International Journal of Management, IT & Engineering
(ISSN: 2249-0558)

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Editorial Board

Title

FACTORS OF DEFAULT IN SMALL AND MEDIUM ENTERPRISE: AN APPLICATION OF CLUSTER ANALYSIS

Author(s)

Subroto Chowdhury

Assistant Professor,

Department of Commerce,

Manipal University

Abstract:

Lending activity is an integral part of the banking business. Howsoever good a bank may be in its credit management it cannot escape the natural laws operating within the dynamics of advance and recovery. To put in more manageable sense the strategic homogeneity of the factors of default are also affected by the category of default and the type of facility. Grouping and regrouping of the factors of default is a natural phenomenon based on certain rules. Thus this kind of an understanding calls for deliberation to find out the factors of default and also look for natural tendency of the factors for formation of clusters. Marketing as a process always looks for clusters based on certain homogeneity of variables so as to design techniques and means thus maximizing reach and minimizing cost. The formation of clusters and the affinity of certain units to cling to the same clusters can always provide with the much needed vital tip. The formulation of recovery plan is more strategic in nature when it comes to banks, with operational part playing a necessary role of execution. The dynamics of the factors of default and the formation of clusters according to major category of defaulter can open up new avenues to find out the synergistic agglomeration of units.

Key Words: Factors of Default, SME, Banks, Cluster Analysis

JEL Classification: G-21, C-83, H-80

Introduction:

India is growing at a pace which can be comfortably compared with the best growing economies of the world. Un-affected by the global meltdown, India was able to hold onto its growth with sound policy initiatives and robust banking network. The banking system prevalent in India is guided by strict compliance measures as well as structured policy formulations which helps it to absorb the financial shocks emanating from other economies. During recent times the banking system has focused in financing the sector of small retail business. The sector is considered as a viable option in terms of both profitability and stability.

No lending business is without risk, thus banks are also exposed to the risk of default in lending to the small retail business. Default Risk, or that risk of loss due to a debtor's non-payment of a loan, has been prevalent in banking history. It is perhaps the most important risk type that has been present in financing from very past till today. Default risk is the primary financial risk in the banking system and exists in virtually all income-producing activities. The management of default risk is critically important for banks to augment its performance over time. A number of small and large failures, combined with the corresponding economic and social impact, more accelerated the importance of measurement of default risk in banking sector.

World wide increase in the number of bank bankruptcies especially in Small and Medium Enterprise (SME) in last few years has raised concern. It has become necessary to find out the factors of default responsible for default in case of small business loans. The sub-prime crisis triggered in the west pulled down the asset prices drastically thus, motivating the bankers to take review of the asset prices which were offered as collateral. In case of SME financing the value of the collateral plays a vital role in recovery mechanism. But collateral cannot always guarantee the recovery. Also the fall in interest spread has made the quality of credit even more important. Keeping in view the above discussed premise it becomes necessary to have comprehensive view on the factors of default in case of SME financing and also look for natural agglomeration of the factors of default

Review of literature:

Several studies have been conducted over time to understand the causes of default. The phenomenon of default is equally costly to all the parties involved in the process of lending and borrowing. Default hurts both the borrower and the lender .The loss of lender is in terms of interest and principal whereas the amount of mental stress and lower credit rating along with bleak future prospects of getting credit is the loss to the borrower (Giliberto and Houston, 1989). Several factors are said to have impact on the default. Interest rate is expected to have an impact on the default and the same is also replicated in the a study of default by Jung (1962) whose findings were that “Interest rates charged to borrowers reflect the expectations that lenders hold toward default risk, and because the risk of default increases with a higher loan-to-value ratio, interest rates should have a positive correlation with the loan-to-value ratio at the time of origination." Von Furstenberg (1969) found household income to have a significant effect on default; he believed that the effect was actually capturing the effect of loan-to-value ratio on default. In comparing the effects of loan and borrower characteristics on default, Von Furstenberg (1969) concluded that loan-to-value ratio explains 32 percent of the total variation in annual default rates, while household income, by itself, explains less than 10 percent.

In their analysis of loan repayment delinquency, Herzog and Earley (1970) examined the role of borrower-related factors on delinquency. Borrower age, marital status, and number of dependents were found to have an effect on delinquency or default. Payment-to-income ratio is very significant to default decision; Williams, Beranek, and Kenkel (1974) concluded "Borrowers with an initial payment-to-income ratio higher than 30 percent were significantly more likely to default than were other borrowers." Geographical distribution is also perceived to have an impact on the repayment behaviors of the borrowers and the same was authenticated by the study conducted by Von Furstenberg and Green (1974) who evaluated that loans made in suburban locations were found to be less risky than those made in central-city locations. In their study of 7690 loan they found that a suburban location reduces delinquency risks significantly (by as much as 47 percent) compared with an urban location. In their comparative analysis of default among seven lending institutions Williams, Beranek, and Kenkel (1974) found that the unemployment rate has a significant and positive effect on default. Vandell and Thibodeau (1985) found that several borrower-related factors significantly affect default. Variables such as self-employment, sources of income from commission and investment, a short length of employment, and low non housing wealth at time of loan origination (i.e. variables capturing low permanent income), were associated with riskier loans. Not only that they also founded that payment burden had a negative effect on default.

In their empirical analysis, Vandell and Thibodeau(1985) analyzed the default decision exclusively. Consistent with the contentions of their model, the authors found contemporaneous net equity to have a significant positive effect on default, whereas the difference between market and par value of the mortgage exhibited a significant negative effect.

In their analysis of borrower characteristics, Herzog and Earley (1970) found borrower's occupation, a proxy measure for the stability of income, to be highly significant. In contrast, payment-to-income ratio at the time of origination was found to be significant. In their analysis they found income to be significant and negatively related to delinquency. According to Flint (1997) having an adequate disposable income is a necessary, but not sufficient. Low incomes increase default risk, but many of those having the apparent ability to repay nevertheless choose not to. In the study conducted by Flint in 1997 it was observed that, 11.6 percent of borrowers who had disposable incomes greater than total amount borrowed ended up defaulting, whereas 83 percent of borrowers with disposable incomes less than total amount borrowed were in repayment. Thus it can be concluded that default risk measurement should include dynamics other than adequacy of disposable income.

Income of the borrowers is one of the factors in default and in the study by (Van Order et al. 2000) it was concluded that default rates and default losses are higher for low-income borrowers. Indebtedness is considered as one of the major factors in default, According to Altman (1968) the firms are more likely to default if they are highly indebted, less profitable, and less liquid and if the legal system does not create efficient incentives to repay the loans. While contradictory views were observed in the study conducted by woo in 2002 where it was revealed that borrowers with high indebtedness are actually less likely to default than borrowers with low indebtedness. Personal characteristics also plays a major role in deciding the repayment by the borrower and the same was observed in the study conducted by Woo (2002) where "borrowers who went into delinquency more than once were more likely to default".

The use of cluster analysis in order to classify the factors of default was not attempted before. However, few studies can be cited from international literature that addresses companies' financial performance using multivariate statistical techniques such as cluster analysis, principal components analysis, discriminant analysis and factor analysis. The power of the cluster in explaining companies' growth and their survivorship rates on the market along with cluster building mode in the financial services industry in Great Britain is studied (Pandit, Cook, Swann, 2001). While Fifield et al. (2002) used principal component analysis to find out the global and local factors that can explain the returns on the emerging markets. In order to analyze the missing data and identify homogenous groups in the interior of the available data cluster modeling of financial data is applied (Bensmail and DeGennaro, 2004). The factors influencing returns on the Indian capital market was studied using principal components analysis (Dhankar and Singh, 2005). Sueyoshi (2005) used non-parametric discriminant analysis and analyzed the financial performances of a number of 147 companies by assigning a set of weights to a linear discriminating function which as a result generated a score as regard to its belonging to a particular group. The success of an investment made in the selected 71 companies from the Australian capital market using a set of financial indictors was studied by Ganesalingam and Kumar (2001). The study brought forward a discriminatory rule which can explain the interrelation between the companies and the factors providing profitability. The rule henceforth was used to envisage the companies' stability and to construct diversified portfolios.

Objective:

The basic objective of the study is to ascertain the various reasons of default in case of SME borrowers and to classify the factors. The study aims to know different reasons of default on repayment of bank loans and to identify the specific factors of default according to the category of default. Also the objective is to identify the natural agglomeration of the specific factors of default according to different category of default.

Study Design:

The design of the study conducted employs two approaches- one is subjective analysis and the other statistical analysis. Twenty five cases are selected form two branches, one public sector bank and the other private sector bank operating in the same area. The cases were selected purposively from both public and private sector banks in order to nullify the managerial impact on default category. The selected cases were studied extensively to understand the profile of the borrower and the probable reasons for default. After proper deliberation on the cases, case profile was prepared and the individual borrowers were interviewed with an open ended interview schedule developed for the purpose of the study. For a better understanding of the factors of default the defaulters were classified into three categories. First category consists of borrowers who have became defaulter in between one to three years of availing the loan and were referred to as C1.The borrower who became defaulter in between three to five years of availing the loan were called C2 and the borrower who became defaulter after five years of availing the loan were classified as C3.

After the identification of the factors responsible for default according to C1, C2 and C3 category; hierarchical clustering analysis was performed. The aim of performing the statistical grouping of the factors was to identify the natural grouping of the factors according to defaulter category. The analysis was performed in order to understand the natural affinity of the factors to exert a cumulative effect on the other factors. However regression analysis was not performed because in regression analysis the exogenous and endogenous variables are designed at the outset to produce results which are definitive in nature. A priori restrictions on the interrelationship between the variables are already imposed. But in the present study the regression style of analysis was not demanded for keeping in view the nature of the study. More natural agglomeration of the factors according to category of defaulter was desired to be studied, hence, the choice of cluster Analysis. Cluster analysis imposes no a priori restriction and tries to form the groups based on their natural affinity. But cluster analysis is not free from limitations- the number of clusters formed may not be correct and the clusters formed from the data may not significantly represent different groupings (see Korobow and Stuhr, 1991). However this limitation in no way restricts the use of cluster analysis. Cluster analysis is used as a complementary tool to help diagnose the nature of the grouping of the factors. The output of cluster analysis is represented by two dimensional treelike diagrams called dendrogram. Dendrogram illustrates the fusions or partitions made at each successive stage of the analysis. It also exhibits the distance between the clusters after their fusion. In our study it was required to form the groups based on the similarity of the factors of default (acting as variable) and the distinction should be formed based on the outliers. Thus we have considered Squared Euclidean distance for the purpose of distance measurement. The rational is also supported by Wolfson et al. (2004) in a study of similar nature arguing that the "Squared Euclidean measurement places greater emphasis on outliers to generate distance patterns".

Locale of the study:

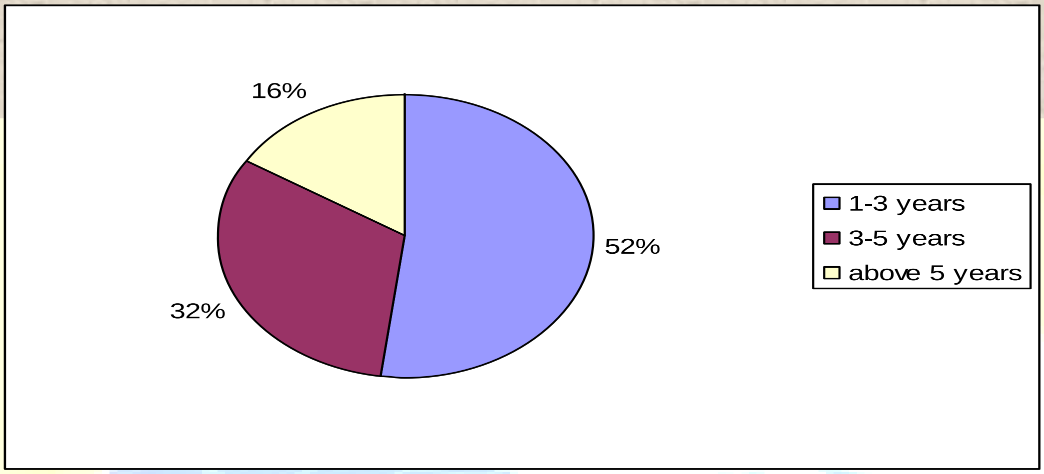
Durgapur which is located (168 km to the north of Calcutta) in the district of Burdwan, in the state of west Bengal, India was selected as the area of study. As per 2001 census Durgapur had a population of 492,996. Males constitute 53% of the population and females 47%. Durgapur has an average literacy rate of 75%, male literacy is 81% and, female literacy is 69%. The Per Capita

Income at current prices (in Rs.)(02-03) in Durgapur is 17,769. Durgapur is known for its entire range of industries. The economy of Durgapur is vibrant and the scope of financing SME is tremendous. Thus the area was selected to find out the causes of default in case of SME borrowers.

The hierarchical cluster method:

The hierarchical cluster method over a fixed p time-period considers an ordered paired list$\{t_p, W_p; p=1, 2, \ldots, P\}$ Where t_p is different time periods and W_p is equal to x row matrices of the factors of default score (in percentage) for x factors in each time period. In the present study, the t_p is the year of study and x represents the various factors of default. For the time-period t_p the hierarchical cluster method is applied to the W_p variable matrix. From each W_p matrix we obtain a D_j squared x-x distance matrix representing the dissimilarity or distance between each pair of factors or objects based on the squared Euclidean distance. For a particular t_p the initial D_j matrix is a symmetric matrix and dij represents distance between the factors i and j. From this Dj matrix we obtain the dendrogram treelike diagram based on the agglomerative algorithms. The final dendrogram describing the different cluster are formed based on the type of linkage method selected. There are mainly three types of linkages methods. The single linkage method, complete linkage method and average linkage methods, apart form the three still other methods like Ward's, the median or the centroid method are also used. Detailed analysis of the algorithm of the linkage methods is beyond the purview of this paper (refer Dillon et al. 1984 for numerical examples of these three algorithms). However the use of single linkage and average linkage method leads to most consistent results and hence considered in our study. The help of statistical package SPSS 10.0 was in use to transmit out the calculations.

Result and Discussion:



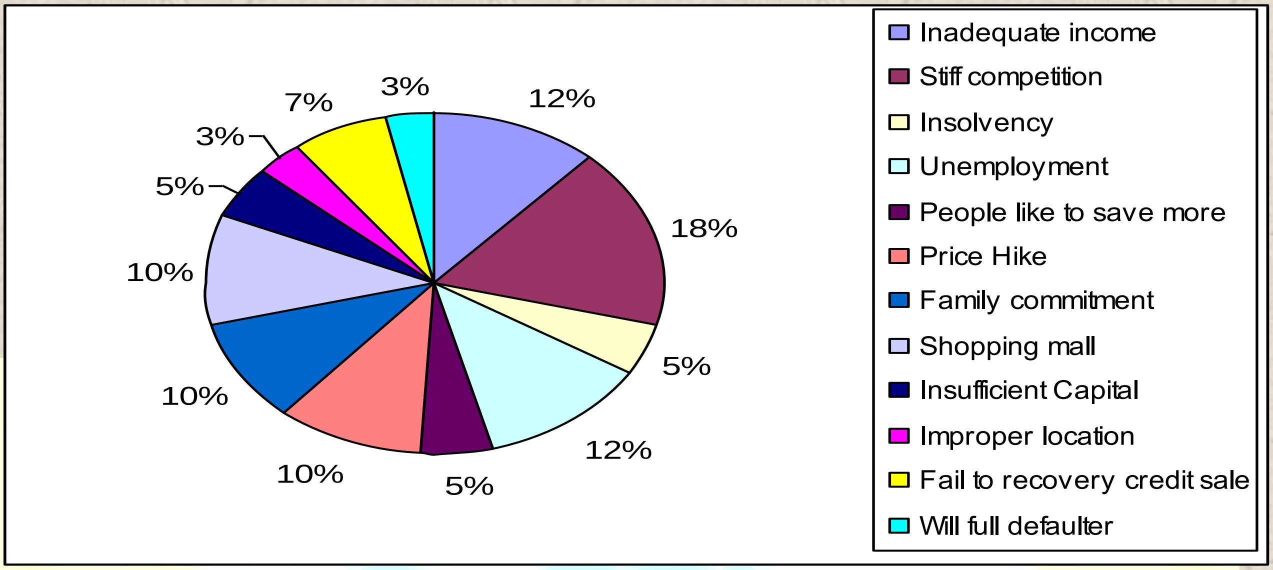
Graph 1: Classification of defaulter according to year of default (in percentage)

Interpretation: The above graph suggests that more than half of the default cases occur within one to three years of availing the loan. About 32% of the cases became defaulter within three to five years. Only 16 % cases belonged to the category C3. Thus it can be implied that majority of the cases become defaulter within five years of availing the loan.

Analysis of factors pertaining to category C1

Factor of default	Petrol Pump	Garment	Stationery	Grocery	Restaurants	Shoe	Total
Inadequate income	1	2	1		1	2	7
Stiff competition	1	3	2	1	1	2	10
Insolvent	2				1		3
Unemployment		3	2	1		1	7
People like to save more		1	1			1	3
Price Hike		2	2			2	6
Family commitment		1	1	1	1	2	6
Shopping mall		3	1	1		1	6
Insufficient Capital		1	1			1	3
Improper location	1	1					2
Fail to recovery credit sale		1	2	1			4
Will full defaulter			1		1		2

Table 1: The factors for C1 category (Multiple responses)



Graph 2: The factors for C1 category (in percentage)

The factors of default as identified by the borrower are arranged in decreasing order based on their importance.

1. **Stiff competition in the market (18%):**
2. **Inadequate income of the borrower (12%):**
3. **Unemployment among the prospective customer (12%):**
4. **Price Hike of the product sells by the shop (10%):**
5. **Family commitment of the borrower (10%):**
6. **Development of shopping mall (10%):**
7. **The shop failed to recover its credit sale (7%):**
8. **Insufficient capital in hand of borrower (5%):**
9. **Because of economic slow down people like to save more (5%):**
10. **Insolvent (5%):**
11. **Setting up the shop in wrong location (3%):**
12. **Willful defaulter (3%):**

Three factor namely Stiff competition, Inadequate Income, and Unemployment among the prospective customer affected most the borrower who became defaulter within one to three years. These three factors have an effect of almost 42% (refer graph no-2).

The major factors as identified pertaining to C1 category as discussed below,

Stiff competition in the market:

Stiff competition is one of the major factors of default as revealed in the study. Frequent discount by the competitors and high end stores is affecting the sales of the small retail stores. Because of the price war in the market the Shop has to sell the product in lower price as a result there is a decrease in profit margin. As profit goes down the shop fails to repay the bank loan.

Inadequate income of the borrower:

Inadequate income of the borrower is another factor of default as identified under study. There are many reasons of inadequate income like generating insufficient profit, Sales are not up to the mark, decrease in market share of the shop because of coming up of new shop.

Unemployment among the prospective customer:

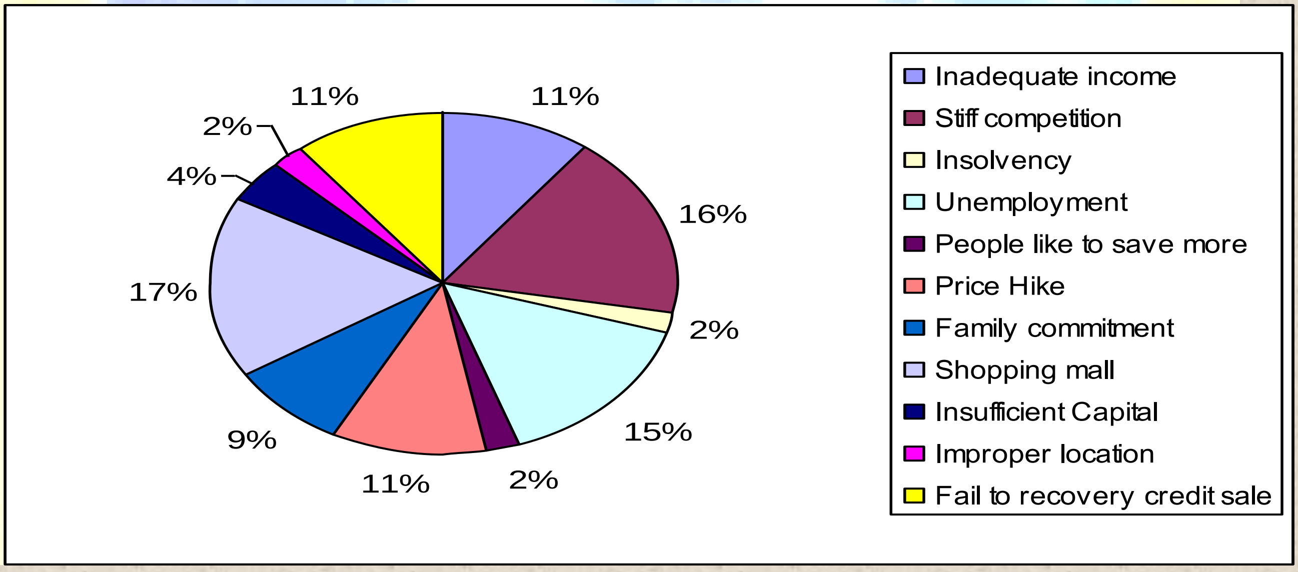
Increase rate of unemployment has resulted in less of disposable income in the hands of the prospective customer. Although these are macro economic factors still they do have micro impact.

Analysis of factors pertaining to category C2

Factor of default	Garment	Stationery	Grocery	Restaurants	Total
Inadequate income	2	2		1	5
Stiff competition	2	2	3	1	8
Insolvent				1	1
Unemployment	2	2	3		7

People like to save more				1	1
Price Hike	2		3		5
Family commitment	1	2	1		4
Shopping mall	2	3	3		8
Insufficient Capital	1	1			2
Improper location	1				1
Fail to recovery credit sale	1	1	3		5

Table 2: The factors for C2 category (Multiple responses)



Graph 3: The factors for C2 category (in percentage)

The factors of default as identified by the borrower are arranged in decreasing order based on their importance

1. **Development of shopping mall (17%):**
2. **Stiff competition in the market (16%):**
3. **Unemployment among the prospective customer (15%):**
4. **Price Hike of the product sells by the shop (11%):**
5. **Inadequate income of the borrower (11%):**
6. **The shop failed to recover its credit sale (11%):**
7. **Family commitment of the borrower (9%):**
8. **Insufficient capital in hand of borrower (4%):**
9. **Because of economic slow down people like to save more (2%):**
10. **Insolvent (2%):**
11. **Setting up the shop in wrong location (2%):**

Three factors namely development of shopping Mall, Stiff competition, and Unemployment among the prospective customer affected most the borrower falling under C2 category. These three factors have an effect of almost 48% (refer graph no-3).

The major factors as identified pertaining to C2 category as discussed below,

<u>Development of shopping mall:</u>

Development of shopping mall is the most important factor for category C2. The shopping malls have gradually started to capture the market and are eating into the business pie of the small borrowers. The availability of every thing under one roof and requirement of less time motivates the people to favour shopping mall to small shops.

<u>Stiff competition in the market:</u>

Stiff competition is one of the major factors of default as pointed out in the study. Frequent discount by the competitors and high end stores are affecting the sale of the small retail stores.

Because of the price war in the market the Shop has to sell the product in lower price as a result there is a decrease in profit margin. As profit goes down the shop fails to repay the bank loan.

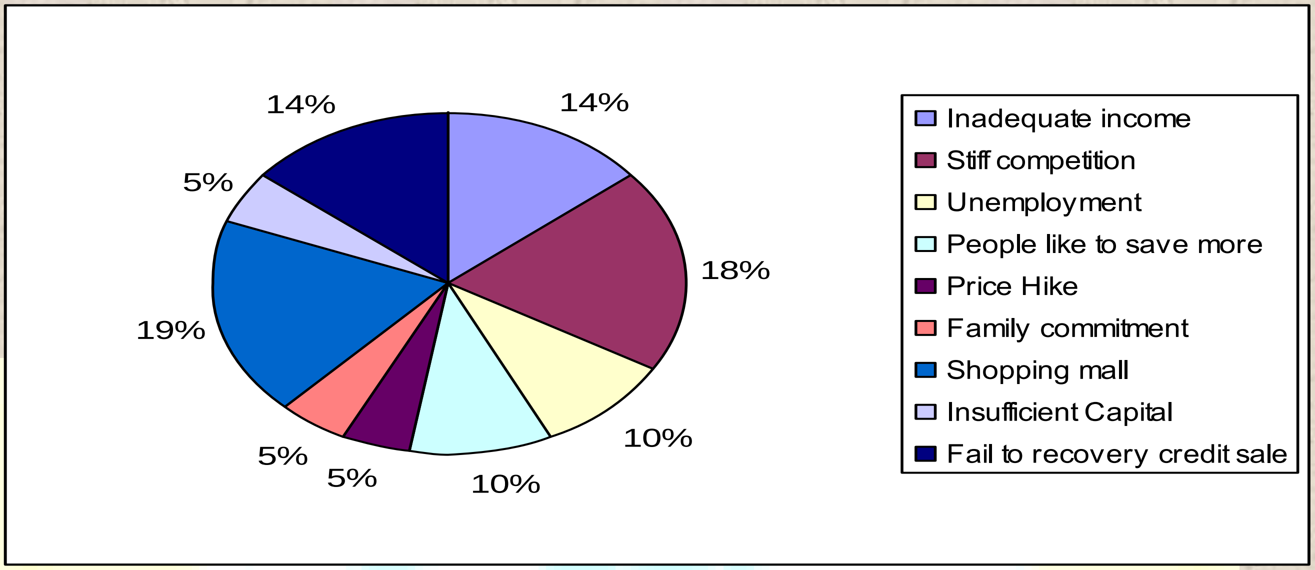
Unemployment among the prospective customer:

Increase rate of unemployment has resulted in less of disposable income in the hands of the prospective customer. Although these are macro economic factors still they do have micro impact.

Analysis of factors pertaining to category C3

Factor of default	Garment	Stationery	Grocery	Total
Inadequate income	2	1		3
Stiff competition	2	1	1	4
Unemployment		1	1	2
People like to save more	2			2
Price Hike	1			1
Family commitment			1	1
Shopping mall	2	1	1	4
Insufficient Capital	1			1
Fail to recovery credit sale	1	1	1	3

Table 3: The factors for C3 category (Multiple responses)



Graph 4: The factors for C3 category (in percentage)

The factors of default as identified by the borrower are arranged in decreasing order based on their importance.

1. **Development of shopping mall (19%):**
2. **Stiff competition in the market (18%):**
3. **The shop failed to recover its credit sale (14%):**
4. **Inadequate income of the borrower (14%):**
5. **Because of economic slow down people like to save more (10%):**
6. **Unemployment among the prospective customer (10%):**
7. **Price Hike of the product sells by the shop (5%):**
8. **Family commitment of the borrower (5%):**
9. **Insufficient capital in hand of borrower (5%):**

Development of shopping mall, Stiff competition, poor credit management and Inadequate Income among the prospective customer affected most the borrower falling under C3 category.

These four factors contributed nearly 65% (refer graph no-4) amongst all the factors responsible for default in category C3.

The major factors as identified pertaining to C3 category as discussed below,

Development of shopping mall:

Development of shopping mall is the most important factor for category C3. The shopping malls have gradually started to capture the market and are eating into the business pie of the small borrowers. The availability of every thing under one roof and requirement of less time motivates the people to favour shopping mall to small shops.

Stiff competition in the market:

Stiff competition is one of the major factors of default as pointed out in the study. Frequent discount by the competitors and high end stores are affecting the sale of the small retail stores. Because of the price war in the market the Shop has to sell the product in lower price as a result there is a decrease in profit margin. As profit goes down the shop fails to repay the bank loan.

The shop failed to recover its credit sale:

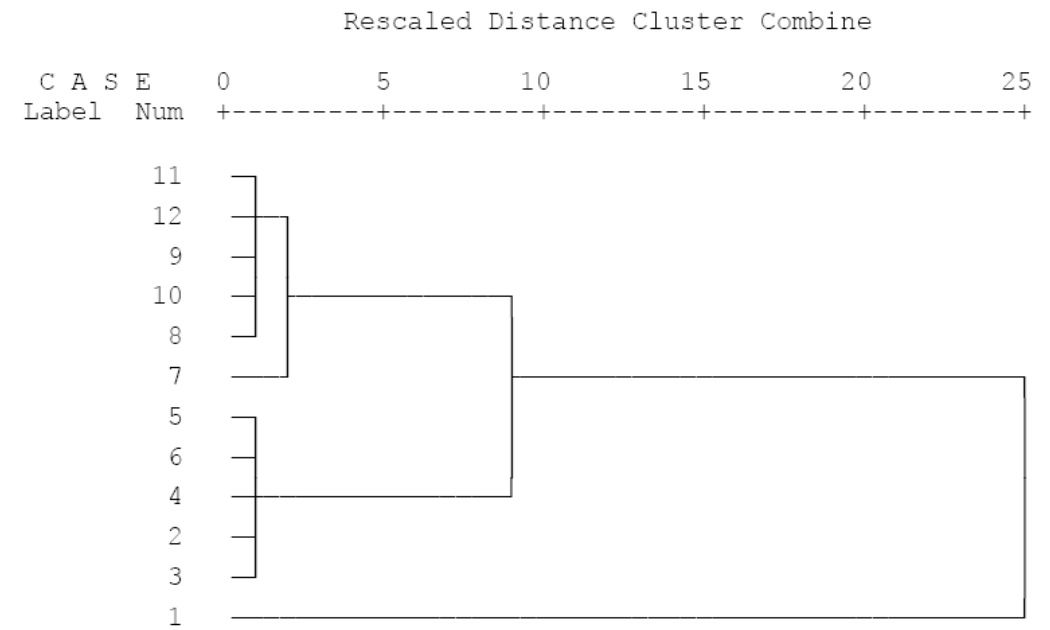
Credit sales in one of the most favored strategy to boost sales. But, improper credit management can lead to large amount of dues mounting up and chances of recovery getting bleak. Thus non recovery of the amounts of credit sales proceeds acted as on of the major factors for the C3 category.

Inadequate income of the borrower:

Inadequate income of the borrower is another factor of default as identified under study. There are many reasons of inadequate income like generating insufficient profit, sale not being up to the mark, decrease in market share.

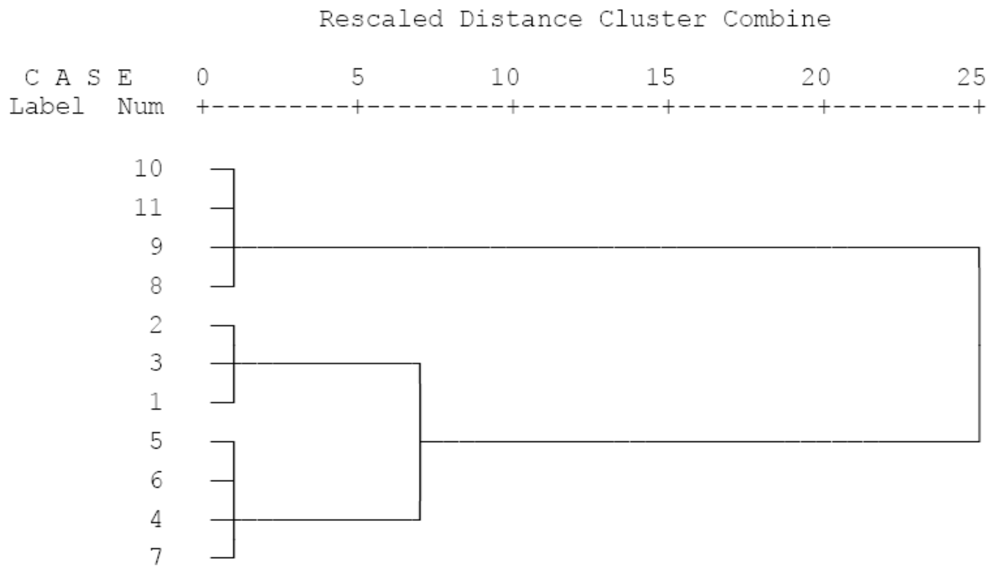
Cluster analysis:

Exhibit-1: Dendrogram using Average Linkage (Between Groups) for category C1



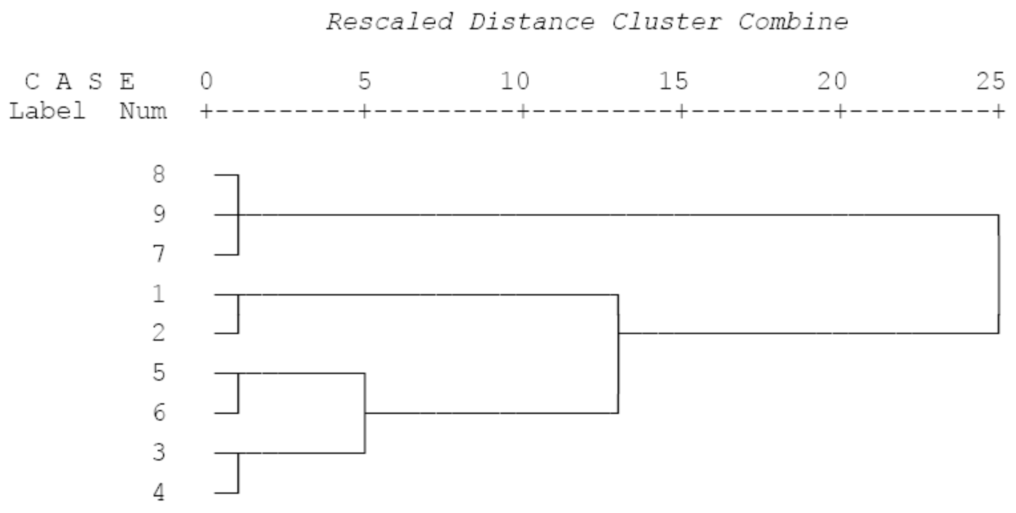
Cluster analysis of the factors has revealed a very interesting pattern. Stiff competition in the market and the inability to recover the money due stands out to be the distinct factors without assigning themselves to any group membership. Thus this pattern exhibited clearly defines this two factors to be single handedly capable of making a borrower defaulter. While the factors like insufficient capital, economic slowdown, improper business location, insolvency and unwillingness to pay making up a group. So it cannot be clearly said which factor amongst the group is having more effect and the cumulative effect can be attributed to the group. Whereas the factors like development of shopping malls, price rise of the products, family commitment and unemployment amongst the prospective customers also noticed to have cumulative effect. It is quite obvious from the analysis that the major factors contributing to formation of defaulter category C1 are stiff competition in the market and the inability of the creditors in credit management. All other factors have some role to play but none of the factors can be singly held accountable for the formation of C1 category.

Exhibit-2: Dendrogram using Average Linkage (Between Groups) for category C2



In case of default category C2 no single factor is responsible. Formation of three distinct groups is noticed leading to agglomeration of factors based on their similarity. The factors like development of shopping mall, stiff competition in the market and unemployment amongst the prospective customer formed one group named G-I. Thus it can be inferred that the three factors acted conjointly having cumulative effect on the of category C-2 defaulter. Whereas improper credit management, family commitment, price hike and improper income of the borrower acted jointly and thus can be said to have cumulative effect. The factors which formed the next group are the insufficient capital in the hands of the borrower, economic slowdown, insolvency and wrong business location. Thus it can be inferred that the in case of category C2 no distinct factor can be held responsible. Amongst the factors identified all the factors have their effect in groups formed based on the similarity amongst the factors.

Exhibit-3: Dendrogram using Average Linkage (Between Groups) for category C3



In case of category C-3 no single factor was responsible. The formation of group showed a very interesting pattern. Development of shopping mall and the stiff competition in the market clubbed and formed one group. Inadequacy of the income of the borrower coupled with improper credit management contributed jointly to form category C-3. While the factors like family commitment, insufficient funds and price hike of the products formed one group; economic slowdown along with unemployment amongst the prospective borrower made the other group. For the defaulter category C-3 there exist almost four groups with factors having similar effect. Thus this can be safely said that as the age of default increases no single factor seems to play a determining factor. All the factors have their role with the similar ones motivating the effect of others falling within the same group.

Table-5: Pattern of group formation

	G-I	G-II	G-III	G-IV
C-1	1	7	8,9,10,11,12	2,3,4,5,6
C-2	1,2,3	4,5,6,7	8,9,10,11	
C-3	7,8,9	1,2	5,6	3,4

Conclusion:

Several factors of default emerged along with interesting patterns of grouping of factors according to the category of defaulter. As identified in the study, Major reason of default of the borrower to become a defaulter in between one to three years of availing the loan was due to Stiff competition in the market. While development of shopping mall is identified as the major reason of default of the borrower who become a defaulter in between three to five years and the borrower who become a defaulter after five year of availing the loan. The study brings in focus the need to have strategic mechanism of recovery based on the category of defaulters. Accordingly bank may try and take appropriate steps to identify borrower who are more interested in growth of the business rather than availing cheap loan from government bank. The banks may also try to identify areas of financing which are more performing or have potential of future growth. As revealed in the study, the borrowers should change the style of business in order to suit the changing business environment. Also banks need to make pragmatic calculation of net disposable income after giving due importance to family commitment of the borrowers. The several factors of default according to the category of defaulter and the natural agglomeration of the factors can provide valuable insights and tips to bankers. The output of the study can also be helpful to the bankers in designing their recovery mechanism.

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