sought experts' opinion on the importance of this attribute in recovery as the attribute was also discussed during focus group interviews.

Each expert was explained the purpose of the study. They were explained each of the above mentioned attributes and were asked to rank them in order of their influence on recovery. The experts were requested to assign a rank of 1 to the factor that they feel most important amongst all and to second most important 2 and so on. The least important factor was to be assigned rank of 7.

4.2.1 Data Analysis and Interpretation of Experts' Opinions

The rank assigned to each attribute was given a rank value. The rank of 1 was given rank value of 7 and rank 2 was given the rank value of 6 and so on. Thus the attribute which was assigned rank value of 7 was considered to be most important and the attribute which was assigned rank value of 1 was considered to be least important. The outcome of analysis of the data collected through structured questionnaire survey is presented in Tables 4.1a and 4.1b. The rank-value of each attribute in terms of

importance of all the experts together is provided in Table 4.1a, whereas group-wise analysis of responses is provided in Table 4.1b. The responses of all experts were analysed on the basis of their cumulative responses for each of the attributes. Through analysis of data we have identified attributes in order of importance. The attribute which had received rank value of 7 by maximum number of experts was ranked as of carrying rank value of 7. Thereafter the attribute which had been ranked as 7 was eliminated and remaining six attributes were analysed and the attribute receiving 6 by highest number of experts was considered to carry rank value of 6. This way we found the order of importance of each attribute by experts considered in totality. The process was non-compensatory as it did not account for variation of responses in terms of rank value for each attribute. The same process was repeated for each group of experts. Responses of experts are analysed and discussed as follows:

Ease of getting loan

Out of 298 experts 150 (50%) experts have given rank value of 6 and 7 to ease of getting loan implying that it is one of the most important attributes for better recovery. The attribute was ranked as of highest importance by 75 experts out of 298 experts. Except BDOs all other categories of experts have ranked this attribute either most important or second most important. ***While designing a credit product for micro-finance the procedural ease in completing the documentation must be considered.***

Promptness in getting loan

199 out of 298 experts have ranked this attributes above the middle rank value 4. Moreover 134 (45%) experts have ranked it either 6 or 7. This indicates the importance of this attribute. While analyzing the category-wise responses of experts it is observed that experts from PSBs have ranked this attribute as of least importance, while all other categories of experts ranked 5 and above.

Continuous supply of loan applications might have created an impression in the minds of PSB's experts that the promptness in getting loan application does not have much impact on repayment performance.

Table 4.1a- Importance Wise Frequency Distribution of Attributes of Recovery in Money Lending

Rank Values	Ease of getting Loan		Promptness in Getting loan		Availability Of repeated Loan		Use of Social Influence for recovery		Use of Muscle Power For Recovery		Availability Of deeper Information		Threats Of Social Ostracism in Case of Non-Recovery	
	N	%age	N	%age	N	%age	N	%age	N	%age	N	%age	N	%age
1	23	7.72	17	5.70	10	3.36	27	9.06	***96***	***32.55***	19	7.05	106	35.23
2	21	7.05	26	8.72	15	5.03	40	13.42	60	19.8	52	17.45	***84***	***28.52***
3	26	8.72	23	7.72	43	14.43	***91***	***30.54***	29	9.4	48	16.11	38	12.75
4	44	14.77	33	11.07	48	15.77	43	14.43	30	10.4	***72***	***23.49***	28	9.4
5	34	11.41	65	21.81	***103***	***34.56***	30	10.07	16	5.37	36	12.08	14	4.7
6	75	25.17	***73***	*24.50*	49	16.44	45	15.1	16	5.03	21	7.05	19	6.04
7	***75***	***25.17***	61	20.47	30	10.4	22	7.38	51	17.45	50	16.78	9	3.36
Total	**298**	**100**	**298**	**100**	**298**	**99.99**	**298**	**100**	**298**	**100**	**298**	**100.01**	**298**	**100**
Mean rank value	**4.91**		**4.90**		**4.63**		**3.78**		**3.21**		**4.06**		**2.51**	

Fig. 4.2- Mean Rank Value of Attributes

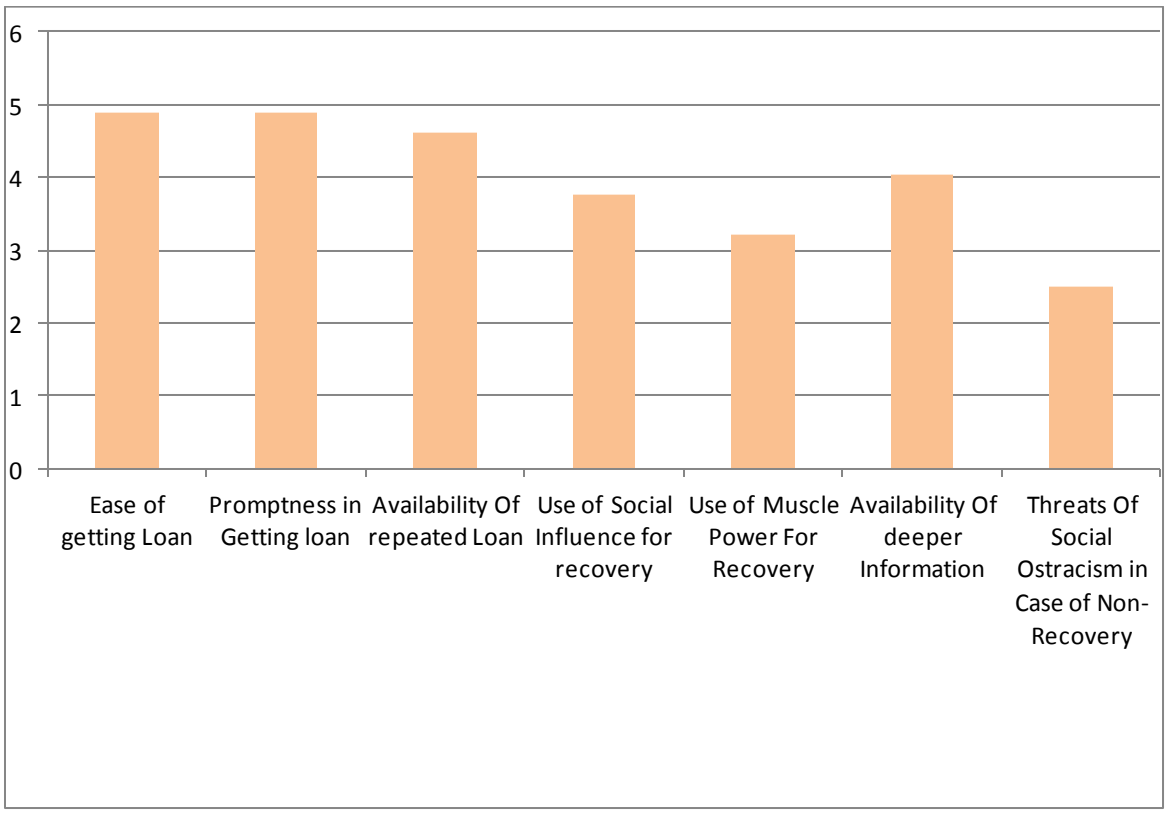


Table 4.1b- Experts' Category Wise and Importance Wise Frequency Distribution of Attributes of Recovery in Money Lending

Job Profile	Ease of getting Loan	Promptness in Getting loan	Availability of repeated Loan	Use of Social Influence for recovery	Use of Muscle Power for Recovery	Availability of deeper Information	Threats of Social Ostracism in Case of Non-Recovery
BDO	4	5	3	6	**1**	7	**2**
COOP	**7**	**6**	**5**	**3**	2	**4**	1
PSB	6	1	**5**	**3**	7	**4**	**2**
RRB	**7**	**6**	**5**	4	**1**	3	**2**
Reg	6	7	**5**	**3**	**1**	**4**	**2**
MFIs	**7**	**6**	4	**3**	**1**	5	**2**
Pvt SB.	6	7	**5**	**3**	**1**	**4**	**2**

Availability of repeated loans

This attribute also carries a favorable response from the experts. While 79 (27%) experts have ranked this attribute as 6 or 7, 230 (77%) experts have ranked it as 4 and above. This attribute has been considered as important, as except BDOs all other categories of experts have ranked it as 4 or 5. ***This implies that the assurance of getting a new loan on repayment of older one incentivize a borrower to repay.***

Use of social influence for recovery

Use of social influence on recovery has been allotted the rank value greater than 4 by 33% percent of the experts only. This implies that in present social structure this attribute's role in recovery is perceived to be not as important as of other three mentioned above. BDOs consider this attribute more effective than others and assigned rank value of 6, while others have considered it less favourably and assigned rank value of 3 or 4. ***This goes against the underlying concept of social capital in micro lending. One of the reasons for this outcome is that here we have considered society's role in recovery wherein the social capital in self help group is related to the peer pressure of the group where each member of the group is a borrower and his/her prospect of getting future loan depends on recovery performance of the group as a whole.***

Use of muscle power for recovery

Use of muscle power has been allotted rank value of 7 by 17.45% of experts, however only 38% of experts have ranked it as 4 and above. This attribute has been awarded lowest rank value of 1 by 33% of experts and 62% of experts have given the rank value of less than 4. This implies that use of muscle power is not an effective tool for improving recovery. Except experts from PSBs who have ranked it of highest importance all other categories of experts have assigned very low importance (rank value of 1 or 2) to this attribute. ***The underlying reason for getting such a response from experts from PSBs may be their experience of recovery in small loans using State Government tools like recovery certificate or bakijai etc.***

Availability of better information about borrower

Availability of better information about the borrower has not been ranked favorably by the experts, though it has not been totally ignored by the experts. 51% of experts have ranked this attribute as 4 and above. This attribute is favored as most important by BDOs while experts from cooperative banks have given rank value of 3 to this attribute. All other categories of experts have assigned rank value of 4 or 5. ***This clearly shows that this factor i.e. better information about borrower is perceived to be important.***

Threat of social ostracism in case of non-recovery

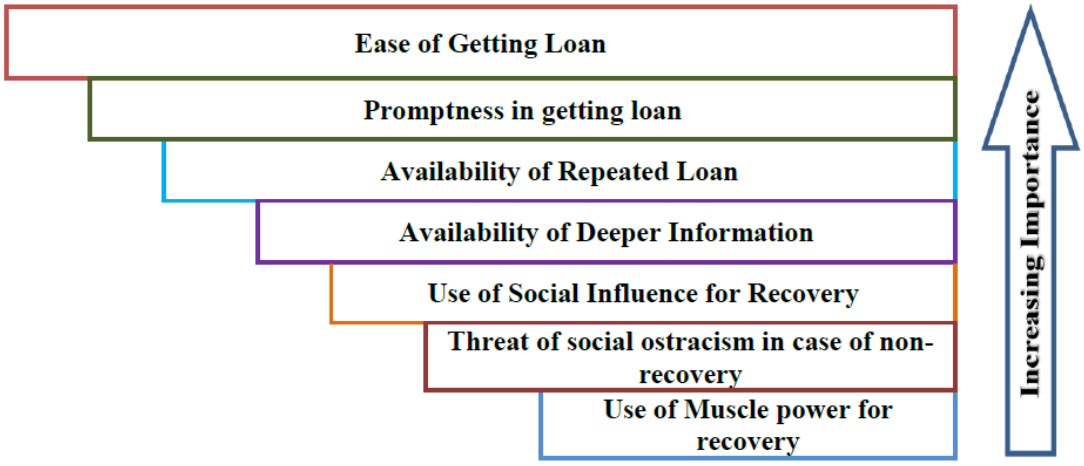
Threat of social ostracism is a social dynamics wherein a defaulter is not allowed to participate in the social and community driven activities. This is an extreme situation and present social texture does not provide any scope for such happening, this attribute has got the rank value greater than 4 by only 14% of total experts.

This factor which has been ranked very low by all the categories of experts, i.e. experts from cooperative banks have assigned it rank value of 1 and all other categories of experts have assigned it rank value of 2. ***This implies that this factor is viewed by all categories of experts as one of the least effective tool as compared to other in improving recovery in money lending.***

It may be observed that the product and process specific features ranked vey high in terms of importance against recovery specific attributes. Mean Rank Values of each attributes are given in Fig. 4.2.

The order of importance, from most important to least important, as analysed with the rank values provided by all the experts, attributes are given in Fig. 4.3.

Fig. 4.3 - Importance Wise Order of Attributes Affecting Recovery in Money Lending



Discussion

By analyzing responses for each category of experts we found that ***Ease of getting Loan*** has been assigned rank value of seven by three categories of experts' namely cooperative banks, regional rural banks and micro-finance institutions. No other attributes have received such a high frequency for rank value of 7. Similarly, after treating ease of getting loan as most important by maximum number of categories of experts, we found that ***Promptness in getting loan*** has been assigned rank value of 6 by three categories of experts. These experts belong to same categories who have assigned rank value of 7 to the previous attribute namely ***Ease of getting Loan.***

From Table 4.1b, we tried to understand the reasons behind difference in opinion across various experts. Ease of getting loan was given a rank value of 4 by BDOs where as all other experts rated it as the most important or second most important

attribute. Considering that the cumbersome procedures and documentation could not deter borrowers to apply under government sponsored schemes, it is not surprising to observe that they have given it a comparatively low importance (rank value 4).

Promptness in getting loan has been ranked low only by experts from PSBs who have managed to experience growth in credit inspite of delayed sanction and disbursement. So with their singular presence as formal credit institution in the rural areas, they do not consider it as an important attribute.

Availability of deeper information of about borrower and use of social influence for recovery has been ranked as of high importance by BDOs. The response is not surprising considering their involvement with socio-political strata of the society.

Another attribute where the difference of opinion is significant is 'use of muscle power for recovery. This attribute is given low importance by all except by PSBs who have ranked it most important. The reason behind response by experts from PSBs would have been their experience of observing better recovery by using state recovery machinery in case of loans disbursed under government sponsored schemes.

Table 4.2- Experts' Category Wise Mean Rank Value of Attributes of Recovery in Money Lending

Job Profile	Var_EOGL	Var_Prompt	Var_Availability	Var_UseS	Var_UseM	Var_Deeper	Var_Threats
BDO	4.30	4.63	4.18	4.90	3.33	4.55	2.13
Coop Bank	5.42	5.40	5.21	2.98	2.50	4.23	2.27
PSB	4.55	4.42	4.26	4.05	3.71	4.27	2.74
RRB	5.02	5.02	4.92	3.71	3.82	3.16	2.35
Regulator	5.26	5.30	5.04	3.00	2.59	3.93	3.00
MFIs	5.09	4.91	4.09	4.00	3.00	4.82	2.18
Pvt Sector Bank	5.70	5.52	5.00	3.37	2.15	3.56	2.67

The majority of experts ranked product driven attributes very high. It implies that if loan products are designed in such a way that they can be availed in a simple and quick manner, the recovery will automatically be higher. Better and deeper information about the borrower is considered as the next important attribute influencing recovery in money lending after product specific attributes by the experts.

It may be concluded that if loan or credit products are made available without going through a cumbersome process and in time then this will motivate the borrowers to repay in compliance with repayment terms. The loan products, developed while bearing these factors in mind, will have less chance for initiation of recovery proceedings, if offered to the borrowers screened on the basis of deeper information gathered about them.

Based on the responses of various experts we calculated the mean rank values assigned to each attribute. The mean rank values assigned to each attribute by different categories of experts are given in Table 4.2. The mean rank value of each attribute has also been plotted on radar chart to observe concurrence or discordance between the categories of experts (Refer radar chart in Figure 4.4).

The attribute "***ease of getting loan***" had received high mean rank value (4.91) from all the experts. However importance attached to this factor was comparatively higher from private sector bank (5.70), cooperative banks (5.42), regulators (5.26), MFIs (5.09) and RRBs (5.02) than that given by PSB (4.55) and BDOs (4.30).

"***Promptness in getting loan***" as an attribute was viewed favorably with a high mean rank value (4.90) by all the experts as one the important factor for recovery of loans in money lending. However there was difference of opinion between the categories. The mean rank values are BDOs (4.63), cooperative banks (5.40), PSBs (4.42), RRBs (5.02), regulators (5.30), MFIs (4.91) and private sector bank (5.52),

While ranking the attribute "***availability of repeated loan***", a mean rank value of 4.63 was obtained. However there was a wide gap in the mean value of ranks assigned by different categories. Maximum mean rank value of this attribute was calculated as 5.21 (Cooperative Banks) and minimum rank value as 4.09 (MFIs), others being 4.18 for BDO, 4.26 for PSB, 4.92 for RRB, 5.04 for regulators and 5.00 for private sector banks.

"***Use of social influence for recovery***" was viewed favorably (mean rank value-4.90) by block development officials only. The mean rank value for this attribute was 3.78. Cooperative banks, private sector banks and regulators attach very low importance to

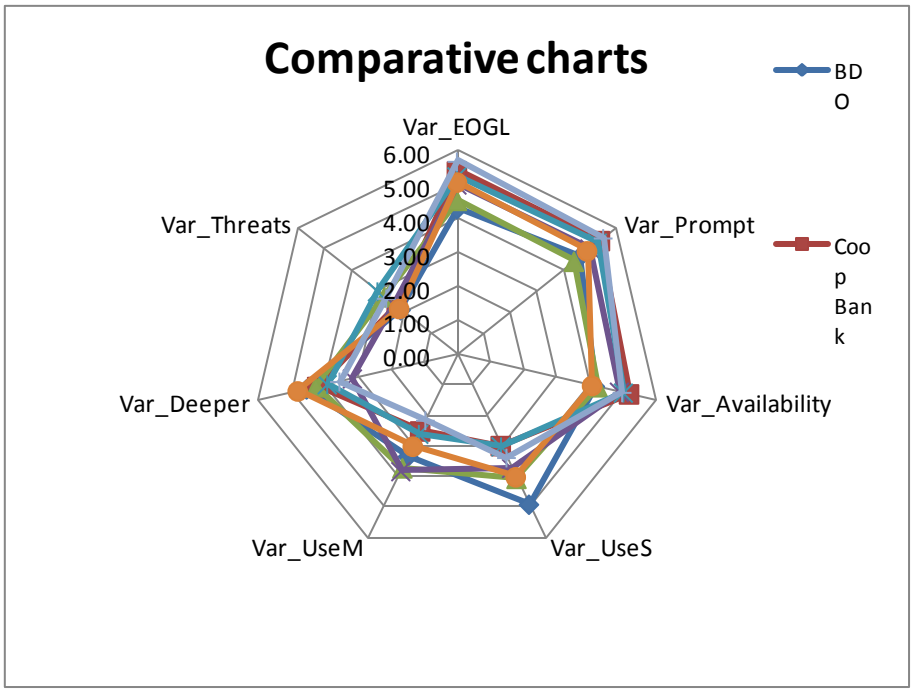
this factor as being useful in recovery as the mean rank value from these categories of experts were 2.98, 3.37 and 3.00 respectively.

An attempt was made to get the multi stake-holders perspective. Difference of opinion in assigning the ranks to the referred factors might be on account of the experience and the role the experts have in the field of micro-credit. This approach was useful in analyzing factors with 360^{o} view.

Contrary to the general perception, private sector banks had given the least preference amongst all categories for "***the use of muscle power for recovery***". Regulators and cooperative banks were of the same opinion. However RRBs and PSBs had not ranked this factor very low. These two categories had ranked them high in comparison to other categories of experts. "**Use of social ostracism**" was ranked the least effective by all the categories. "Availability of better information about the borrower" was viewed important for recovery by all categories of experts except private sector banks and RRBs.

Threat of social ostracism was given least importance for recovery by all experts and could be viewed from the perspective of a democratic society wherein such a stringent action might not be possible.

Fig. 4.4- Radar Diagram Depicting Ratings given by Experts



In order to get an insight into the dimensions that facilitate recovery of loans provided by moneylenders, and whether these attributes could be reduced to the identifiable dimensions, we conducted factor analysis. Before conducting factor analysis we checked the correlations between the attributes and the Spearman's rank correlation coefficients. Spearman's rho for the attributes is given in the Table 4.3.

It is evident that first three attributes namely- ease of getting loan, promptness in getting loan and availability of repeated loan are positively correlated. The other attributes related to recovery initiatives namely use of social influence, use of muscle power and threat of social ostracism are negatively correlated with the first three attributes referred above. It implies that experts who are of the opinion that the convenience in getting loan is one of the important factors for improving recovery do not assign importance to recovery proceedings as an effective tool.

Table 4.3- Spearman Correlation Coefficient

	Ease of getting Loan	Promptness in Getting loan	Availability of repeated Loan	Use of Social Influence for recovery	Use of Muscle Power For Recovery	Availability of deeper Information	Threats of Social Ostracism in Case of Non-Recovery
Ease of getting Loan	1						
Promptness in Getting loan	.500**	1					
Availability Of repeated Loan	.194**	.186**	1				
Use of Social Influence for recovery	-.475**	-.469**	-.368**	1			
Use of Muscle Power For Recovery	-.429**	-.503**	-.269**	.184**	1		
Availability Of deeper Information	-.326**	-.269**	-.261**	0.062	-.189**	1	
Threats Of Social Ostracism in Case of Non-Recovery	-.235**	-.264**	-.164**	0.011	-0.061	-0.064	1

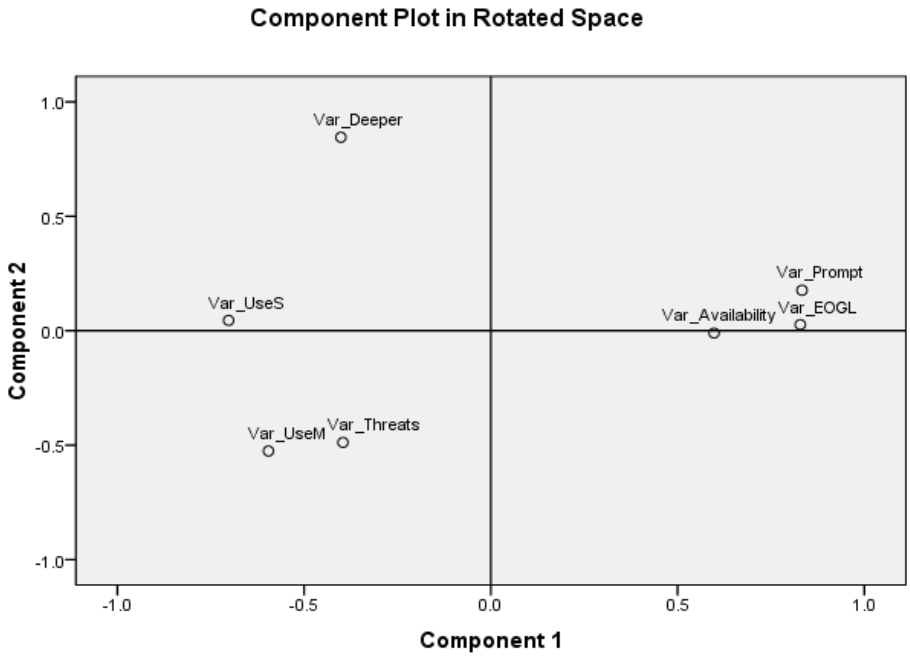
***. Correlation is significant at the 0.01 level (2-tailed).

Considering low values of rho we went ahead with Varimax rotation in factor analysis. Varimax Method is an orthogonal rotation method that minimizes the number of variables that have high loadings on each factor. This method simplifies the interpretation of the factors. Orthogonal rotation results in factors that are uncorrelated.

Factors are plotted in Fig 4.5. It is clear that that Factor '1' (Product attributes and Recovery Measures) can be put on a bipolar continuum consisting of a ***loan servicing attributes*** viz. ease of getting loan, promptness in getting loan and availability of repeated loan on one side and ***loan recovery attributes*** viz. use of muscle power, use of social influence and threat of social ostracism in case of non-recovery on the other side.

Factor '2' (Borrower's Information) which is orthogonal to the first factor, consists entirely of the attribute "***better information about the borrower".***

Fig. 4.5- Component Plot of Experts View on Money Lending



The findings reveal that there are two dimensions which make money lending effective in terms of recovery of loan. The first dimension is about loan facilitation

and another recovery specific feature. If a lender is adept in designing a loan product which offers ease, promptness and assurance of getting loan as and when required repeatedly mainly for productive purpose, the borrowers themselves will be motivated to repay the loan.

Table 4.4- Component Matrix of Experts View on Money Lending

Factors	Attributes	*[1] Rotated Component		*[2] Rotated Component	
		Component		Component	
		1	2	1	2
Product attributes and Recovery Measure	Ease of getting Loan	**.820**	-.118	**.828**	.027
	Promptness in Getting loan	**.851**	.029	**.833**	.177
	Availability of repeated Loan	**.587**	-.114	**.598**	-.010
	Use of Social Influence for Recovery	**-.684**	.166	**-.702**	.045
	Use of Muscle Power For Recovery	**-.678**	-.414	**-.595**	-.526
	Threats Of Social Ostracism in Case of Non-Recovery	**-.475**	-.412	***-.396***	-.488
Borrower's Information	Availability Of deeper Information	-.249	**.902**	-.402	**.845**

*[1] Extraction Method: Principal Component Analysis., 2 Components extracted
*[2] Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization

To tackle delinquency, even with such a loan product, the lender should have effective loan contract enforcement mechanism. These could be through use of social influence or coercive action.

Another dimension is that of consumer insight and consists of information about suitability of a specific loan product suited for specific segment of the borrowers or whether default is voluntary or involuntary or what recovery measures are appropriate in a social context and with borrowers' history.

As the first factor involves product development and enforcement of legal system for recovery, it is the consumer insight which a lender can use for his benefit in terms of

selecting credit worthy borrowers. This dimension presents an opportunity to study the process of appraising prospective borrowers in terms of credit worthiness. There are three ways to assess prospective borrower namely subjective method, quantitative method and hybrid procedures involving both these two methods.

The quantitative method of assessing a borrower is commonly known as credit scoring model. Rest of the chapter will deal with various techniques for identifying predictors (variables) and developing a model for identifying a good borrower from a pool of borrowers.

The next stage of research was designed to get a set of variables that if incorporated in designing credit product and appraisal process, will improve repayment in micro-finance sector.

4.3 Experts' Opinion Survey of Variables Affecting Recovery in Micro-finance

The experts that provided their opinion for attributes affecting recovery in money lending were now administered a questionnaire seeking their opinion on variables that impact repayment rates in micro-finance.

Responses were measured on a scale graded 1, 3 and 5 for neutral, important and most important respectively. For each variable, mean score was calculated. To find out difference of opinion between groups, ANOVA test was performed at 0.01 significant level using SPSS version 16.

In our study we had seven categories of experts. To test difference of opinion for statistical significance, one-way ANOVA test was performed for each of the variables. The variables that received a mean score of 3 and above were considered as important and those which received less than 3 were considered unimportant. The consolidated results providing information about mean score of each variable as well as the significance (in terms of difference of opinion between groups) have been presented in Appendix 3.

Using two dimensions viz. "mean score of variables" and "whether difference in opinion of category of experts about the variables is statistically significant or non-

significant" we classified each of the variables into four cells of matrix as given in Fig. 4.6.

- Important and with non-significant difference of opinion.
- Unimportant with non- significant difference of opinion.
- Important and with significant difference of opinion.
- Unimportant with significant difference of opinion.

Fig. 4.6- Predictors Grid

		Difference In opinion of Experts	
Factors Classification in terms of Importance (Mean Value)		Non-Significant	Significant
	Important	Var_Age, Var_Hou, Var_Pur, Var_Dep, Var_Emp, Var_Ent,	Var_Lit, Var_Per, Var_Edk, Var_Edg, Var_Agr, Var_Rep, Var_Dis, Var_Opn, Var_Sra, Var_Op2, Var_Deb, Var_Col, Var_Spo, Var_Sub, Var_Pgu
	Unimportant	Var_Gen, Var_Mar, Var_Fpl,	Var_Kid,

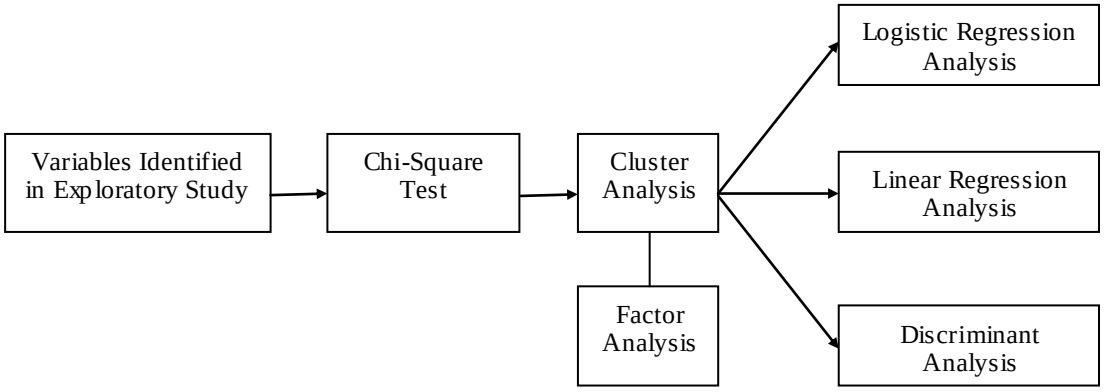
Var_Age=Age, Var_Gen =Gender, Var_Lit=Literacy, Var_Per=Period of stay at same place, Var_Mar=Marital Status, Var_Kid=No. of Kids, Var_Edk =Concern for Kids education, Var_Edg=Concern for Girls education, Var_Hou=Ownership of a house, Var_Agr=Ownership of agriculture land, Var_Fpl=Attitude towards family planning, Var_Rep=Past track record of repayment, Var_Pur=Purpose of loan, Var_Dis=Distance from bank, Var_Opn=Opinions about applicant from existing borrowers, Var_Dep=No. of dependents, Var_Emp=Period of engagement in the same activities, Var_Sra=Eligibility for action under State Recovery Acts, Var_Op2 =Opinion of reputed persons of the area to which applicant belongs, Var_Deb=Existing indebtedness of borrower, Var_Col =Availability of collateral, Var_Spo=Involvement of spouse in earning activity, Var_Sub=Availability of Subsidy, Var_Ent=Engagement in Self Employment, Var_Pgu=Availability of Personal Guarantee

Though the variables received different grades in terms of their importance, only a few variables like gender, marital status and attitude towards family planning were assigned unimportant and insignificant difference in opinion of experts. However literature on micro-finance cites gender as an important factor. Gramin Model of micro-finance started with female-centric customer targeting. "Attitude towards Family Planning" was not directly asked in the borrowers' survey as the question was felt to be an embarrassment to the female, so proxy of this question was considered viz. "number of kids". As this survey was just an exploratory one, we considered those entire variables which were considered borrower-specific and left out those variables which were considered extraneous factors such as legal infrastructure available for recovery in delinquent cases or applicability of State Recovery Act etc.

4.4 An Analysis of Survey Research of Micro-finance Borrowers

Next step in the research process was to analyse the responses received from borrowers from both defaulters and non-defaulters. The total number of borrowers considered for research were 1025 consisting of 297 defaulters and 728 non-defaulters. The differences between responses to these variables (for both defaulters and non-defaulters) were first tested for statistical significance in order to focus on those discriminatory variables and eliminate the rest.

Fig. 4.7- Flow Diagram of Data Analysis of Descriptive Study



4.4.1 Pearson Chi Square Test

We performed Pearson Chi Square Test to gauge the significance of each variable. Those variables which were not found significant from this test were eliminated from

any further analysis. It can be seen that all but three variables are significant. Pearson Chi Squares were obtained for each variable and significance was deduced. Results are provided in Appendix 4. For example, the Pearson Chi Square of V_Gen is 211.2 and hence it is significant. For the variable V_Age, it is 196.7 and so on. The variables which were not significant through this test were V_Res with a Chi Square of 1.465, V_Exp with a Chi Square of 1.988 and V_Purpose with a Chi Square of 1.281.

We have thus eliminated V_Res, V_Exp and V_Purpose from the list of variables to be considered for further analysis. It is to be borne in mind that though these variables are meticulously observed by practical bankers while assessing credit worthiness of any prospective borrower, results are not out of sync considering the premises under which micro-finance is being disbursed.

Further, micro-finance is a very short term and a small dose of credit given to poor people. The borrower may use it for income generating purpose or for consumption purpose. In case of emergency loans, these borrowers approach indigenous money lenders who charge heavily in terms of interest rates. Even if micro-finance loans are used for consumption purposes, they save on interest. The data was collected from regions where most of the loans were sanctioned to the borrowers whose occupation does not require any specific skill set. Therefore, in our analysis, variable V_Exp was found to be insignificant.

As far as the variable V_Res is concerned, experts were taken from the population where the percentage of migrants was almost negligible. This implies that whether defaulters or non defaulters, most of the borrowers were residing at the same place for more than a year and experts have provided their opinions based on this fact.

4.4.2 Factor Analysis of the set of variables that tested significant

Factor analysis was carried out at this stage on 17 variables to screen any other possible elimination. These variables were obtained after elimination of three variables at Chi Square Test stage. We performed Varimax Rotation. Varimax Rotation is justified here as the variables were not highly correlated as explained in the previous section. Results of factor analysis are shown in Tables 4.5a and 4.5b.

Table 4.5.a- KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	5.202E3
	Df	136
	Sig.	.000

Table 4.5.b- Rotated Component Matrix[a]

		Component				
		1	2	3	4	5
Demographic Status	V_Age	**0.533**	0.066	0.396	0.433	0.033
	V_Marital	**0.63**	0.114	0.201	0.371	-0.004
	V_Kids	**0.485**	-0.013	0.427	0.086	0.066
	V_KidsEdu	**0.861**	-0.079	-0.084	-0.063	-0.015
	V_GirlsEdu	**0.818**	-0.104	0.012	-0.169	-0.01
Employment Status	V_Empl_Bf_Loan	-0.097	**0.829**	0.087	-0.177	0.146
	V_LevelBussAftLoan	-0.056	**0.835**	0.03	-0.195	0.12
	V_DistanceBank	-0.032	**-0.54**	0.191	0	0.244
Social Status	V_Gen	0.17	0.019	**0.741**	-0.179	0.239
	V_House	0.394	-0.174	**0.483**	0.398	0.089
	V_DistMembers	0.01	-0.388	**0.656**	0.119	0.081
	V_ConstdBy	-0.045	0.249	**0.573**	0.254	-0.139
Group Integrity	V_Family	-0.036	-0.061	0.171	**0.607**	0.248
	V_Diversion	-0.05	-0.321	0.056	**0.436**	0.156
	V_Meeting	0.116	-0.356	-0.136	**0.634**	-0.21
Financial Status	V_LoanML	-0.044	0.101	-0.343	-0.067	**-0.762**
	V_DefaultML	-0.005	0.12	-0.114	0.126	**0.854**
	Extraction Method: Principal Component Analysis.					
	Rotation Method: Varimax with Kaiser Normalization.					

The Kaiser-Meyer_Olkin (KMO) Measure of Sampling Adequacy is a statistics that indicates the proportion of variance in variables that might be caused by underlying factors. In our case, KMO statistics is 0.720 which implies that sampling is reasonably adequate. Bartlett's test of sphericity tests the hypothesis that the correlation matrix is an identity matrix, which would indicate that variables are unrelated and therefore unsuitable for structural detection. Significance value less than 0.05 indicates that the data set is suitable for factor analysis which was the finding in our case too as shown

in Table 4.5.a. The degree of freedom here is 136 and approximate chi square using Bartlett's test of sphericity is 5.202E03.

The results of factor analysis with Varimax rotation are presented in the Table 4.5 b. The results show that all the variables are loaded on one or other factor. Therefore we did not eliminate any of the variables and continued our further analysis with the original set of 17 variables.

To gain insight into the factors on which these variables were loaded, we tried naming these factors as well. We can see five loaded groups through rotated component matrix in Table 4.5.b. Under first component are the variables V_Age, V_Marital, V_Kids, V_KidsEdu and V_GirlsEdu with factor loading of 0.533, 0.630, 0.485, 0.861 and 0.818 respectively. This factor is named "***Demographic Status"***. The factor includes borrower's age, marital status, number of kids and their education status.

The second factor is named ***"borrower's employment status"*** which includes variables namely borrower's status of employment before availing loan, employment conditions after availing loan and the distance between the place of borrower's residence and bank. The distance is important as the borrower need to transact with the bank during the currency of employment.

Third factor is named as ***"Social Status"*** consists of variables V_Gen, V_House, V_DistMembers and V_ConstdBy with factor weights of 0.741, 0.483, 0.656 and 0.573 respectively. Gender, ownership of house, social connectedness and ability to form a group all represent the borrower's position in society.

Fourth factor is named as ***"Group Integrity"*** consists of variables V_Meeting, V_Family and V_Diversions with factors of 0.634, 0.607 and 0.436 respectively. Meeting frequency of group members, number of members from a family and the level of diversion of funds to the purpose other than for which a loan was granted represent the integrity of a group.

The fifth factor is named as ***"Financial Status"*** consists of variables V_LoanML and V_DefaultML with factor weights of -0.762 and 0.854 respectively

4.4.3 Cluster Analysis

Cluster analysis was performed to reduce the set of variables that discriminate borrowers into defaulters and non-defaulters more accurately.

We performed cluster analysis with 17 variables found significant in the previous section using Chi Square test. The purpose of cluster analysis was to find further a set of variables which can discriminate borrowers in two groups namely defaulters and non-defaulters. With an objective of reducing variables without compromising on effectiveness we ran a number of trials of cluster analyses.

First we started cluster analysis using all of the variables together and found the results very encouraging. Accuracy of prediction was defined in terms of percentage and the formula used for calculation is mentioned as under:

$$\text{Accuracy (percentage)} = \frac{\text{(No. of Defaulters and non-defaulters predicted correctly)}}{\text{Total number of borrowers both defaulters and non-defaulters}}$$

Accuracy in discriminating defaulters and non-defaulters was achieved at 82.04%. With an objective of getting improved efficiency with less number of variables without compromising on effectiveness of discriminating power, we reduced stepwise variables. At first stage we ran cluster analysis 17 times, each time eliminating one variable. The accuracy rate for each cluster analysis is presented in the Table 4.6. We found out that by the elimination of variable 'V_Empl_Bf_Loan', we achieved the highest accuracy rate. Therefore we eliminated this variable. The same procedure was repeated six more times eliminating one variable at each step. . In the second step, the variable 'V_GirlEdu' was eliminated, as it has the highest figure of 0.953. In third step, variable 'V_ConstBy' was eliminated, as it had the highest figure of 0.94. In the fourth step, the variable 'V_Age' was eliminated, as it had the highest figure of 0.938. In the fifth step, the variable 'V_DefaultML' was eliminated, as it had the highest figure of 0.938. Then the variable 'V_Kids' was eliminated as it had the highest figure of 0.936. Altogether we performed this process 99 (1+17+16+15+14+13+12+11=99) times.

As the results of cluster analysis performed at each step through pecking order, we found that the effectiveness was not compromised while the number of variables got

reduced. The final results of each of 99 cluster analysis performed are tabulated in the Table 4.6.

We stopped cluster analysis of variables at a stage when we arrived at 10 variables. Though there was nothing sacrosanct about the numbers of variables to be considered, it was aimed at reducing the cost of capturing information without loss of effectiveness. The number of variables to be used in scoring is the sole discretion of a lender but our emphasis here was on evolving an approach that would find out variables which can be readily and effortlessly captured for decision making without letting go of potential borrowers. For example- even variable (say gender) can predict the chance of default but then should lender eliminate the entire male or female population from his list of prospective borrowers. Rather lender should focus on other variables as well that can reduce delinquency. At the same time having too many variables in appraisal process without having significant improvement in discriminating power will simply be indifferent.

4.4.4 Logistic Regression

After cluster analysis, we went for logistic regression to verify the effectiveness of variables in identifying defaulters and non-defaulters. We performed logistic regression eight times starting with 17 variables and eliminating one variable at each step. The variables which were eliminated were the same as obtained from cluster analysis and the same elimination order was used as given in the previous section. After analyzing the results of logistic regression from Table 4.7, we saw that the eliminations suggested by cluster analysis were correct. A high accuracy rate was maintained throughout our analysis. However when we compare the results for 11 variables and 10 variables logistic regression, we can see that 11 variables are giving a better accuracy of 95.3 % as compared to 94.8 % of the 10 variable set. Hence we decided to continue our analysis with 11 variables with an intention of attaining an improved result.

Table 4.6- Cluster Analysis - Elimination of Variables

		V_Gen	V_Age	V_Marital	V_Kids	V_KidsEdu	V_GirlsEdu	V_House	V_Meeting	V_DistMembers	V_ConstdBy	V_Family	V_Empl_Bf_Loan	V_LevelBussAftLoan	V_DistanceBank	V_Diversion	V_LoanML	V_DefaultML
I step	Excluding	**V1**	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.795	0.94	0.92	0.93	0.928	0.901	0.755	0.942	0.793	0.778	0.764	0.951	0.93	0.81	0.935	0.79	0.916
2nd Step	Excluding	**V1**	**V2**	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.843	0.948	0.937	0.933	0.941	0.953	0.923	0.933	0.937	0.782	0.904		0.932	0.937	0.81	0.806	0.941
3rd Step	Excluding	**V1**	**V2**	**V3**	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.817	0.748	0.937	0.918	0.937		0.926		0.708	0.94	0.912		0.914	0.823	0.933	0.812	0.937
4th Step	Excluding	**V1**	**V2**	**V3**	**V4**	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.821	0.938	0.937	0.934	0.932		0.786	0.81	0.923		0.917		0.925	0.836	0.81	0.788	0.826
5th Step	Excluding	**V1**	**V2**	**V3**	**V4**	**V5**	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.902		0.926	0.917	0.934		0.907	0.913	0.907		0.908		0.931	0.929	0.933	0.709	0.938
6th Step	Excluding	V1	V2	V3	V4	V5	**V6**	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.89		0.926	0.936	0.894		0.71	0.915	0.925		0.907		0.93	0.915	0.918	0.927	
7th Step	Excluding	V1	V2	V3	V4	V5	V6	**V7**	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
	Index	0.916		0.932		0.91		0.915	0.908	0.921		0.906		0.924	0.902	0.946	0.943	

Table 4.7- Logistic Regression Variables (Classification Table)					
V1.V2,V3,V4,V5,V6,V7,V8,V9,V10, V11, V12, V13, V14,V15, V16, V17			Predicted		17
			ID		Percentage Correct
			D	ND	
Observed	ID	D	272	25	91.6
		ND	18	710	97.5
	Overall Percentage				95.8
V1.V2,V3,V4,V5,V6,V7,V8,V9,V10, V11, V12, V13, V14,V15, V16, V17			Predicted		16
			ID		Percentage Correct
			D	ND	
Observed	ID	D	265	32	89.2
		ND	25	703	96.6
	Overall Percentage				94.4
V1.V2,V3,V4,V5,V6,V7,V8,V9,V10, V11, V13, V14,V15, V16, V17			Predicted		15
			ID		Percentage Correct
			D	ND	
Observed	ID	D	265	32	89.2
		ND	26	702	96.4
	Overall Percentage				94.3
V1.V2,V3,V4,V5,V7,V8,V9,V10, V11, V13, V14,V15, V16, V17			Predicted		14
			ID		Percentage Correct
			D	ND	
Observed	ID	D	268	29	90.2
		ND	25	703	96.6
	Overall Percentage				94.7
V1,V2,V3,V4,V5,V7,V8,V9, V11, V13, V14,V15, V16, V17			Predicted		13
			ID		Percentage Correct
			D	ND	
Observed	ID	D	267	30	89.9
		ND	23	705	96.8
	Overall Percentage				94.8
V1,V3,V4,V5,V7,V8,V9, V11, V13, V14,V15, V16, V17			Predicted		12
			ID		Percentage Correct
			D	ND	
Observed	ID	D	268	29	90.2
		ND	23	705	96.8
	Overall Percentage				94.9
V1,V3,V4,V5,V7,V8,V9, V11, V13, V14,V15, V16,			Predicted		11
			ID		Percentage Correct
			D	ND	
Observed	ID	D	269	28	90.6
		ND	20	708	97.3
	Overall Percentage				95.3
V1,V3,V5,V7,V8,V9, V11, V13, V14,V15, V16,			Predicted		10
			ID		Percentage Correct
			D	ND	
Observed	ID	D	270	27	90.9
		ND	26	702	96.4
	Overall Percentage				94.8

V1=V_Gen, V2=V_Age, V3=V_Marital, V4=V_Kids, V5=V_KidsEdu, V6=V_GirlsEdu, V7=V_House, V8=V_Meeting, V9=V_DistMembers, V10=V_ConstdBy ,V11=V_Family, V12=V_Empl_Bf_Loan, V13=V_LevelBussAftLoan, V14=V_DistanceBank, V15=V_Diversion, V16=V_LoanML, V17=V_DefaultML

4.4.5 Linear Regression Analysis to Develop an Easy to use Credit Scoring Model

Before performing regression analysis, we checked the correlation between the predictor variables to get the information about multi-collinearity. On calculating the correlations between 11 variables (Appendix 3) which we selected after performing cluster analysis and logistic regression, we observed that only two sets of variables are correlated to some extent. Correlation coefficients were calculated to observe linear dependency among several independent variables, a situation which could lead to multi-collinearity problem in multivariate regression analysis.

From Appendix 3, we can observe that the correlation coefficients between all the pairs are less than 0.5 or greater than -0.5. In fact, the highest value of the correlation coefficient observed is .439 between the variables 'V_Marital' and 'V_House' and the lowest figure of -.345 is witnessed for the variables 'V_Gen' and 'V_LoanML'.

To simplify the credit scoring model for practical application by industry personnel we performed linear regression analysis on dummy variables for 11 variables arrived in previous sections of our analysis.
Dummy variables were considered as they are simple and easy to capture by the field functionaries in micro-finance industry.
Table 4.8 summarizes the regression results about the model summary. The Adjusted R Square value tells for our model accounts for explaining 70.2% of variance – considered to be a reasonably good model fit.

Table 4.8- Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.839[a]	.705	.702	.248	.705	219.773	11	1013	.000

a. Predictors: (Constant), V_LoanML, V_KidsEdu, V_LevelBussAftLoan, V_Diversion, V_Family, V_DistanceBank, V_Gen, V_Marital, V_Meeting, V_DistMembers, V_House

Table 4.9 Reports an ANOVA, which assesses the overall significance of our model. As $p < 0.05$ our model is significant.

Table 4.9 - ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	148.653	11	13.514	219.773	.000[a]
	Residual	62.290	1013	.061		
	Total	210.942	1024			

a. Predictors: (Constant), V_LoanML, V_KidsEdu, V_LevelBussAftLoan, V_Diversion, V_Family, V_DistanceBank, V_Gen, V_Marital, V_Meeting, V_DistMembers, V_House

b. Dependent Variable: ID

The Unstandardized Beta Coefficients in Table 4.10 give a measure of the contribution of each variable to the model. A large value indicates that a unit change in this predictor variable has a large effect on the criterion variable.

Table 4.10- Coefficients of Linear Regression Analysis [a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	-.347	.038		-9.025	.000	-.422	-.272		
V_Gen	.164	.019	.180	8.628	.000	.127	.201	.666	1.501
V_Marital	.203	.031	.133	6.555	.000	.142	.264	.711	1.406
V_KidsEdu	-.017	.017	-.019	-1.008	.314	-.051	.016	.832	1.202
V_House	.279	.024	.254	11.800	.000	.232	.325	.629	1.590
V_Meeting	.117	.021	.111	5.428	.000	.074	.159	.700	1.429
V_DistMembers	.380	.026	.305	14.359	.000	.328	.431	.645	1.550
V_Family	.336	.021	.299	16.083	.000	.295	.377	.842	1.187
V_LevelBussAftLoan	-.045	.018	-.048	-2.511	.012	-.080	-.010	.790	1.266
V_DistanceBank	-.021	.020	-.020	-1.087	.277	-.059	.017	.841	1.189
V_Diversion	.025	.017	.028	1.491	.136	-.008	.058	.849	1.177
V_LoanML	-.068	.018	-.073	-3.709	.000	-.105	-.032	.748	1.338

a. Dependent Variable: ID

The t and Sig (p) values give a rough indication of the impact of each predictor variable – a big absolute t value and small p value suggests that a predictor variable is having a large impact on the criterion variable.

Spotting multi-collinearity among a set of explanatory variables might not be easy. The obvious course of action is to examine the correlations between these variables, but while this is a good initial step that is often helpful, more subtle forms of multi-collinearity involving more than two variables might exist. A useful approach is the examination of the variance inflation factors (VIFs) or the tolerances of the explanatory variables. The tolerance of an explanatory variable is defined as the proportion of variance of the variable in question not explained by a regression on the remaining explanatory variables with smaller values indicating stronger relationships. The VIF of an explanatory variable measures the inflation of the variance of the variable's regression co-efficient relative to a regression where all the explanatory variables are independent. The VIFs are inversely related to the tolerances with larger values indicating involvement in more severe relationships (according to a rule of thumb, VIFs above 10 or tolerances below 0.1 are seen as a cause of concern). From Table 4.10, it can be observed that the VIF for all the variables are less than 10.

Credit Scoring Methodology

Once we got the coefficients of all eleven variables from multivariate linear regression analysis, we tested them on our data set. The coefficients have been found out using a set of 1025 samples. We checked for the accuracy of the model on the same data set as the back testing involved individual sample verification and the coefficients have been obtained at an aggregate level. When we checked the data on different cut-off scores, we got the results as mentioned in Table 4.11.

In our study we have considered "credit loss" as a loss due to prediction of a defaulter as non-defaulter whereas "business loss" is defined as loss of potential borrowers (non-defaulter) who are predicted as defaulters. These losses in the Table 4.11 have been shown as percentages of total number of borrowers and not as amount.

Table 4.11- Credit Scoring Results (Linear Regression)				
Score = 0.3				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**186**	**111**		**0.133 (13.30%)**
ND	**2**	**726**	**0.003 (0.30%)**	
Score =0 .35				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**206**	**91**		**0.112 (11.20%)**
ND	**3**	**725**	**0.004 (0.40%)**	
Score =0 .4				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**222**	**75**		**0.094 (9.40%)**
ND	**6**	**722**	**0.008 (0.80%)**	
Score = 0.5				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**253**	**44**		**0.059 (5.90%)**
ND	**22**	**706**	**0.030 (3.00%)**	
Score =0.6				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**275**	**22**		**0.031 (3.10%)**
ND	**36**	**692**	**0.049 (4.90%)**	
Score = 0.7				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**282**	**15**		**0.023 (2.30%)**
ND	**94**	**634**	**0.129 (12.90%)**	
Score = 0.75				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**283**	**14**		**0.022 (2.20%)**
ND	**112**	**616**	**0.154 (15.40%)**	
Score = 0.8				
	D	**ND**	**Business Loss**	**Credit Loss**
D	**284**	**13**		**0.021 (2.10%)**
ND	**134**	**594**	**0.184 (18.40%)**	

It can be seen from Table 4.11 that at a cut-off score of 0.3, the business loss is 0.3 % and credit loss is 13.3 %. At a cut-off score of 0.35, the business loss is 0.4 % and credit loss is 11.2 %. At a cut-off score of 0.4, the business loss is 0.8 % and credit loss is 9.4%. At a cut-off score of 0.5, the business loss is 3 % and credit loss is 5.9 %. At a cut-off score of 0.6, the business loss is 4.9 % and credit loss is 3.1 %. At a cut-off score of 0.7, the business loss is 12.9 % and credit loss is 2.3 %. At a cut-off score

of 0.75, the business loss is 15.4 % and credit loss is 2.2 %. At a cut-off score of 0.8, the business loss is 18.4 % and credit loss is 2.1 %.

The main intention behind the segregation of scores was to chalk out a scoring pattern for micro financing. The model has been tested from the scores of 0.3 to 0.8 with an interval range of either 0.05 or 0.1. We noticed the following patterns in our analysis:

- Business Loss increases when we say no to a request with an increasing score.
- Credit Loss decreases when we say yes to a request with an increasing score.
- Business Loss is almost constant towards the lower end.
- Credit Loss is almost constant towards the higher end.

The score '0.4' has been chosen as a cut-off point for a turn down of the request because there is a sudden increase in the business loss as we move from the credit score of 0.4 to 0.5. The business loss is almost constant till the score of 0.4 and we see an abrupt change at 0.5, hence the cut-off. The score '0.7' has been chosen as a cut-off point for an acceptance of the request as credit loss becomes almost constant once we move beyond the score of 0.7 and business loss continues to grow steadily.

Hence, the score '0.7' has been taken as the cut-off. The range of 0.4 to 0.7 is the area which requires some brainstorming at the managerial level. The range of 0.4 to 0.5 has been assigned a negative bias; however a first level managerial review is required. The range of 0.6 to 0.7 has been assigned a positive bias with a first level managerial review requirement. The range of 0.5 to 0.6 should not be assigned any bias. If the score lies in this range, we suggest that the procedure requires a second level manager review with an exhaustive study of applicant's answers. A standard interview with the borrower is suggested.

We converted the scores which are mathematically arrived into more acceptable numbers to be used by industry professionals by multiplying 1000. For example a score of 0.455 was converted to 455.

Proposed Heuristic for Approving Loans

On closely analyzing the different percentages of Business Loss and Credit Loss as mentioned in the Table 4.11 at the checkpoints, we devised the following strategy for approving loans:

- If the score is less than 400, it is a strict no.
- If the score is between 400 and 500, the strategy is negatively biased and the decision requires a first level manager review.
- If the score is between 500 and 600, the strategy is neutral and the decision requires a second level manager review.
- If the score is between 600 and 700, the strategy is positively biased and the decision requires a first level manager review.
- If the score is greater than 700, it is strict yes.

The above mentioned strategy has been shown graphically in Table 4.12.

Table 4.12- Credit Score Application

Interval of Score	Bias	Credit Approval
Below 400	Strongly Negative	Automatic Rejection
400-500	Negatively biased	Rejection after Ist level consent
500-600	Neutral	Decision after 2nd Level consent
600-700	Positively biased	Approval after Ist level consent
700 and above	Strongly Positive	Automatic approval

Model suggested that we can fix up our range of score depending on management's perspective on business risk or credit risk assumption. Assumptions are related to the level of credit risk (risk of granting loans to defaulters) or business risk (loss of good borrowers) a lender is willing to assume.

4.4.6 Discriminant Analysis with an Objective to Arrive at a Critical Score of Predicting Defaulters

Discriminant analysis is used to classify observations into two or more mutually exclusive groups using the information provided by a set of predictors. A discriminant function (canonical root), is a latent variable that is created as a linear combination of the independent variables, such that

$$\mathbf{L = b_1x_1 + b_2x_2 + ... + b_nx_n + c,}$$

Where b_i is discriminant coefficient, the x_i is independent variable and c is a constant. The discriminant coefficients (b_i) are calculated such that the distance between the means of the dependent variable is maximized.

With an objective of getting a critical score by which we can predict defaulters or non-defaulters, we ran discriminant analysis on SPSS. The results obtained from the analysis are tabulated in the Table 4.13a to 4.13f.

Table 4.13a- Test Results

Box's M		2.822E3
F	Approx.	42.147
	df1	66
	df2	1.114E6
	Sig.	.00

Tests null hypothesis of equal population covariance matrices. Box's *M* is highly sensitive, is not robust if sample sizes are unequal and hence ignored.

Table 4.13b- Summary of Canonical Discriminant Functions Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	2.386[a]	100.0	100.0	.839

a. First 1 canonical discriminant functions were used in the analysis.

In a 2 group discriminant function, the cutting score was used to classify the 2 groups uniquely. The cutting score is the score used for constructing the classification matrix. Optimal cutting score depends on sizes of groups. If equal, it is halfway between the two groups' centroids.

The Table 4.13b of eigenvalues gives us information about the effectiveness of the discriminant functions. The eigenvalue is a ratio of between-groups sum of squares to within-groups or error sum of squares.

Table 4.13c- Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.295	1241.137	11	.000

Table 4.13d- Canonical Discriminant Function Coefficients

	Function
	1
V_Gen	.792
V_Marital	.979
V_KidsEdu	-.084
V_House	1.346
V_Meeting	.563
V_DistMembers	1.833
V_Family	1.621
V_LevelBussAftLoan	-.217
V_DistanceBank	-.102
V_Diversion	.121
V_LoanML	-.330
(Constant)	-5.104

Unstandardized coefficients

The size of the eigenvalue is helpful for measuring the spread of the group centroids in the corresponding dimension of the multivariate discriminant space. Larger

eigenvalues indicate that the discriminant function is more useful in distinguishing between the groups. The canonical correlation coefficient (0.839) measures the association between the discriminant score and the set of independent variables. It is an indicator of the strength of relationship between entities in the solution.

The key statistic indicating whether or not there is a relationship between the independent and dependent variables are the significance test for Wilks' lambda. Wilks' lambda is the proportion of the total variance in the discriminant scores NOT explained by differences among the groups. *In our research about 29.5% of the variance is not explained by group differences. As chi-square statistic corresponding to Wilks' lambda is statistically significant, we conclude that there is a relationship between the dependent groups and the independent variables.*

Table 4.13d contains the un-standardized discriminant function coefficients. These would be used like un-standardized b (regression) coefficients in multiple regressions that is, they are used to construct the actual prediction equation which can be used to classify new cases. Our model should be like this:

Di = -5.104 + 0.792V_Gen + 0.979 V_Marital -0.084 V_KidsEdu + 1.346 V_House + 0.563 V_Meeting +1.833 V_DistMembers + 1.621 V_Family - 0.217 V_LevelBussAftLoan – 0.102 V_DistanceBank + 0.121V_Diversion - 0.330 V_LoanML

The equation clearly shows the importance of gender, marital status, owning of house, frequency of meeting and distance between members of the group. All these variables have greater weight in the equation.

Table 4.13e- Functions at Group Centroids

ID	Function
	1
0	-2.416
1	.986

Unstandardized canonical discriminant functions evaluated at group means

Centroids are the mean discriminant scores for each group. This table is used to establish the cutting point for classifying cases. If the two groups are of equal size, the

best cutting point is half way between the values of the functions at group centroids (that is, the average). If the groups are unequal, the optimal cutting point is the weighted average of the two values.

The Table 4.13f is used to observe how well the discriminant function works, and whether it works equally well for each group of the dependent variable. Here it correctly classifies more than 96% of the non-defaulters (ID-1), and correctly classifies more than 91% of the defaulters (ID-0). Overall, 94.8% of the cases are correctly classified.

Table 4.13f- Classification Results[b,c]

		ID	Predicted Group Membership		Total
			0	1	
Original	Count	0	272	25	297
		1	28	700	728
	%	0	91.6	8.4	100.0
		1	3.8	96.2	100.0
Cross-validated[a]	Count	0	272	25	297
		1	28	700	728
	%	0	91.6	8.4	100.0
		1	3.8	96.2	100.0

a. Cross validation was done for all cases. In cross validation, each case is classified by the functions derived from all cases other than that case.

b. . 94.8% of original grouped cases correctly classified.

c. 94.8% of cross-validated grouped cases correctly classified.

4.5 Conclusion

The approach undertaken in this study was to identify variables which can be useful in predicting default. We identified variables in terms of significance by using Chi-Square test and then analyzing their effectiveness by interpreting results of cluster analysis. The variables identified have been used to develop credit scoring model and the testing of their effectiveness & robustness have been tested by using three different techniques- logistic regression, linear regression & discriminant analysis. The results of these techniques show that the variables identified are pertinent in credit scoring. However we developed a credit scoring model using linear regression considering the ease & convenience at lenders end.

CHAPTER 5

FINDINGS AND FUTURE SCOPE FOR RESEARCH

5.1 Introduction

Micro-credit grew out of two new ways to judge the repayment risk of the self-employed poor: joint-liability groups and loan officers who make detailed personal and financial evaluations of individual borrowers and their homes, businesses, and collateral. Scoring is another new (to micro-credit) way to judge repayment risk. Credit Scoring detects historical links between repayment performance and the characteristics of loan applications. It assumes that the links between repayment performance and the characteristics of loan applications will persist over time, and then based on the characteristics of current applications it forecasts future repayment risk. In high-income countries, credit scoring in retail banking has been one of the biggest breakthrough ever in terms of providing millions of people of modest means with access to small, short, unsecured, low-transaction cost loans.

The challenge of micro-credit is to judge the risk of whether the self-employed poor will repay their debts as promised. Scoring does reduce probability of defaults and so reduces time spent on collections; this greater efficiency improves both outreach and sustainability. Scoring, however, is not for most micro lenders. It works best for those with a solid individual lending technology and a large database of historical loans.

5.2 Enablers of Better Recovery Rate in Indigenous Money Lending Business

Our research focused on developing credit scoring methodology that progressively parsimoniously uses borrowers' attributes/variables to predict defaulters. In first stage an exploratory study was undertaken to get an insight into money lending business with a specific view to understand enablers of better recovery rates in money lending by indigenous money lenders, since money lending is still a thriving trade. Experts, who had either worked directly to provide micro-credit or influenced the policy or growth of micro-finance, directly or indirectly were surveyed. ***Analysis shows that if loan products are designed in such a way that they can be availed in a simple and quick manner, the recovery prospects will automatically be higher.***

As the experts were aware about the underlying factors of recovery in money lending, the majority of these experts ranked product-driven attributes very high. In view of experts these attributes have higher rank value against the better and deeper information about the borrower. ***Outcome of research findings reveal that availability of easy, prompt and repeated loan or credit products motivate the borrowers to repay in compliance with repayment terms.***

Factor analysis of variables revealed that there were two dimensions which made money lending effective in terms of recovery of loan. The first dimension was about loan facilitation and recovery specific feature and second dimension was about borrower information.

If a lender is adept in designing a loan product which offers ease, promptness and assurance of getting loan as and when required repeatedly for productive purpose, the borrowers themselves will be motivated to repay the loan.

To tackle delinquency, even with such a loan product, the lender should have effective loan contract enforcement mechanism. These could be through use of social influence or coercive action. Coercive action may consist of sending tough reminders to repay at inconvenient times or taking possession of assets. Usually this acts as a major deterrent for a majority of borrowers, although may not be required to be exercised in general, unless certain aspects have been over looked at appraisal stage itself. Results of our study show that recovery measures are ranked as of least importance and thus to be used as last resort.

Another dimension was that of consumer insight and consisted of information about suitability of a specific loan product for specific segment of the borrower, whether default is voluntary or involuntary, what recovery measure are appropriate in a social contexts and with borrower history. Continuous and timely capturing of development at borrower's front by the lender help lender to take appropriate measures to improve recovery.

5.3 Predictors of Recovery in Micro-finance as viewed by experts

The research was designed to get an insight into attributes/variables that, if incorporated in designing credit product and appraisal process, may improve repayment in micro-finance sector. A focused group of experts involved in the activity of micro-finance either as policy maker, facilitator or provider was undertaken to get a deeper insight into attributes affecting recovery of micro loans. These groups of experts were classified on the basis of their expertise and their role.

'Gender', 'marital status of borrower' and 'borrower's attitude towards family planning' was considered to be unimportant by the experts and difference in the opinion of experts was insignificant. Though 'number of kids' was also considered to be unimportant but there was significant difference of opinion. 'Age', 'ownership of house', 'purpose of loan', 'number of dependents', 'period of engagement in the same activities' and 'engagement in self employment' were considered as important and there was insignificant difference of opinion of experts. 'Literacy (reading and writing ability)', 'period of stay at same place', 'concern for kids education', 'concern for girls education', 'ownership of agriculture land', 'past track record of repayment', 'distance from bank', 'opinions about applicant from existing borrowers', 'eligibility for action under state recovery', 'opinion of reputed persons of the area to which applicant belongs', 'existing indebtedness of borrower', 'availability of collateral', 'involvement of spouse in earning activity', 'availability of subsidy', 'availability of personal guarantee' are other variables which were found to be important but there was significant difference of opinion amongst experts. Having identified above referred variables affecting recovery of micro finance loans, we designed and developed a structured questionnaire for borrowers' survey.

5.4 Reduction in the cardinality of set of variables

Borrowers under micro-finance category were surveyed for their attributes and the results were analysed using various statistical techniques. As a first step, we performed. Pearson Chi Square Test to gauge the significance of each variable. Those variables which are not found significant from this test were eliminated from any further analysis. Period of stay at same place, experience of borrower and purpose of loan were found to be insignificant and were deleted from the list of variables

considered for further analysis. Subsequently we performed factor analysis to observe possibility of further elimination of variables. The results of Factor Analysis showed us that all the variables were loaded with one or another factor. Therefore we continued our analysis with the same set of 17 variables.

Cluster analysis was performed to discriminate defaulters and non-defaulters based on combination of variables selected. The results were found to be satisfactory and authentic in terms of classification of defaulters and non-defaulters. The differentiation was accurate with 90% accuracy rates. At first stage we ran cluster analysis 17 times, each time eliminating one variable. The same procedure was repeated six more times eliminating one variable at each step. Altogether we performed this process 99 times.

As the results of cluster analysis performed at each step through pecking order, we found that the effectiveness was not compromised while the number of variables got reduced.

With cluster analysis we found the discriminating power of 99 sets of combination of variables. According to the discriminating power, we decided which variables to retain and which one to delete in successive run of cluster analysis. Though we ran cluster analysis 99 times we never observed accuracy rate of less than 70%. Highest accuracy rate was as high as 95%. Cluster analysis proved to be an effective tool to identify relevant variables to discriminate defaulters and non-defaulters which was subsequently used to develop credit scoring model. Variables, thus identified, helped in building an effective credit scoring model.

5.5 Development of a Credit Scoring Methodology for Micro-finance Borrowers

With an objective to develop credit scoring methodology we started with logistic regression. We performed logistic regression eight times starting with 17 variables, eliminating one variable at each step. The variables which were eliminated were the same as obtained from cluster analysis and the same elimination order was used as given in the previous section. After analyzing the results of logistic regression we saw that the eliminations suggested by cluster analysis were correct. A high accuracy rate was maintained throughout our analysis and it varied between 94.3% - 95.8%. With

11 variables, we observed an accuracy rate of 95.3% and therefore we went ahead with 11 variables rather than 17 variables which provided an accuracy rate of 95.8%.

Next approach was to apply multivariate linear regression analysis to arrive at a function which can provide us a score to enable a lender to make informed decision to take a credit call. The Adjusted R Square value tells us that our model accounts for 70.2% of variance in the spelling scores – a good model. ANOVA which assesses the overall significance of our model tells us that $p < 0.05$ and so our model is significant.

Model suggested that we can fix up our range of score depending on management's perspective on business risk or credit risk assumption. Assumptions are related to the level of credit risk (risk of granting loans to defaulters) or business risk (loss of good borrowers) a lender is willing to assume.

Finally, we performed discriminant analysis that was used to classify observations into two or more mutually exclusive groups using the information provided by a set of predictors (analogous to independent variables in regression), when no natural ordering is present amongst the groups. With an objective of getting a critical score by which we can predict defaulters or non-defaulters, we ran multivariate discriminant analysis on SPSS.

We find that the set of variables which are selected after cluster analysis are pertinent and effective for discriminating defaulters and non-defaulters.

5.6 Major Findings

The research has identified a comprehensive list of eleven variables namely 'gender', 'marital status', 'concern for kids education', ' ownership of house', 'frequency of meeting of group members', ' average distance between group members', ' number of family members in group', 'level of business after availing loan', ' average distance between borrower and bank', 'diversion of loan', and 'loan from money lender' for credit scoring in micro-finance.

The research was an attempt to extend credit scoring methodology in micro-finance in Indian context. This would provide the future researchers and practitioners with some guidance in field of credit scoring methodology for micro-finance industry. The

research provides an approach to identify relevant variables to develop credit scoring models in micro-finance which could be utilised by micro-finance lenders to ensure better recovery of micro-finance loans and at the same time contribute in improving their effectiveness by way of sustainable development, especially of the lower income strata of society.

Application of one statistical tool among others has been studied in various papers. Our research suggests development of credit scoring methodology with sequential application of statistical tools. Methodology not only suggests various tools but also provide flexibility in the hands of practitioners to identify predictor variables and capture them in advance or concurrently during currency of loan. This historical pool of data of barrowers consisting of defaulters and non-defaulters can be used to develop a credit score model relevant to specific lender for screening prospective borrowers.

5.7 Limitations

The major limitations of the study are as under:

- The study was conducted on borrowers of four districts of Uttar Pradesh, namely – Sitapur, Lakhimpur, Gonda and Raebarely. As the behavioral attributes change with change in the geography and socio-economic factors, a larger area with larger sample size is required to be used for developing model for credit scoring which can be implemented across geographical areas.
- The study is based on cross-sectional data. More effective analysis can be performed if the data could be obtained from the bank/MFIs on the period of delinquency.
- The other important issue is the development of the performance measures which were developed based upon self-reported information from the experts. The items in the questionnaire are subjective in nature. Experts were asked to rate items based on their perception, as to the extent to which the items were applicable in their respective organisations. Hence, the lack of objective measures might introduce certain amount of human factor into the data collected.

- Credit scoring models in micro-finance have the same ultimate goal as credit scoring models in other domains: optimal discrimination between good and bad loans. The discriminatory power performance of credit scoring systems for micro-finance remains too weak (in terms of small dataset used to develop a model as compared to retail lending) to justify a complete reversal of the traditional credit process towards scoring. However, credit scoring may become a refinement tool in the current process as it has already proven to be stable, easy to use, and also to have a certain discriminatory power.

5.8 Future Scope of Research

- The sample size of borrowers considered in the study was 1025. However a larger size of the sample could have helped in improving the statistical results. Therefore large sample size could be tried upon to increase the external validity of the instrument.
- Similar research can be undertaken in different states to identify variation in attributes affecting recovery of loans under micro-finance from state to state.
- There is a scope of conducting research for micro-finance borrowers who are individual borrowers and also for those borrowers who have shifted from group lending to individual lending and developing parametric models for those borrowers.
- The longitudinal study with controlled and experimental groups in collaboration with the lenders may have a great potential for future research with practical applicability.

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Appendix 1 - Questionnaire: Experts' Perceptions on Recovery in money – lending and micro-finance

Sl. No.	Demographic / Behavioral characteristics of borrower	Importance in context of assessment for recovery of loan		
		Very Important	Important	Neutral
1	Age			
2	Gender			
3	Literacy (reading & writing ability)			
4	Period of stay at same place			
5	Marital Status			
6	No. of Kids			
7	Concern for Kids education			
8	Concern for Girls education			
9	Ownership of a house			
10	Ownership of agriculture land			
11	Attitude towards family planning			
12	Past track record of repayment			
13	Purpose of loan			
14	Distance from bank			
15	Opinions about applicant from existing borrowers			
16	No. of dependents			
17	Period of engagement in the same employment activities.			
18	Eligibility for action under State Recovery Acts.			
19	Opinion of reputed persons of the area to which applicant belongs			
20	Existing indebtedness of borrower			
21	Availability of collateral			
22	Involvement of spouse in earning activity			
23	Availability of subsidy			
24	Engagement in self employment (Being Micro Entrepreneur)			
25	Availability of personal guarantee			

Reasons for higher repayment rates to the money lender (Please rank them in order of importance i.e. most important (1) to least important (7) according to your opinion):

Ease of getting loan	Promptness in getting loan	Availability of repeated loan	Use of social influence for recovery	Use of muscle power for recovery	Availability of deeper information about the borrower	Threat of social outcast in case of non recovery

Name: Organization: Date:

Designation: Email: Contact No.:

Appendix 2- Questionnaire: Borrowers' Survey

Sl. No.	Characteristics	Variable_Code	Values	
			0	1
1	Gender	V_Gen	Male	Female
2	Age	V_Age	Age<25	Age>=25
3	Period of Stay at Current location	V_Res	Stay<3	Stay>=3
4	Marital Status	V_Marital	Unmarried	Married
5	Number of Kids	V_Kids	Kids<2	Kids>=2
6	Whether Kids being educated	V_KidsEdu	Uneducated	Educated
7	Whether Girls being educated	V_KidsGirlsEdu	Uneducated	Educated
8	Ownership of a house	V_House	Doesn't own	Own
9	Frequency of meeting of group members	V_Meeting	Fortnightly or monthly	Daily or Weekly
10	Average distance between group members	V_DistMembers	Dist.>3Kms	Dist.<=3Kms
11	Group Constituted by	V_ConstdBy	By Others	On Own
12	Number of family members in group	V_Family	More than 1	Only 1
13	Employment before loan	V_Empl_Bf_Loan	Unemployed	Else
14	Employment after loan	V_LevelBussAftLoan	New	Same Employment
15	Experience	V_Exp	Exp<1yr	Exp>=1 yr
16	Distance from Bank	V_DistanceBank	Dist.>3Kms	Dist.<=3Kms
17	Purpose of loan	V_Purpose	Other Than IGL	Income Generating Loan
18	Diversion of loan	V_Diversion	Diversion>=10%	Diversion<10%
19	Whether loan availed from money lender	V_LoanML	No	Yes
20	Whether defaulted on loan availed from money lender	V_DefaultML	Yes	No

Appendix 3 – Predictions of Recovery in Micro-Finance and their Importance as Perceived by Experts

	Mean	Type of Organisation	Sum of Squares	df	Mean Square	F	Sig.
Var_Age	3.35	Between Groups	13.745	6	2.291	1.58	0.153
		Within Groups	421.96	291	1.45		
		Total	435.705	297			
Var_Gen	2.25	Between Groups	19.251	6	3.209	1.808	0.097
		Within Groups	516.373	291	1.774		
		Total	535.624	297			
Var_Lit	3.19	Between Groups	39.171	6	6.529	3.355	0.003
		Within Groups	566.305	291	1.946		
		Total	605.477	297			
Var_Per	3.75	Between Groups	50.482	6	8.414	5.705	0
		Within Groups	429.142	291	1.475		
		Total	479.624	297			
Var_Mar	2.38	Between Groups	19.395	6	3.233	1.766	0.106
		Within Groups	532.511	291	1.83		
		Total	551.906	297			
Var_Kid	2.62	Between Groups	44.277	6	7.379	4.386	0
		Within Groups	489.629	291	1.683		
		Total	533.906	297			
Var_Edk	2.87	Between Groups	47.456	6	7.909	3.51	0.002
		Within Groups	655.698	291	2.253		
		Total	703.154	297			
Var_Edg	2.79	Between Groups	37.642	6	6.274	2.868	0.01
		Within Groups	636.613	291	2.188		
		Total	674.255	297			
Var_Hou	3.28	Between Groups	23.71	6	3.952	2.081	0.055
		Within Groups	552.613	291	1.899		
		Total	576.322	297			
Var_Agr	3.13	Between Groups	39.548	6	6.591	3.477	0.002
		Within Groups	551.607	291	1.896		
		Total	591.154	297			
Var_Fpl	2.87	Between Groups	16.474	6	2.746	1.214	0.299
		Within Groups	658.157	291	2.262		
		Total	674.631	297			
Var_Rep	4.33	Between Groups	60.287	6	10.048	8.562	0
		Within Groups	341.485	291	1.173		
		Total	401.772	297			

	Mean	Type of Organisaztion	Sum of Squares	df	Mean Square	F	Sig.
Var_Pur	4.36	Between Groups	1.701	6	0.283	0.25	0.959
		Within Groups	330.594	291	1.136		
		Total	332.295	297			
Var_Dis	3.03	Between Groups	101.241	6	16.874	10.618	0
		Within Groups	462.423	291	1.589		
		Total	563.664	297			
Var_Opn	3.52	Between Groups	86.319	6	14.386	8.612	0
		Within Groups	486.097	291	1.67		
		Total	572.416	297			
Var_Dep	3.03	Between Groups	11.438	6	1.906	1.386	0.22
		Within Groups	400.226	291	1.375		
		Total	411.664	297			
Var_Emp	3.58	Between Groups	19.871	6	3.312	2.404	0.028
		Within Groups	400.854	291	1.378		
		Total	420.725	297			
Var_Sra	3.58	Between Groups	31.351	6	5.225	2.985	0.008
		Within Groups	509.374	291	1.75		
		Total	540.725	297			
Var_Op3	3.19	Between Groups	55.526	6	9.254	4.602	0
		Within Groups	585.186	291	2.011		
		Total	640.711	297			
Var_Deb	4.01	Between Groups	69.404	6	11.567	8.663	0
		Within Groups	388.582	291	1.335		
		Total	457.987	297			
Var_Col	3.11	Between Groups	48.523	6	8.087	4.491	0
		Within Groups	524.041	291	1.801		
		Total	572.564	297			
Var_Spo	3.23	Between Groups	33.696	6	5.616	3.449	0.003
		Within Groups	473.861	291	1.628		
		Total	507.557	297			
Var_Sub	2.36	Between Groups	70.118	6	11.686	6.581	0
		Within Groups	516.741	291	1.776		
		Total	586.859	297			
Var_Ent	3.66	Between Groups	5.547	6	0.925	0.619	0.715
		Within Groups	434.896	291	1.494		
		Total	440.443	297			
Var_Pgu	3.11	Between Groups	70.339	6	11.723	5.703	0
		Within Groups	598.224	291	2.056		
		Total	668.564	297			

Appendix 4- Pearson Chi-Square Table

S.No.	Variable		Values		Pearson Chi-Square	Probability	Significant
			0	1			
1	V_Gen		Male	Female	211.2	0	YES
		D	245	52			
		ND	237	491			
		Total	482	543			
2	V_Age		Age< 25	Age>=25	196.7	0	YES
		D	140	157			
		ND	63	665			
		Total	203	822			
3	V_Res		Stay<3	Stay>=3	1.465	0.226	NO
		D	13	284			
		ND	21	707			
		Total	34	991			
4	V_Marital		Unmarried	Married	145.7	0	YES
		D	81	216			
		ND	19	709			
		Total	100	925			
5	V_Kids		Kids<2	Kids>=2	108.7	0	YES
		D	208	89			
		ND	250	478			
		Total	458	567			
6	V_KidsEdu		Uneducated	Educated	21.988	0	YES
		D	157	140			
		ND	269	459			
		Total	426	599			
7	V_GirlEdu		Uneducated	Educated	41.426	0	YES
		D	202	95			
		ND	334	394			
		Total	536	489			
8	V_House		Doesn't	Own	374.1	0	YES
		D	181	116			
		ND	43	685			
		Total	224	801			
9	V_Meeting		Fortnightly or monthly	Daily or Weekly	102.2	0	YES
		D	287	10			
		ND	485	243			
		Total	772	253			
10	V_DistMembers		Dist.>3Kms	Dist.<=3 Kms	385.8	0	YES
		D	151	146			
		ND	11	717			
		Total	162	863			

S.No.	Variable		Values		Pearson Chi-Square	Probability	Significant
			0	1			
11	V_ConstdBy		By Others	On own	100.3	0	YES
		D	286	11			
		ND	484	244			
		Total	770	255			
12	V_Family		More than 1	Only 1	277.7	0	YES
		D	159	138			
		ND	52	676			
		Total	211	814			
13	V_Empl_Bf_Loan		Unemployed	Else	19.425	0	YES
		D	121	176			
		ND	407	321			
			528	497			
14	V_LevelBussAftLoan		New	Same Employment	58.863	0	YES
		D	128	169			
		ND	501	227			
		Total	629	396			
15	V_Exp		Exp<1yr	Exp>=1yr	1.988	0.159	NO
		D	128	169			
		ND	349	379			
		Total	477	548			
16	V_DistanceBank		Dist.>3Kms	Dist.<=3 Kms	38.832	0	YES
		D	262	35			
		ND	507	221			
		Total	477	548			
17	V_Purpose		Other Than IGL	Income Generating	1.281	0.258	NO
		D	78	219			
		ND	167	561			
		Total	245	780			
18	V_Diversion		Diversion>=10%	Diversion<10%	64.764	0	YES
		D	198	99			
		ND	284	444			
		Total	482	543			
19	V_LoanML		No	Yes	166.5	0	YES
		D	93	204			
		ND	542	186			
			635	390			
20	V_DefaultML		Yes	No	7.635	0.006	YES
		D	56	241			
		ND	89	639			
		Total	145	880			

Brief Biography of Candidate: Arun Kumar Vaish

Arun Kumar Vaish is a Visiting Faculty (Finance) at Birla Institute of Technology & Sciences, Pilani. He completed his B.E. (Hons.) in 1989 from BITS-Pilani. Out of his total experience of 22 years, he has served for more than 13 years in banking in various domains like credit, retail, branch banking, correspondent banking, capital market and treasury. During his tenure as rural branch manager, he has managed to reduce non-performing asset of the branch drastically and his efforts towards micro-credit, especially government sponsored schemes, was recognized by administrative authorities. Since 2006, he is teaching at BITS-Pilani. His research interest areas are micro-finance, credit-risk and structured finance. He has delivered several guest lectures and conducted MDPs.

Brief Biography of Supervisor: Prof. Arya Kumar

Prof. Arya Kumar is presently Dean Student Welfare Division and Chief Entrepreneurship Development & IPR Unit BITS, Pilani. He is also coordinating the activities of Technology Business Incubator and Centre for Entrepreneurial Leadership at BITS, Pilani. He did his M A (Hons.) Economics in first class first in the year 1977 and PhD from BITS-Pilani in the area of Financial Management of Higher Education in India in the year 1982. He has a diversified experience of more than 33 years of serving in educational institutions, research organizations, banks and financial institutions. He served as Chief General Manager and Zonal Head of Delhi Zone of the Industrial Investment Bank of India, an All India Financial Institution, till July 2003. He was actively involved in Corporate Planning, Project Financing, Investment Banking, and Reconstruction of ailing units in different capacities between 1983 and 2003 in the banking industry.

His basic interests lie in Entrepreneurship, Strategic Management, Values in Management and Financial Management. He has co-authored four books in the area of Entrepreneurship, General Management, Ethics in Management, and Grassroots Entrepreneurship. He has contributed many research articles in National Journals and Economic Dailies in the area of entrepreneurship, management and economics. He has been serving as Guest Faculty with a number of leading management institutions and colleges of various Banks. He has successfully completed "Workshop on Technology Entrepreneurship Education – Theory and Practice " organised by Lester Center for Entrepreneurship, Berkeley, Indo US Science & Technology Forum, DST, Govt. of India and Intel; Entrepreneurship Educators Course (EEC) jointly organised by STVP, Stanford University, IIM Bangalore and National Entrepreneurship Network (NEN); Goldman Sach's 10,000 Women Programme: Tools for Growing your Business organised by NEN in collaboration with London Business School; and Accelerated Commercialisation of Technology Innovation organized by Venture Centre, NCL , Innovation Park in association with Accelerator India, Cambridge University.

He has presented papers in 5 international conferences abroad and 10 national/international conferences in India during the last 6 years. He has published 18 research papers in international/national journals during last 6 years. He has examined 6 PhD theses, and is supervising 6 research students in different stages of completion of their PhD; provided inputs to more than 20 PhD candidates as a member of Doctoral Advisory Committee, supervised 11 postgraduate theses, 50 students in undertaking special study oriented projects. He has delivered more than 32 invited talks/chaired sessions during the last 6 years, especially in the areas of entrepreneurship, finance, banking and economic development. He has to his credit three vital research projects that have been funded by NSTMIS, DST, Govt of India, and National Entrepreneurship Network, Wadhwani Foundation, Aditya Birla Group.

He is a member of the National Entrepreneurship Network (NEN) India Faculty Advisory Board which has done a pioneering work in promoting entrepreneurship in educational institutions by creating a favourable echo- system for the past more than seven years. He has contributed to the "Expert Group Consultation on Developing a Manual on Youth Enterprise Development" organised by Commonwealth Youth Programme Asia Centre, along with Ministry of Youth Affairs and Sports, GOI. He was honoured with distinguished faculty award in recognition and appreciation of his dedication, interest, enthusiasm and attitude in accomplishing his assigned mission of teaching by BITSAA International in 2011 and Global excellence award for outstanding contribution to management education - 2012 Management Teachers Consortium (MTC).

Brief Biography of Co-Supervisor: Prof. Anil K Bhat

Prof. Anil Bhat graduated in Mechanical Engineering in 1982 from REC, (now NIT) Srinagar and obtained his doctorate (fellowship) from IIM-Bangalore. His specialization is Marketing Research and his methodological contribution has been in the area of "Cluster analysis of rank order data". He is a member of Academy of Management. He has been trained at international workshops conducted by Haas School of Business, University of California, Berkeley and STVP, Stanford. He has also worked in managerial capacity for organizations before turning to academics. He has more than fifty publications to his credit and has supervised a number of Ph.D. students. He has also conceptualized, designed and conducted many MDP's both for private and public sector companies. He is presently Professor and Head, Management Department, and Faculty Advisor, Center for Entrepreneurial Leadership (CEL) at BITS-Pilani. He has served as a management expert on Union Public Service Commission expert panel. He has been certified as an Entrepreneur Educator by STVP Stanford, NEN and IIMB.

List of Publications

1. Arun Kumar Vaish, Prof. Arya Kumar and Prof. Anil Bhat (2011). Need For Credit Scoring in Micro Finance: Literature Review, *International Journal of Research in Commerce, Economics & Management*, Vol.1 (2011) Issue No. 6 (October,2011)
2. Arun Kumar Vaish, Prof. Arya Kumar and Prof. Anil Bhat (2011). Stakeholders' Perspective of Service Attributes: An Empirical Study about Money Lending in Rural India, *Asia pacific Journal of Research in Business Management*, Volume 2, Issue 12 (December 2011).
3. Arun Kumar Vaish and Aditya Nagpal (2008). Micro-Financing in the Management of Ponds for Water Conservation, *International convention on Water Resource Development and Management*, BITS Pilani, October 2008.
4. Arun Kumar Vaish (2008). Role of ICT in Re-energizing Individual Lending Model of Micro-Credit, *National Conference on Financial Sector: Contemporary Issues*, IBS Bhubneshwar, November 2008.
5. Arun Kumar Vaish (2010). Housing Microfinance: Developing an Architectural plan for collaborating Banks, MFIs and Government for synergizing efforts and gains, *Institutional and Technological Environment for Microfinance Conference*, New Delhi, organised by Burgundy School of Business, France, January 2010.
6. Arun Kumar Vaish and Sharad Agrawal (2010). Indian Microfinance Industry: Resilience during Economic Downturn, *3rd International Conference on Microfinance*, Puducherry, Jan 2010
7. Arun Kumar Vaish and Sharad Agrawal (2010). Regulation of Micro-Finance Industry: A Global Perspective, *Fifth Annual International Conference on Public Policy and Management, IIM Banglore*, August 2010.
8. Arun Kumar Vaish, Prof. Arya Kumar & Prof. Anil Bhat, Wither Money Lender? Long live Money-lending Insights! *World conference on "Emerging Issues in Management" organized on May 30- June 1,2013*. Jointly hosted by the Indian Institutes of Management at Goa (India).