# Chapter - 6 Results Analysis

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6.1 Case Studies

Case-1

The Manufacturing Client Proposal at glance

Name of the Client : Mr. Santosh Koparde
Name of the Unit : M/s Koparde Package Industries Pvt Ltd. Parvati Industries Estate, Hospet, Bellary Dist.
Name of the Bank : State Bank of India, Hospet

Mr. Santosh Koparde has approached the State Bank of India, Hospet for a team loan of Rs.2 crores. He wishes to establish a full-lived Corrugated Box manufacturing unit under the name M/s Koparde Package Industries Pvt. Ltd in a KIDA notified industrial area of Hospet. The unit will be engaged in manufacturing of corrugated packaging material and corrugated boxes. The market for the product as identified by the promoter in the immediate vicinity is the liquor industry, mineral waters manufactures and pharmaceuticals. Apart from this has orders Mr. Santosh Koparde from multinational corporations in Bangalore, Andhra Pradesh and Maharastra to the extent of Rs. 10 Crores. Moreover this product, which is in the growth stage, has tremendous market potential.

Mr. Santosh Koparde is considered to be shrewd businessman since he comes from a family with business background. He has excellent rapport with the bankers and he his technically qualified. He is excepted to show good managerial capabilities, on account of his leadership qualities and business acumen. Further he hired the services of a professional manager who is charted accounted with the adequate experience. The proposed unit will be located at KIDA notified industrial area of Hospet, the unit has alternative power generation facility, abundance supply of water, employing 4 to 5 skilled labor and 25 to 30 un-skilled labor. With Hospet as the location labor should not be a problem at all. Mr. Santosh Koparde as Managing Director, the operations should run smoothly. The estimate sales is Rs 10 Crores p.a with working capital requirements of 3 crores that is being advanced by the same bank in the form of cashes credit limit. The promoter will fund 40% of the cost of the project and the balance is sought from the bank.

The working ratios calculated from the financial statements i.e., DSER, DER and CR are as per the guidelines of bank and makes the proposed unit a viable and profitable one.
The Credit risk Analysis Report of M/s Koparde Package Industries Pvt. Ltd, Hospet

CREES Credit Advice Report
Expert System Prototype Implementation using Expert System Builder
Credit Risk Evaluation using Expert System - Manufacturing Sector

Client Id : C000000001
Application Id : A000000001
Client Name : M/s Koparde Package Industries Pvt. Ltd, Hospet

1. Technical Feasibility Rating is - Good
2. Management Commitment Rating is - Good
3. Commercial Viability Rating is - Very Good
4. Financial Analysis Rating is - Good
5. Economic Analysis Rating is - OK

Credit Risk Rating of the client is High Safety
Credit Rating AA

1. Technical Feasibility Assessment
   1.1 Effluent Disposal is Very Good
   1.2 Transportation Facilities are Good
   1.3 Infrastructure Facilities Good
   1.4 Selection of Technology Good
   1.5 Other Technical factors Adequate

Technical Feasibility is Good
Credit Risk rating is A

Utilities Risk Assessment
1. Water Requirement Rating is - Very Good
2. Power Requirement Rating is - Very Good
3. Fuel Requirement Rating is - Very Good

Defuzzified Utilities Credit Weight is: Very Good 22.33 Out of 30.0
Credit Risk Rating HighSafety-AA

2. Management Commitment Assessment
   2.1 Integrity is Good
   2.2 Involvement is Good
   2.3 Financial Resources are Sufficient
   2.4 Competence is Good
   2.5 Leadership is Very Good
   2.6 Organization Qualities are Good
   2.7 Business Plan is Good
Management Commitment is Good  
Credit Risk Rating High  
Safety-A

3. **Commercial Viability Assessment**
   1. Profit Margin Rating is - Excellent  
   2. Product Viability Rating is - Very Good  
   3. Product profile Rating is - Excellent  
   4. Market Share Client Rating is - Good  
   5. Profile Customers Rating is - Excellent  
   6. Satisfaction of Customers Rating is - Good  
   7. Letter of Recommendation Rating is - Excellent  
   8. Competitive Strategy Rating is – Very Good  
   9. Sales Mode Rating is - Excellent

**Commercial Viability Risk Rating is Very Good**  
Risk Rating Highest Safety-AA

4. **Financial Analysis Assessment**
   1. Net Present value is Good  
   2. Debt Service coverage Ratio is Good  
   3. Debt equity ratio is Good  
   4. Current Ratio is Good  
   5. Capital Turnover Ratio is Adequate  
   6. Profitability is Good  
   7. Liquidity is Good  
   8. Break Even Point is OK  
   9. Cost of Production is Adequate  
   10. Project Cost is OK  
   11. Return on Investment on Good

**Financial Risk Analysis is Good**

5. **Economic Analysis Assessment**
   1. Loan Details Rating is - Excellent  
   2. Net Present Value Rating is - Very Good  
   3. Business Ratios Rating is - Excellent  
   4. Project Cost Rating is - Very Good  
   5. Liquidity Rating is - Good  
   6. Profitability Rating is - Excellent  
   7. Current Business Assets Rating is - Good  
   8. Balance Sheet Status Rating is – Very Good

**Economic Analysis Risk Rating is Very Good**  
Risk Rating Highest Safety-AA
The Manufacturing Client Proposal at glance

Name of the Applicant/Promoter : Mr. Lokesh Patil
Name of the Unit : M/s. Shiva Printing Press [A SSI UNIT]
Name of the Bank : Canara Bank,
                    Bagalkot

Mr. Lokesh Patil has approached Canara Bank, for a team loan of Rs 2 Crores. He wishes to establish to full-fledged off-set printing press under the name and style of Shiva Printing Press, in a D-Class notified industrial area. The unit will be engaged in manufacturing of brand labels, printed packing material for the textile industry and large scale printing of posters. Mr. Lokesh Patil foresees a sizeable market share and future demand for the product is forecasted as excellent. With the given price structure the estimate sales of Rs 8 crores per annum seems to be realistic moreover with the product being in the growth stage.

The promoter is very well known to be the bankers and has a good track record. He is considered to be hardworking, honest and with good moral character. Further Mr. Lokesh Patil has more than 5 years’ experience in the field with good technical qualification besides, having good leadership qualities. It may be also noted Mr. Lokesh Patil family financial background is sound and he is willing to contribute 25% of the project cost.

The proposed unit be set up at Bagalkot, a well-developed town with predominantly educational institutions and hospitals. Therefore earning the name for good infrastructure facilities and immediate for the proposed business. The effluent disposal methods adopted have been approved by the authorities, power generation facility is available and the required semi-skilled labor forces is available in abundance hence the project with it’s proposed capacity is viable.

Finally, analysis of the projected financial statements indicate the projected net profit of 75 lakh is achievable with the given cost of production. Liquidity ratio and current ratio are within the limits. Comparisons of the cost project, installed capacity and internal rate of return with the industry standards were found to be within acceptable limits.
The Credit risk Analysis Report of M/s. Shiva Printing Press [A SSI UNIT], Bagalkot
CREES Credit Advice Report

Credit Risk Evaluation using Expert System- Manufacturing Sector

Client Id : C000000002
Application Id : A000000002
Client Name : M/s. Shiva Printing Press [A SSI UNIT], Bagalkot

1. Technical Feasibility Rating is - OK
2. Management Commitment Rating is - Good
3. Commercial Viability Rating is - Good
4. Financial Analysis Rating is - OK
5. Economic Analysis Rating is - OK

Credit Risk Rating of the client is Adequate Safety
Credit Rating B

1. Technical Feasibility Assessment
   1.6 Effluent Disposal is Adequate
   1.7 Transportation Facilities are OK
   1.8 Infrastructure Facilities Good
   1.9 Selection of Technology Good
   1.10 Other Technical factors OK

Technical Feasibility is OK
Credit Risk rating is B

Utilities Risk Assessment
1. Water Requirement Rating is - Good
2. Power Requirement Rating is - Good
3. Fuel Requirement Rating is - Good

Defuzzified Utilities Credit Weight is: Good 16.33 Out of 30.0
Credit Risk Rating Adequate Safety-B

2. Management Commitment Assessment
   2.1 Integrity is Good
   2.2 Involvement is Good
   2.3 Financial Resources are Sufficient
   2.4 Competence is Good
   2.5 Leadership is Good
   2.6 Organization Qualities are Good
2.7 Business Plan is Adequate

Management Commitment is Good

Credit Risk Rating Adequate Safety-B

4. **Commercial Viability Assessment**
1. Profit Margin Rating is - Good
2. Product Viability Rating is - Good
3. Product profile Rating is - Good
4. Market Share Client Rating is - Adequate
5. Profile Customers Rating is - Good
6. Satisfaction of Customers Rating is - Good
7. Letter of Recommendation Rating is - Good
8. Competitive Strategy Rating is – Good
9. Sales Mode Rating is - Good

**Commercial Viability Risk Rating is Adequate**

Risk Rating Adequate Safety -B

4. **Financial Analysis Assessment**
1. Net Present value is Adequate
2. Debt Service coverage Ratio is Good
3. Debt equity ratio is Adequate
4. Current Ratio is Good
5. Capital Turnover Ratio is Adequate
6. Profitability is Adequate
7. Liquidity is Adequate
8. Break Even Point is OK
9. Cost of Production is Low
10. Project Cost is OK
11. Return on Investment on Adequate

**Financial Risk Analysis - OK**
Risk rating is Adequate Safety-B

5. **Economic Analysis Assessment**
1. Loan Details Rating is - Good
2. Net Present Value Rating is - Adequate
3. Business Ratios Rating is - Good
4. Project Cost Rating is - Adequate
5. Liquidity Rating is - Adequate
6. Profitability Rating is - Good
7. Current Business Assets Rating is - Adequate
8. Balance Sheet Status Rating is – Good

**Economic Analysis is OK**
Risk Rating Adequate Safety-B
Trading Industry Proposal at glance

Name of the Promoter : Mr. Kiran Gowda
Name of the Unit : M/s Basava Pharma Traders, Bagalkot
Name of the Bank : VijayaBank, Bagalkot

Mr. Kiran Gowda is a has completed D.Pharm. His family is running a Medical shop since two generations. His brother is famous doctor. His family has good reputation in the city. Mr. Kiran Gowda has approached Vijaya Bank in Bagalkot with the proposal to setup Pharma Distributing Company. The proposed location in Mahaveer Road, a prime commercial area in the city.

The proposed business has good market potential in this area and does not seem to face much competition because there are more than 100 hospitals in around Bagalkot city. He is also the president of Medical Shops Association, Bagalkot district and good contact with many doctors of the city and around. A team loan of Rs 2 crores is required to establish the Pharma business. expects an annual turnover over Rs 10 crore Other financial indicators as available from the financial statements are as follows-

DSCR-1.6, DER-1.9, CR-1.41. Cost of the project 2 Crores. Apparently the business looks viable and profitable.

The Credit risk Analysis Report of  M/s Basava Pharma Traders, Bagalkot

CREES Credit Advice Report
Credit Risk Evaluation using Expert System- Trading Sector

Credit Risk Evaluation using Expert System

Trading Sector Credit Rating Assessment

Client Id : C000000003
Application Id : A000000003
Client Name : M/s Basava Pharma Traders, Bagalkot

1. Management Risk Rating is - Excellent
2. Business Risk Rating is - Excellent
3. Finance Risk Rating is - Excellent
Soft Computed Trading Risk Weight is: 140 Out of Standard Weight: 150.0
Credit Risk Rating: Highest Safety - AAA

1. Management Risk Assessment
1.1 Management Quality is Excellent
1.2 Financials and MIS is Excellent
1.3 Account Behavior is Excellent
1.4 Technical Qualification is Excellent

Management Risk Assessment is Excellent
Credit Risk rating is AAA

2. Business Risk Assessment
1. Competition Rating is - Excellent
2. Local Advantage Rating is - Excellent
3. Commodities Traded Rating is - Excellent
4. Market Perception Rating is - Excellent
5. Industry Profile Rating is - Excellent
6. Product Characteristics Rating is - Excellent
7. Marketing Rating is - Very Good

Defuzzified Trading Sector Business Risk Credit Weight is: Excellent 15.0
Credit Risk Rating Highest Safety-AAA

3.0 Financial Risk Assessment
3.1 Earnings/Growth Trends is Excellent
3.2 Tol/TNW is Excellent is Excellent
3.3 Inventories to Debtors/Sales is Excellent
3.4 Sundry Creditors to Purchases is Excellent
3.5 Net Profit/Sales is Excellent
3.6 Bank borrowing to sales is Excellent
3.7 Current Ratio is Excellent
3.8 Stock holding to Sales is Excellent

Financial Risk Assessment is Excellent
Credit Risk rating is AAA
Service Industry Proposal at glance

Hospital Industry Credit Risk Assessment
Nursing Home Risk Assessment

Name of the Promoter: Mr. Basavaraj Patil
Name of the Unit: Sanjeevini Hitech Healthcare
Name of the Bank: Corporation Bank, Bagalkot

Mr. Basavaraj Patil is a Heart Specialist and would like to establish a hitech healthcare centre project worth 5 crore. He has a good friend circle of doctor experts in various fields and approached Corporation Bank with accredit risk of 5 Crores.

He has good reputation and unique expertise in his field. Bagalkot is having good potential health market and Heart specialist in this area are in demand. He comes from the family of doctors and his wife is also a doctor by profession. His father runs a nursing home. He has sound family backup and has good relation ship past financial performance with bankers.

He has hospital administration experience also. He owns the land to setup the health care facilities.

CREES Credit Advice Report
Credit Risk Evaluation using Expert System- Service Sector

Service Sector Credit Rating Assessment

Client Id: C000000005
Application Id: A000000005
Client Name: Sanjeevini Hitech Healthcare, Bagalkot

1. Promoters Profile Risk Rating is - Very Good
2. Existing NursingHome Risk Rating is - Good
3. Proposed NursingHome Risk Rating is - Excellent
4. Market Potential Risk Rating is - Very Good
5. Project Costing Risk Rating is - Very Good
6. Staff Profile Risk Rating is - Very Good
7. Implementation Risk Rating is - Excellent
8. Capital Risk Rating is - Excellent
9. Repayment Risk Rating is - Very Good

Credit Risk Advice
The Client Risk Rating is Very Good,
Client Risk Rating is Highest Risk and
Client Risk Grade is AA

1. Profile of Promoters Risk Assessment
   1.1 Constitution of Applicant is Excellent
   1.2 Background of Applicant is Very Good
   1.3 Profile of Qualification is Very Good
   1.4 Experience of the applicants is Very Good
   1.5 Achievements/Publications is Very Good
   1.6 Income tax/ Wealth Tax Assessment is Very Good

Profile of Promoters Risk Assessment is Very Good

2. Background of Existing Nursing Home
   2.1 Date of Establishment is Old
   2.2 Available Surgical and Diagnostic Facilities are Very Good
   2.3 Beds capacity is Very Good
   2.4 Average No. of New Patients/Day is Very Good
   2.5 Average No of Surgeries Performed/ Month is Very Good
   2.6 Working Results are Very Good
   2.7 Present Bank Dealings are Very Good
   2.8 Present Financial Position is Very Good
   2.9 Bridge Loan Availed for the proposed project is Very Good
   2.10 Financial Resources are Very Good

Background of Existing Nursing Home is Very Good

3. Proposed Nursing Home Features/Facilities
   3.1 Infrastructure is Very Good
   3.2 Consultancy is Very Good
   3.3 Diagnosis is Very Good
   3.4 Ambulance Facilities are Very Good
   3.5 Surgical Facilities are Very Good

Proposed Nursing Home Features/Facilities is Very Good

4. Market Potential
   4.1 No. of Nursing Homes and Hospitals in the Village/Town/City are in adequate
   4.2 No. of Govt. Hospitals / PHC Existing are in sufficient
   4.3 Total Bed Capacity of All Hospitals and Nursing Homes is inadequate
   4.4 Total Bed Capacity of Govt. Hospitals/ PHC Existing is inadequate
   4.5 No of clinics/ Nursing Homes/ Hospitals at the proposed location is inadequate
   4.6 Bed capacity of the Clinics/ Nursing Homes/ Hospitals at the proposed location is inadequate
4.7 No of post graduate Doctors available in the village /town / city apart from the post graduate doctors available in the govt. Hospital/ Primary Health Centres is inadequate

4.8 The population of the village/ town / city is large

4.9 Population of the nearby village/town/ hamlets who depend on the medical facilities at the proposed location is large

4.10 Specialty of the proposed Nursing Home/ Hospital vis-à-vis the existing Nursing Home is Very Good

**Market Potential is Excellent**

Similarly other risk parameter are evaluated to come to Final Decision

**6.2 Analysis of the a client case using ESB**
The Expert System Builder(ESB) software displays the explanation and justification for arriving at the final decision by showing the result of each question explicitly. The following sample lines are shown from the output report.

**[Question 1]** [Importance = MEDIUM]
Succession Planning [Type = Multiple]
--- Family business no cause for concern
--- Promoters are young and have family backup [NEUTRAL]
--- Promoters are old, but succession of family members is expected [NEUTRAL]
--- Promoters are old and no backup for succession [NEUTRAL]
Resultant Weight = 12.75 from a MAX. of 15.00

**[Question 2]** [Importance = MEDIUM]
Management Experience [Type = Multiple]
-- Client is in the business for more than a decade and well experienced [NEUTRAL]
--- Client is in the business for more than five years but less than a decade
--- Client is in the business for less than five years [NEUTRAL]
--- The client is totally new in this venture [NEUTRAL]
Resultant Weight = 14.25 from a MAX. of 15.00

**[Question 3]** [Importance = MEDIUM]
Submission of ABS/PBS [Type = Multiple]
--- Submission is within one month from balance sheet date [NEUTRAL]
--- Submission is within three months from balance sheet date
--- Submission is more than three but in six months from balance sheet date [NEUTRAL]
--- Submission is above six months from balance sheet date [NEUTRAL]
Resultant Weight = 12.75 from a MAX. of 15.00
[**Question 4**]  [Importance = MEDIUM]
Submission of Feedback data [Type = Multiple]
--- Submission is within a week from due date [NEUTRAL]
--- Submission is within 15 days due date [NEUTRAL]
--- Submission is within 30 days due date [NO]
--- Submission is more than 30 days from due date [NEUTRAL]
Resultant Weight = 11.25 from a MAX. of 15.00

[**Question 5**]  [Importance = NORMAL]
Renewal of Limits [Type = Multiple]
--- Limits are renewed within a month [NEUTRAL]
--- Limits are renewed within 3 months [NEUTRAL]
--- Limits are renewed after 3 months but less than 6 months [YES]
--- Limits are renewed with a delay of more than 6 months [NEUTRAL]
Resultant Weight = 7.50 from a MAX. of 10.00

[**Question 6**]  [Importance = HIGH]
Repayment of Interest [Type = Multiple]
--- Interest is paid promptly within a week [NEUTRAL]
--- Interest is paid promptly within 15 days [NEUTRAL]
--- Interest is paid promptly within 30 days
--- Delay in payment of Interest is more than 30 days [NEUTRAL]
Resultant Weight = 15.50 from a MAX. of 20.00

**6.3 Results discussion**

Researchers have collected the real data (Hiding the Client’s Identity) and also simulated the about 500 client’s data. These samples are representing the Manufacturing, Trading and Service sectors. They have tested CREES system. The results are compared with that of manual system as shown in Table-9. The Percentage of clients misjudged by the fuzzy tool is (21/500)*100 = 4.2%. The credit risk decisions taken manually and CREES system are agreeing to great extent about 95.8% accuracy. Figure-33 shows graph of comparison of results.

Authors have collected about 500 samples from banks, conducted experiments with Expert System Builder (ESB) software and results have been tabulated as shown in Table 6. The results obtained from this ESB tool agree with the manual decisions in most of the cases as shown in Table 21. The Percentage of clients misjudged by the fuzzy tool is (26/500)*100 = 5.2%. The graphical representation of comparative study of manual and ESB tool based decision patterns are shown in Figure- 33.
Table: 21 Comparisons of Manual and ESB Results

<table>
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<tr>
<th>Srl No</th>
<th>Client Risk Level</th>
<th>Manual Decisions</th>
<th>Rule Viewer Decisions</th>
<th>Relative Error</th>
<th>No of Clients MisClassified</th>
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<tbody>
<tr>
<td>1</td>
<td>Highest Safety</td>
<td>78</td>
<td>84</td>
<td>8%</td>
<td>6</td>
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<tr>
<td>2</td>
<td>High Safety</td>
<td>70</td>
<td>74</td>
<td>6%</td>
<td>4</td>
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<tr>
<td>3</td>
<td>Moderate Safety</td>
<td>90</td>
<td>87</td>
<td>-3%</td>
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<td>4</td>
<td>adequate Risk</td>
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<td>83</td>
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<tr>
<td>6</td>
<td>Default</td>
<td>86</td>
<td>82</td>
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<tr>
<td>Total</td>
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<td>500</td>
<td>500</td>
<td>6%</td>
<td>20</td>
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</table>

Fig - 33 Comparison of manual and ESB Results

Table: 22 Comparisons of Manual and CREES Results

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Client Risk Level</th>
<th>Manual Decisions</th>
<th>CREES Decisions</th>
<th>Relative Error %</th>
<th>No. of Clients Mis Classified</th>
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<tr>
<td>1</td>
<td>Highest Safety</td>
<td>78</td>
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<td>2</td>
<td>High Safety</td>
<td>70</td>
<td>74</td>
<td>5.4</td>
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<tr>
<td>3</td>
<td>Significant Safety</td>
<td>90</td>
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<td>-3.4</td>
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<td>4</td>
<td>Low Risk</td>
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<td>94</td>
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<td>85</td>
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<td>-2.4</td>
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<td>500</td>
<td>500</td>
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<td>22</td>
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6.4 Conclusions and findings

The recent worldwide economic crisis in 2007 was an eye opener for Banks and Financial institutions. The need for effective credit risk management was realized as the need of the hour. International Credit Rating agencies like Standard and Poor's, Moody KMV have redefined their rating procedures after this crisis as their ratings on many companies were also questioned. Basel Committee has released Basel–II norms for credit risk management and enforcing effective implementation in Banks. Significance of the Credit Risk is realized and given high priority by regulators and banking, finance and insurance sectors.

Past decades have seen a number of mathematical models on credit risk evaluation. Every methods is aimed at prediction of default of a client company as accurately as possible and as early as possible. Researchers have conducted an exhaustive study of credit risk literature on since 1964 to today and studied about 300 articles in international journals and conference proceedings in this regard. The work also includes the study of loan applications in various banks across the country and abroad and credit policy documents.

The interactions with credit rating experts has to enabled to capture knowledge and thought process of expert in to a knowledgebase. The Credit Rating Framework (CRF) designed taking all risk parameters of decision environment in to account and their significance. The Credit Risk Evaluation Expert System development was the major contribution of this research.
Hybrid soft computing - Evolutionary neuro fuzzy logic has been applied in CREES.

The CREES system has tested MSME client samples from Manufacturing, Trading and Service sectors. The results are satisfactory compared manual results.

At outset researchers conclude that

- Significance of the Credit Risk is realized and given high priority by regulators and banking, finance and insurance sectors
- There is immense need for Expert System (CREES), as on now all credit risk decisions of MSME are carried out manually and causes lot of delay
- The methodology Evolutionary Neurofuzzy logic captures the knowledge of human experts in their domain languages
- CREES Expert system is friendly to Credit Rating Executives and MSME Users

6.5 Scope for further research
1. Development of Data warehouse of the industry-wise, business-wise knowledgebase of credit rating frameworks
2. Data mining techniques are needed to explore the hidden knowledge patterns in the data sets.
3. Testing CREES with international Credit Data sets
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