

Basel II – Integrated Risk Management Solution

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1 Abstract

Introduction:

As per RBI's direction, compliance with Basel II norms is mandatory for the banks before 31st March 2007. This paper proposes an IT solution that could be offered by IT companies to help banks, adhere to Basel II norms.

Problem:

Critical Success Factors for the banks are.

- 1) Risk Identification
- 2) Quantitative Risk Measurement
- 3) Risk Mitigation
- 4) Minimum Capital Allocation

But banks find compliance to Basel II norms in the above areas difficult, due to increasing number of customer base of the banks, absence of effective risk management solution and absence of system interfaces between the existing stand alone applications of the banks.

Proposed Solution:

Mid sized IT (Information Technology) companies could offer an "End to End Risk Management Solution" to the banks which will identify measure, mitigate credit risk, market risk and operational risk and also suggest real time capital allocation for each of the above risks. The element of the proposed solution consists of following applications:

1. CRM (Customer Relationship Management) - application
2. BI (Business Intelligence) based Banking Dashboard
3. Risk Measurement (core) Application
4. Risk Mitigation Application

Key Benefits:

1. Help banks to satisfy the three pillars of Basel II viz. 1. Minimum capital requirement 2. Supervisory review process 3. Market discipline requirements
2. Real time monitoring of clients credit position (including credit score)
3. Real time monitoring of banks financial position with respect to equity/derivative market.

Leveraging the Benefits of Proposed solution:

The suggested "End to End Risk Management Solution" could be customized and offered to Micro Financial Institutions, Non-Banking Financial Institution, and Insurance players also.

2. Introduction:

Basel II is the revised capital accord of Basel I. Basel II accord defines the minimum regulatory capital which is to be allocated by each bank based on its risk profile of assets. Banks have to maintain the capital adequacy ratio (CAR) of minimum 9%. As per RBI, banks which are getting more than 20% of their businesses from abroad have to implement Basel II. But most of the banks are now interested to implement Basel II.

Three pillars of Basel II:

- Pillar I: Minimum capital requirement
- Pillar 2: Supervisory review process
- Pillar 3: Market discipline requirements

2.1 Types of Risks:

As of now 3 types of major risks are addressed in Basel II:

1. Credit Risk: Default by the borrower to repay the borrowings
2. Market Risk: Volatility in the banks' portfolio due to change in market factors.
3. Operational risk: Risk arising out of banks' inefficient internal processes, systems, people or external events like natural disasters, robbery etc

2.2 Minimum Capital Allocation for credit risk

To allocate the capital for any of the above risk, it should be quantitatively measured. Currently banks follow two methods to measure credit risk and allocate the capital for credit risk.

2.2.1 Standardized Approach:

External credit rating agencies like CARE, Icria will assign the ratings for the assets of the banks and then capital is allocated for each of the assets. Credit rating and capital allocation is inversely proportional.

2.2.2 Internal Rating (IR) Approach

This method has been further classified to

- Foundation IR approach
- Advanced IR approach

In both methods, capital is allocated based on the following 3 factors:

- Exposure at default (EAD) – amount of facility that is likely to be drawn in default.
- Loss given at default (LGD) – Measures the proportion of lost exposure in default.
- Probability of default (PD) - chances of default in terms of percentage (Default – fails to repay borrowings)

2.3 Minimum Capital Allocation for Market Risk

Value at risk (Var) is used to measure the market risk .Var summarizes the likely loss in value of a portfolio over a given time period with specified probability. Historical simulation, Model building approach, Montey carlo simulation – are some of the Var techniques.

2.4 Minimum Capital Allocation for Operational Risk

Three methods are followed to measure and allocate the capital for operational risk.

2.4.1 Basic Indicator approach:

Capital charge should be 15% of banks' average annual positive Gross income over the previous three years.

2.4.2 Standardized indicator approach:

In this approach banks activities are classified into 8-business line. Each business line is having an exposure indicator (broadly it is a Gross income) which is multiplied by the factor (β) will give the capital charge for operational risk.

2.4.3 Advanced Measurement Approach (AMA):

Loss distribution approach is one of the advanced versions in this approach, in which the impact of significant operational events on the various business lines of banks and the frequency of occurrences of these events are captured in the form of normal distribution.

3. Why Banks Prefer Risk Management Solution:

As per Gartner's Survey, compliance with Basel II will undoubtedly require software packages that can maximize a bank's ability to identify, measure the risk and allocate the capital to specific risk. Banks need risk analytics solution, to collate the data, analyze, and report the findings (measurement of risks) from the analysis of the data.

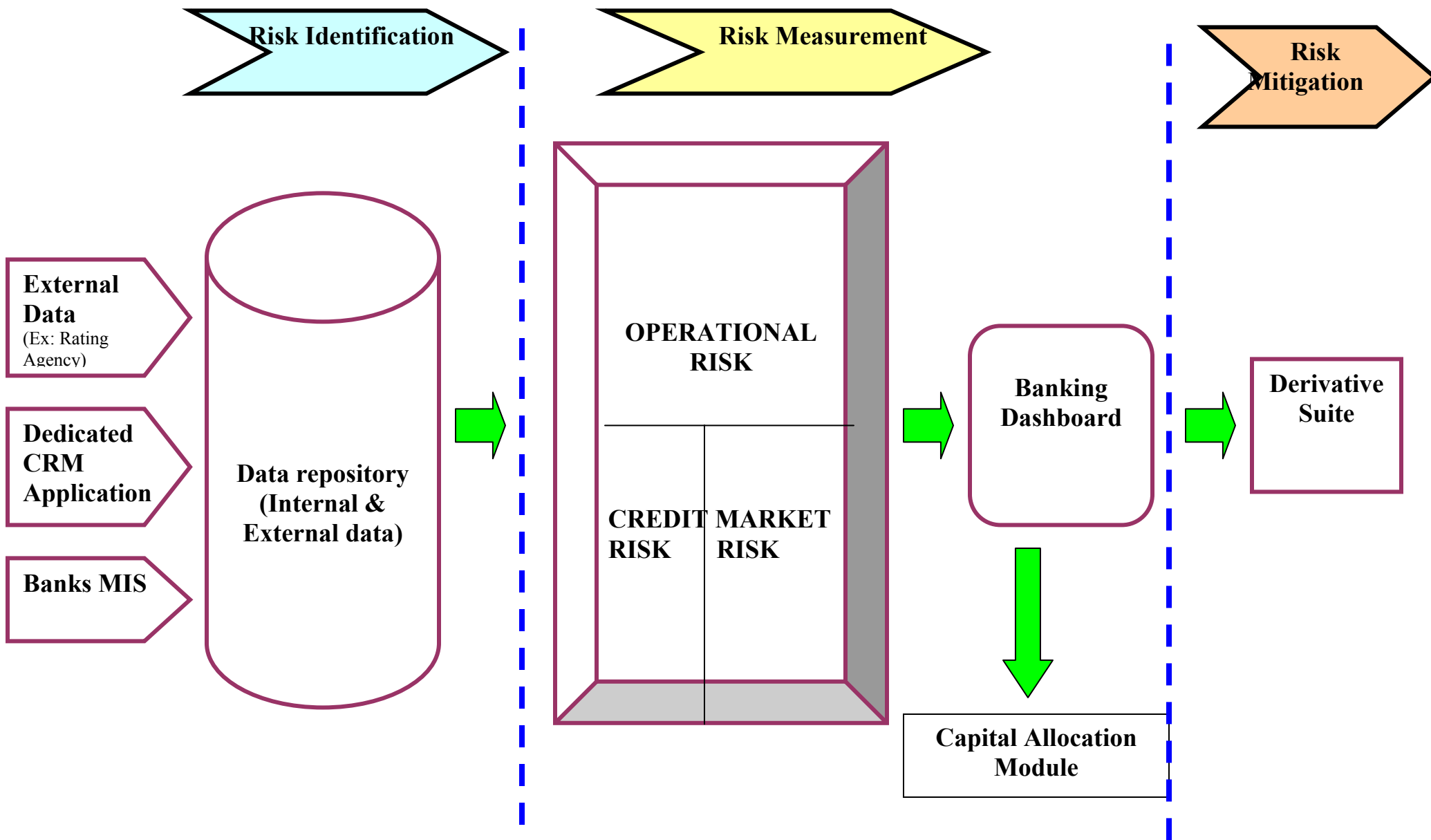
4. Proposed Solution:

To measure credit risk, market risk, operation risk, banks need to

- Identify the risk
- Measure the risk & Capital Allocation
- Mitigate the risk

The above three functionalities have been addressed by the proposed solution in various phases.

The proposed risk management solution has been depicted in the following diagram



4.1 Anatomy of the Risk Management Solution:

The solution consists of three modules.

1. Risks Identification Module
2. Risk Measurement Module
3. Risk Mitigation Module.

4.2 Risk Identification Module:

Data from different sources, are extracted and populated into data repository, which serves as input engine for risk measurement module. The following table represents the details.

Name of the Data Source	Data to be extracted	Purpose of extracting the data.
Dedicated CRM application	Clients data: Clients Payment history, Recovery rate, value of the loan, maturity ,net worth, value of the mortgage(security),	To measure “Credit Risk”
Bank’s MIS (Management Information System)	Bank’s Financials: Rate Sensitive Assets, Rate Sensitive Liability, cash wallet, For-Ex Position, Exposure in equity, derivative market.	To measure “Market Risk”
	Internal Loss Data: History of System failures, Process failures, external events and its impact on various business lines (value of operational loss), Frequency of occurrences,	To measure “Operational Risk” (with respect to bank)
External Sources	Reports form external rating agencies: List of defaulted clients, Credit rating across clients/Sectors, Credit Score for the clients	To measure “Credit Risk”
	External Operational Loss Data:	To measure “Operational Risk” (with respect to banking industry)

4.3 Risk Measurement Module:

Data stored in the repository, is populated into risk measurement module which consists of “Risk Analysis Engine” and “Risk Analysis Dashboard”.

4.4 Risk Analysis Engine:

This engine quantitatively measures each risk and feed the numbers to banking dashboard which is the User Interface.

4.4.1 Measurement of Credit Risk:

Credit Risk is measured based on “Advanced Internal Rating Approach”. By measuring the “Expected Loss”, credit Risk is quantitatively measured.

$$\text{Expected Loss} = \text{Probability of Default (PD)} * \text{Loss Given at Default (LGD)} * \text{Exposure at Default (EAD)}$$

In the data repository, historical data of client’s credit details is available, from which a normal probability distribution curve will be plotted. The above three variables (PD, LGD, EAD) will be calculated from the normal distribution curve.

4.4.2 Measurement of Market Risk:

Market risk consists of

- Interest rate risk
- Foreign exchange risk
- Commodity risk
- Equity Risk

Interest rate risk Measurement:

Interest risk of the bank is quantitatively measured by measuring the “Duration Gap” of the bank’s financial assets.

$$D = \frac{\sum_{t=1}^k \frac{CF_t(t)}{(1+y)^t}}{\sum_{t=1}^k \frac{CF_t}{(1+y)^t}} = \frac{\sum_{t=1}^n \frac{CF_t(t)}{(1+y)^t}}{\text{PV of the Security.}}$$

D=Duration

F=Cash flow

Y=Discount rate

t-Time Period

PV-Present Value of the Security

Unit of the duration is years

$$\text{Duration Gap} = \text{Dollar Weighted duration of asset portfolio} - \text{Dollar Weighted duration of bank's liabilities}$$

Duration of Asset (DA) = [[Summation of (Expected cash inflows * Time period received)] / (1+Discount rate) ^t]] / [Summation of (Expected cash inflows/ (1+Discount rate) ^t)] *where t=1 to n*

Duration of Liability (DL) = $\frac{[\text{Summation of (Expected cash outflows * Time period received)] / (1 + \text{Discount rate})^t]}{[\text{Summation of (Expected cash outflows / (1 + \text{Discount rate})^t)]}$ *where t=1 to n*

All the above required fields (cash inflow, time period, discount rate (given by the bankers), to calculate the duration are available in the Risk Analysis engine which are populated from bank's MIS

4.4.3 Foreign Exchange risk and Commodity risk measurement:

Equity risk, Foreign Exchange (For ex) risk and Commodity risk are measured by the methodology called Var (Value At Risk), by running a simulation package, which is part of the "Risk Analysis Engine-Var is a technique used to estimate the probability of portfolio/market losses based on the statistical analysis of historical for ex/price movements and volatilities.

Var consists of time period, a confidence level and a loss amount (or loss percentage). Var defines the maximum loss the bank could occur with a 95% or 99% level of confidence, over a selected time period.

Ex: IF Var for For ex risk is given as: Confidence level -95%, Expected loss- 4%, Time period -1 year, it means if banks invest 100\$ in for ex market, then banks can 95% confidence that, For ex loss wont exceed 4\$(100*4%).

In the proposed risk management solution, Var is measured by the historical method taking "Implied Volatility" as a key input. Implied volatility is calculated by running "Black-Shoes model", with historical data (which is populated from Bank's MIS) in the "Risk Analysis Engine"

4.4.4 Measurement of Operational Risk:

Operation risk is measured based on "Advanced Measurement Approach"

Operational Loss= Probability of loss event (PE)* Loss given that event (LGE)

In the data repository, historical internal loss data of bank is available from which a normal probability distribution curve will be plotted. The above two variables (PE, LGE) will be calculated from the normal distribution curve. To calculate the capital to set aside for capital risk, following parameters are needed, which will be assessed by respective department heads.

γ = Factor to convert the expected loss to unexpected loss
RPI =Risk profile Index
EI=Exposure

All the above analysis are carried out in the Risk Analysis Engine, and fed into "Risk Analysis Dashboard" where the user can view the quantified risk.

4.5 Risk Mitigation Module:

When the credit risk or market risk exceeds the pre defined norms (predefined norms could be set up in a “Risk Analysis Dashboard), “Risk Analysis Dashboard” will raise the traffic signal alerts to focus the attention towards the high risky component.

Example: When the probability of default for a particular client is moving from 0.6 to 0.9 , then “Risk Analysis Dashboard” raises the “Red signal” against the particular client , so that banks can focus on this client to decide whether to extend the loan to this client or not.. Similarly when the probability of default for a particular client is moving from 0.9 to 0.5, then “Risk Analysis Dashboard” raises the “Green signal” against the particular client, so that banks can extend the credit facility to the client.

The same process is applicable for market risk also. For market risk, “Risk Analysis Dashboard is raising the signal alerts, and “Risk Mitigation Module” suggests the ways to hedge the risk.

Example: When the duration gap is positive, (Duration of Asset>Duration of Liability)and when the projected trend of interest rate is positive, then “Risk Mitigation Module” will raise the red signal ,suggests either reduce duration of asset or increase the duration of liability, in order to protect the net worth of the bank.

5. Suggested Technology:

Since data extraction, data mining and analysis of data are involved in this solution, Business Intelligence (BI) is the suggested technology to implement the above proposed Solution.

6. Value Addition (benefits) to clients:

- Help banks to satisfy the three pillars of Basel II.
 - Pillar I: Minimum capital requirement:-Through comprehensive end to end risk management system; banks would be able to allocate the required minimum capital for each risk
 - Pillar II: Supervisory review process:-Real time monitoring of clients credit position and banks financial position through “Risk Analysis Engine”
 - Pillar III: Market discipline requirements-Improved transparency, sound financial system, effective risk management and mitigation process, and disclosure of bank’s financial stability to public, through “Risk Analysis Dashboard”
- To gain a competitive advantage through effective risk management solution
- To sustain with industry competition
- Increased cost savings through data integration to dashboard
- Improved Customer management by effectively using “dedicated CRM application”

6.1 ROI to the Clients:

- According to Gartner's 2006 report, banks that don't establish integrated enterprise risk management capabilities will lose customers, increase capital cost and decrease credit ratings, compared to competitors".
- According to SAS survey 2006, if a medium- to large-sized bank with \$10 billion economic capital, invests \$2b million to risk management solution, it will translate into a \$200 million operation cost reduction with in a year.
- A survey of McKinsey report (2006) says banks with stronger risk management for Basel II could raise pretax earnings of banks by 3% to 6%.
- According to E Risk, a US based provider of enterprise risk management solution, by implementing risk management solution , share prices of banks have been increased by 11.3%over the four quarters of 2005
- As per Oracle's survey ,92 % of US banks are achieving high return on investment (ROI) by implementing risk management solution

6.2 Value Addition to existing clients of IT companies-Cross Selling:

- Since Basel II compliance is applicable to most of the global banks, and they need an "Enterprise risk management solution", IT companies could offer the solution to its existing banking and financial service clients.

7. Way Forward:

- The suggested risk management solution could be customized and offered to Micro finance institutions (MFI), Non banking financial institutions, and Insurance companies, because risk management is still a challenge for all these financial services.

8. Limitations:

- In each module, the most preferred methodology to measure the risk suggested by IBS (International Bank of Settlements) is executed. Ex: credit Risk, is measured by Advance Internal Rating approach, Market risk is measured by "duration". If banks want to use some other methodology to measure the risk, it is not possible in this solution.
- Banks should have already an IT set up (like implementation of CRM application).Otherwise it will take huge investment of time and money, to implement such an enterprise risk management solution to banks.
- Availability of data (Client's data/Internal loss events data) to measure the risk
- In this article IT companies, refers to mid sized IT companies, since most of the mid sized IT companies have not tapped the potential of Basel II.

9. Alternative Solution:

- To develop the suggested risk management solution, it requires a strong domain expertise and efficient technical platform.
- Instead of developing the solution completely by IT companies, they could have strategic partnership with risk management solution providers like SAS, to offer the solution.

10. Market Potential for Risk Management solution:

- According to Gartner September 2005 report, market size in terms revenue potential for Basel II solution is greater than \$ 300 million in US for 2006
- As per Accenture's recent survey, 50% of European banks said they expected to invest approximately Euro 100 million, in 2006, which is 16% more than previous year investments.
- As per recent Data Quest survey, Indian banks with sizable number of branches will invest 50-70 m\$ in IT and risk management solutions, to implement Basel II.
- As Per CRIS INFAC estimates, the growth rate in BFSI sector will be 25-30% in next 3-4 years and key drivers of this growth rate will be innovative banking software, CRM, Risk management solutions, which are the key drivers of implementing Basel II.

11. Conclusion:

- Currently only very few mid sized IT companies offer integrated risk management package. In future not only banks, but most of the financial services companies will be in a need an integrated risk management and mitigation packages.
- Banks need risk management packages not only to adhere Basel II ,also for effective risk management and mitigation, effective capital allocation, gain competitive advantage, develop the robust system and process, improve reporting systems and transparency, and cost reduction through detailed data analysis
- IT companies could also offer technical consulting to banks and financial services industry regarding implementation and maintenance of risk management framework, which will reap significant monetary benefits to IT companies.

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