A Model Framework for
Measuring and Managing Operational Risks
in Treasury Operations in Financial Institutions

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CERTIFICATE

This is to certify that the thesis entitled- "A **Model Framework for Measuring and Managing Operational Risks in Treasury Operations in Financial Institutions**" submitted by **Akhilesh Tripathi** ID No. **2006 PHXF 27**foraward of Ph.D. degree of the Institute, embodies original work done by him under my supervision.

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Abstract of Research

For the past 2-3 decades, Operational Risks have increasingly been considered as one of the major and important financial risks and gained importance similar and to some extent, more than market risk and credit risk. Operational Risk Management (ORM) is acquiring new credibility as a roadmap to add value to the banking business. Day by day, it is attracting more and more attention from regulators, financial institutions and other stakeholders. Operational risk is embedded everywhere and its assessment, at most of the occasions, is subjective. The major reason is, operational risks are entrenched "work in progress" and difficult to quantify. Addressing operational risks in an effective manner is important for business continuity and sustainability of an organisation, as experts believe, these have final impact on the market value of a firm.

Though Basel Accord has specified norms for assessment and measurement of operational risks, but these are mainly confined to the calculation of economic and regulatory capital, primarily to meet statutory norms. Besides, these specified assessment and measurement approaches are also based heavily on quantitative and statistical aspects, which require specialised skills and knowledge of statistical tools. Against this backdrop there has been observed a felt need for developing an efficient and effective assessment tool, which has sustainable operational risk management initiatives aligned to institutional strategy.

Adhering to these notions, our present research work tries to pin pointedly give a direction for developing an integrated operational risk management framework in the wake of empirical work done for strengthening ORM in banks and financial institutions, for which regulatory as well as individual institutions are required to devise their own mechanisms under Advanced Measurement Approach (AMA), for meeting Basel norms. We attempt in this thesis analysis of quantitative and qualitative aspects of operational risks and propose a model framework for their assessment and measurement, keeping in view the practical problems faced by a banker, inter-alia, in the analysis of data through statistical and quantitative methods. We start our research by reviewing present state of practices, systems, procedures

and various other activities followed in treasury and investment department/cell of a Bank/ Indian financial institution and compare these with the best global practices. We identify various risk factors enduring in different Indian financial institutions viz. Public Sector Banks, Private Sector Banks, Mutual Fund Houses, Venture Capital Funds, Research Houses and Brokerage Houses in the light of various regulatory/statutory/legal/internal policy guidelines/parameters, global practices etc. and identify various steps of investment making process. We segregate these steps into three stages- pre-investment activities, investment-capturing activities and post-investment activities and then identify operational risk-contributing factors - people, processes, systems and external events attached to these. We study major features and characteristics of these ORCs and try to ascertain their role and contribution from interplay and interactions among themselves as well as with the other risk contributing factors. We subsequently assess the role and responsibilities of dealers, traders, investment managers, systems managers, supervisors in generating operational risks and their effective management. After identifying risk contributing factors, we get these vetted by treasury professionals/experts on the essence of, inter-alia, degree of risk, level of risk and severity of risk attached to them. Based on these vetted ORCs we formulate hypotheses and devise questionnaires to collect opinions from treasury professionals for identifying the major ORC. We send questionnaires to professionals working in treasury and investment business line for their opinion, meanwhile review assessment and measurement approaches in the context of AMA under Basel guidelines, and zeroed ourselves on KRI and RCSA approach for our model framework.

We collect professional responses and analyse data to test hypotheses. Our results show that out of the four major operational risk factors - people, process, systems and external events, experts have rated people as the most risk-contributing factor. Results also highlight that people behind investment and trading desks play the most important role in creating and mitigating operational risks. Experts also endorse that people are the decisive factors in the process and own the powers to jeopardize the effectiveness of systems and procedures by indulging themselves into the undesirable acts. Their actions can expose a bank or financial institution to horrible ramifications and, at times, to the extent of closure of an organisation (e.g. Barings Bank). Analysis of professional responses and testing of different hypotheses further

reveal that though People related risk-contributing factors are most important, which generate High Risk, Processes and Systems, the other two risk-contributing factors, are also important as these invoke Medium and Low level Risk severity factors. Hence, these need to be assessed and ascertained well for initiating appropriate steps in time.

Risk management is a process and consistent and continuous evaluation of risk contributing factors is necessary. Since all these ORCs were considered important by the experts, we extend our analysis by undertaking relevancy ranking of the professional responses. We itemise major events/intervention points among the identified ORCs, which are prominent, vulnerable and demand undiverted, focussed and preferred attention consistently and continuously. Relevancy ranking convincingly proved that People related risk-contributing factors carry High Risk, Processes related risk contributing factors, Medium Risk and Systems related risk-contributing factors generate Low Risk severity factors.

Hypotheses analysis and relevancy ranking of the responses prove that all the three ORCs are interdependent, however, we also consider it fit, appropriate and important to understand the relationship between different risk contributing factors i.e. between systems and process, systems and people, process and people. As such, we undertake correlation analysis to determine the significance and strength of relationship between the defined variables- people, process and systems. Our correlation and association results show that all the three factors are negatively related, hence, need to be attended accordingly. Results also show that the relationship among people related risks with other ORCs is highly inverse, as such these should be accorded preferred attention. Our analysis also reveal that risk management in investment and treasury operations of a FI requires strong people, processes and systems related framework and an integrated perspective of the three can help in dramatically minimising the overall risk as these factors are negatively related. Looking at the magnitude of negative relationship being relatively more stronger between people and processes as compared to people and systems, it was construed that greater benefit can be derived in minimising the risk by putting proper people and processes related risk mitigation factors in place.

Analysis of professional responses and other analysis postulate that with proper identification of various control risk factors, a well-defined framework/model can be developed easily and which can significantly address quantification of various operational risk factors. As such, keeping in view the data results and the constraints faced by a banker in applying statistical and quantitative tools for data analysis, we adopt experts' opinion based KRI/RCSA approach for our model framework. KRI based approach is primarily qualitative and entails less quantitative and statistical requirements. We also select KRI based approach because of its bottom down approach characteristics where the participants get involved in the process and offer suggestions/ ideas for improvement. We develop our model framework for assessment of operational risks, in four stages. We start with a *process flow chart* detailing sequence of actions and an overview of the model framework at a glance. We show in this process flow chart key steps for identification and specification of important treasury activities, sub activities, decisions making points etc. Then we develop *a basic framework for identifying KRIs* with respect to risk sensitivity and severity. After this KRI framework, in the third step of the model, we propose a comprehensive *framework* showing relationship among various operational risk contributing factors- people, process, systems and external events, their strategy, structure and execution for controls, checks and balances, internal and external changes. Since our research results show people as the most important risk-contributing factor, we develop, in the fourth and final step of the model a *framework* for identifying and mitigating people related operational risk factor. Thus, we complete our model framework in four stages.

Our proposed model framework is based on KRIs/RCSA approach, which provides a methodological advantage over the traditional statistical techniques, since in our framework, the qualitative aspects of ORCs viz importance of risk severity, their frequency and relationship among various operational risk contributing factors- people, process, systems and external events can be reviewed frequently and consistently. With this cyclical and concurrent review of all the four stages of our model framework, our framework may help in understanding the existing risks, known risks, unknown risk, misses, near misses, present threats and future risks and the like and based on these review, risk mitigation techniques can be implemented in time.

Our proposed model framework does not necessitate acquaintance with and proficiency in various processes of treasury and investment activities and/or extensive knowledge of human psychology, since it has drawn from KRIs/RCSA initiatives, which are usually defined in detail in the process manuals /job cards for working professionals/employees available in every financial institution.

In addition, we have explicated our framework on the essence of audit formats because across the globe, every financial institution is covered under various types of audits viz, internal, concurrent, credit, systems, human resources, statutory etc. and professional are exposed to these regularly and frequently. Acquaintance with the process, format and framework makes a risk assessor at home. Finally, our framework is an elixir distillation from KRIs/RCSA based risk assessment approaches, which are literally akin to Risk Based Internal Audit (RBIA) or Risk Focused Internal Audit (RFIA). In India, banking regulator, RBI devise directives and monitor guidelines in this regard. As such, we hope that our model will be accepted by the users easily. Our model framework can also be modified and used as a reference for constructing models for assessing and managing operational risks in other business lines of a bank/ FI. It can also be tailored to meet the Basel norms under Advanced Measurement Approach (AMA), subject to invariable vetting of parameters/control factors by the experts.

Key Words: Risk Management, Treasury Management, Investment Management, Financial Management, Investment Analysis, Treasury Operations, Front Office, Mid Office, Back Office, Trading, Securities, Dealer, Investment Manager, Systems Manager, Operational Risk, Market Risk, Capital Market, Investment Market, Bond, Equity.

List of Abbreviations

ALM - Asset and Liability Management

BCBS- Basel Committee on Banking Supervision

BCP- Business Continuity Plan

CBLO- Collateralized Borrowing and Lending Obligations

CCIL- Clearing Corporation of India Ltd

CD- Certificates of Deposit

CISA-Certified Information Systems Auditor

CISSP- Certified Information Systems Security Professional

CP- Commercial Paper

CR- Credit Risk

CRR-Cash Reserve Ratio

DRP- Disaster Recovery Plan

DTL - Demand & Time Liabilities

FEDAI – Foreign Exchange Dealers Association of India

FIMMDA- Fixed Income Money Market and Derivatives Association

GoI- Government of India

HFT- Held for Trading

HTM- Held to Maturity

ISDA-International Swaps and Derivatives Association

KPI-Key Performance Indicators

KRI- Key Risk Indicators

KYC- Know Your Customer

LPG - Liberalisation, Privatisation and Globalisation

MR- Market Risk

NIM- Net Interest Margin

NSDL- National Securities Depository Ltd.

NSE- National Stock Exchange

OR- Operational Risk

ORC- Operational Risk Contributor

PAT -Profit After Tax

RBI- Reserve Bank of India

RCSA - Risk Control &Self-Assessment

SEBI- Securities & Exchange Board of India

SEC- Securities & Exchange Corporation (USA)

SHCL- Stock Holding Corporation Ltd.

SLR- Statutory Liquidity Ratio

VaR- Value at Risk

VCF- Venture Capital Fund

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Chapter 1- Research Background and Scope

"Risk is almost God *like* in qualities. It is omnipresent".[1]

Shri Anand Sinha, Deputy Governor RBI

1.1- Background[2]

 Risk has a long history, perhaps as long as human history, and so does risk management. Risk is inherent in every walk of life. Understanding risks and learning to manage them has been mantra for survival in any age or in any realm of life (Sinha, 2012). Risk (uncertainty of occurrence of an event) has been part and parcel of human activity, but they have not always been labelled as such. For much of the recorded time, events with negative consequences were attributed to divine providence or to the supernatural. The responses to risk under these circumstances were prayer, sacrifice (often of innocents), and an acceptance of whatever fate meted out. If the gods intervened on our behalf, we got positive outcomes, and if they did not, we suffered; sacrifice, on the other hand, appeased the spirits that caused bad outcomes. No measure to control of risk was therefore considered necessary because everything that happened was predestined and driven by forces outside our control.

However, the first break in this karmic view of risk occurred in the middle ages when mathematicians, more in the interests of success at the card tables than in risk measurement, came up with the first measures of probability. In 1494, an Italian monk, Luca Pacioli, a man of many talents, viz inventor of double-entry book keeping and writer of a mathematics book 'Summa de Arithmetica', presented a puzzle that challenged mathematicians of the time. Assume, he said, that two gamblers are playing a best-of-five dice game and are interrupted after three games, with one gambler leading two to one. What is the fairest way to split the pot between the two gamblers, assuming that the game cannot be resumed but taking into account the state of the game when it was interrupted? With hindsight of several centuries,

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[1] Inaugural address speech on "Perspectives on Risk and Governance" by ShriAnandSinha, Deputy Governor, Reserve Bank of India, at the Risk & Governance Summit at Mumbai on August 23, 2012.

[2] Excerpts from the Book, "Strategic Risk Taking – A Framework for Risk Management" by AshwathDamodaran (2007), pp 70-73

the answer may seem simple, but one has to remember that the notion of making predictions or estimating probabilities had not developed by that time. The first steps toward solving the Pacioli Puzzle came in the early part of the sixteenth century when an Italian doctor and gambler, Girolamo Cardano, estimated the likelihood of different outcomes of rolling a dice. His observations were contained in a book titled Books on the Game of Chance, where he estimated not only the likelihood of rolling a specific number on a dice (1/6), but also the likelihood of obtaining same values on two consecutive rolls. He, for instance, estimated the probability of rolling two 1s in a row to be 1/36. Galileo, taking a break from discovering the galaxies, came to the same conclusions for his patron, the Grand Duke of Tuscany, but he did not go much further than explaining the roll of the dice.

It was not until 1654 that the Pacioli puzzle was fully solved when Blaise Pascal and Pierre de Fermat exchanged a series of five letters on the puzzle. In these letters, Pascal and Fermat considered all the possible outcomes to the Pacioli puzzle and noted that with a fair dice, the gambler who was ahead two games to one in a best-of-five dice game would prevail three times out of four, if the game were completed, and was thus entitled to three quarters of the pot. In the process, they established the foundations of probabilities and their usefulness not just in explaining the past but also in predicting the future. Pascal developed his triangle[3] of numbers for equal-odds games, as depicted hereunder in Figure 1.1.1:

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[3]Pascal's triangle can be used to compute the likelihood of any event with even/ odds occurring. In general, it provides the number of possible combinations if an even-odds event is repeated a fixed number of times; if repeated N times, adding the numbers in the N+1 row and dividing each number by this total should yield the probabilities.

Figure- 1.1.1 –Description of Pascal Triangle[4]

```
                          1
                    1           1
                1       2           1
            1       3       3           1
        1       4       6       4       1
    1       5       10      10      5       1
1       6       15      20      15      6       1
  000     000     000     000     000     000
```

Pascal Triangle

Pascal and Fermat fired the opening volley in the discussion of probabilities with their solution to the Pacioli puzzle, but the muscle power for using probabilities was provided by Jacob Bernoulli, with his discovery of the *law of large numbers.* In this discovery, Bernoulli proved that a random sampling of items from a population has the same characteristics, on average, as the population. He used coin flips to illustrate his point by noting that the proportion of heads and tails approached 50 percent as the number of coin tosses increased. In the process, he laid the foundation for generalizing population properties from samples, a practice that now permeates both the social and economic sciences.

The advancement in statistics extended the reach of probability into the uncertainties (risk) that individuals and businesses faced day to day. In 1738, an English mathematician of French extraction, Abraham de Moivre[5], introduced the normal distribution as an approximation for binomial distributions as sample sizes became larger. This provided researchers with a critical tool for linking sample statistics with probability statements. The bell curve, which characterizes the normal distribution, was refined by other mathematicians, including Laplace and Gauss, and the distribution is still referred to as the Gaussian distribution.

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[4]Adapted from the Book, "Strategic Risk Taking – A Framework for Risk Management" by AshwathDamodaran (2007), pp 72
[5]De Moivre, A., 1738, Doctrine of Chances.

In 1763, Reverend Thomas Bayes[6]published a simple way of updating existing beliefs in the light of new evidence. In Bayesian statistics, the existing beliefs are called prior probabilities, and the revised values after considering the new evidence are called posterior or conditional probabilities. Bayes provided a powerful tool for researchers who wanted to use probabilities to assess the likelihood of negative outcomes and to update these probabilities as events unfolded. In addition, Bayes' rule allows us to start with subjective judgments about the likelihood of events occurring and to modify these judgments as new data or information is made available about these events. Later on, Markowitz[7&8] laid the foundation for modern portfolio theory by making explicit the benefits of diversification which were improvised by Sharpe and Lintner[9].

1.2- Evolution of Risk Measures

Measuring risk is a critical first step towards managing it. Risk measures have evolved over time, from a fatalistic acceptance of bad outcomes to probabilistic measures and its logical extension practically. In the following Table -1.2.1, we summarize the key developments made over the time in the area of risk analysis and risk measurement:

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[6] Bayes, Rev. T., "An Essay Toward Solving a Problem in the Doctrine of Chances", Philos. Trans. R.
Soc. London 53, pp. 370-418 (1763); reprinted in Biometrika 45, pp. 293-315 (1958).

[7]See the Markowitz autobiography for the Nobel committee. It can be accessed online at http://nobelprize.org/economics/laureates/1990/markowitz-autobio.html.;

[8] Markowitz, H.M. 1952. "Portfolio Selection," The Journal of Finance, 7(l): 77-91. Markowitz, H.M. 1959. Portfolio Selection: Efficient Diversification of Investments.New York: Wiley (Yale University Press, 1970, Basil Blackwell, 1991).

[9] Sharpe, William F., 1961,. Capital asset prices: A theory of market equilibrium under conditions of risk,
Journal of Finance, 19 (3), 425-442; Lintner, J., 1965 The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, Review of Economics and Statistics, 47: 13-37;
Treynor, Jack (1961). Towards a theory of market value of risky assets, unpublished manuscript.

Table- 1.2.1 - Key Developments in the Area of Risk Analysis& Risk Measurement[10]

Key Events	Era	Risk Measures used
Risk was considered to be either fated and thus impossible to change or divine providence, in which case it could be altered only through prayer or sacrifice	Pre-1494	None or gut feeling
Luca Pacioli posits his puzzle with two gamblers in a coin tossing game.	1494	
Pascal and Fermal solve the Pacioli puzzle and lay foundations for probability estimation and theory	1654	Computed probabilities
Graunt generates life table using data on births and deaths in London.	1662	
Bernoulli states the "law of large numbers," providing the basis for sampling from large populations.	1711	Sample-based probabilities
deMoivre derives the normal distribution as an approximation to the binomial, and Gauss & Laplace refine it.	1738	
Bayes published his treatise on how to update prior beliefs as new information is acquired.	1763	
Insurance business develops and with it come actuarial measures of risk, based upon historical data.	1800s	Expected loss
Bachelier examines stock and option prices on Paris exchanges and defends his thesis that prices follow a random walk.	1900	Price variance
Standard Statistics Bureau, Moody's, and Fitch start rating corporate bonds using accounting information.	1909	
	1915	Bond & Stock ratings
Markowitz lays statistical basis for diversification and generates efficient portfolios for different risk levels.	1952	Variance added to portfolio
Sharpe and Lintner introduce a riskless asset and show that combinations of it and a market portfolio (including all traded assets) are optimal for all investors. The CAPM is born.	1964	Market beta
Risk and return models based upon alternatives to normal distribution - Power law, asymmetric, and jump process distributions.	1960–	
Using the "no arbitrage" argument, Ross derives the arbitrage pricing model; multiple market risk factors are derived from the historical data.	1976	Factor betas
Macroeconomic variables examined as potential market risk factors, leading the multi-factor model.	1986	Macro- economic betas
Fama and French, examining the link between stock returns and firm-specific factors, conclude that market cap and book to price at better proxies for risk than beta or betas.	1992	Proxies

[10]AshwathDamodaran (2007), "Strategic Risk Taking – A Framework for Risk Management" Chapter-4, How do we measure risk? pp .95,

Thus risk measures evolved over a period of time along with developments in statistics and economics on one hand and the availability of data on the other hand. The law of large numbers showed that sampling means can be used to approximate population averages, with the precision increasing with sample size. The normal distribution allows us to make probability statements about the sample mean. Finally, Bayes' rule allows us to estimate probabilities and revise them based on new sampling data. The work done on probability, sampling theory and the normal distribution has provided a logical foundation for the analysis of raw data.

It is worth noting that as new risk measures have evolved, the old ones have not been entirely abandoned. Notwithstanding the advances over the past few centuries and our shift to more modern, sophisticated ways of analyzing risk, the belief that powerful forces beyond our reach shape our destinies is never far below the surface. The same traders who use sophisticated computer models to measure risk consult their astrological charts and rediscover religion when confronted with the possibility of large losses.

1.3- Banks and Risks

Banks, by definition, are in the business of taking and managing risk (Arora, 2009).In their role as intermediaries, they perform a very critical function of risk transformation which results in warehousing of risks (Sinha 2012). The banking business has become far more sophisticated and complex and simultaneously risk also. The risk taking behaviour of banks contribute and amplify systemic risk which have severe repercussions in financial and economic fragility which was witnessed during and in the aftermath of the latest global financial crisis.

Banks operate on the foundation of public confidence and any small breach in that confidence can lead to a run on the bank and to its eventual failure (Sinha 2012). Given their unique business model and the special role played, sound risk management system is essential in banks for successful and fruitful assessment, measurement and management of risks.

1.3.1- Types of Banking Risks

Growing competition and fast technological changes in the operating environment have impacted business potentials, and banks are facing various risks which may be divided into two broad categories- business risks and control risks. While *business risks* are the risks arising out of the operations in a bank and consist of eight types of risks - capital, credit, market, earnings, liquidity, business strategy and environmental, operational and group risks, *control risks* measure the risks arising out of any lapses in the internal controls, management, organizational structure and compliances. Control risks are highly interdependent and events that affect one area of risk can have ramifications for a range of other risk categories (Arora, 2009).

There are three main categories of risks, which have a mention in the Basel Capital Accord -Credit Risk, Market Risk and Operational Risk-

Credit Risk, a major source of loss, is the risk where customers fail to comply with their obligations to service debt. Major credit risk components are exposure, likelihood of default, or of a deterioration of credit standing, and the recoveries under default.

Market Risk may be defined as the possibility of loss to a bank caused by the changes in the market variables. Market risk management provides a comprehensive and dynamic frame work for measuring, monitoring and managing liquidity, interest rate, foreign exchange and equity as well as commodity price risk of a bank that needs to be closely integrated with the bank's business strategy.

Operational risk has been defined by Basel Committee on Banking Supervision (2003)as "*the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events, including legal risk, but excluding strategic and reputational risk*". Operational risk involves breakdown in internal controls, personnel and corporate governance leading to error, fraud, and performance failure, compromise on the interest of the bank resulting in financial loss(Arora,2009).

1.3.2-Difference between Credit Risk, Market Risk and Operational Risk

Marcelo Cruz (2002)[11]defines the difference between Credit Risk, Market Risk and Operational Risk with an example. He says: "Consider a bank that holds bonds of XYZ Corporation. The value of the bonds will change over time. Suppose if the value fell due to a change in the market price of the bond, it would be *Market Risk*. If the value fell as a result of the bankruptcy of XYZ Corp, this would be *Credit Risk*. If the value fell because of a delivery failure, this would be *Operational Risk*. However, in each of the cases, effect will be a write-down in value of the bonds, but the specific cause will be a consequence of different risks."Janakiramani, (2008) advises that given the close linkage of operational risk with other risk types, it is very important for banks to first have a clear understanding of the concept of operational risk before designing the operational risk measurement and management framework. The Basel Accord stipulates that operational risk losses related to credit risk are treated as credit losses but operational risk losses related to market losses are treated as operational risk losses for the purpose of regulatory capital computation. The Basel definition is clearly based on the causes of operational risk, rather than on the outcome of operational risk. Operational risk may materialise directly, as in the case of say, wire transfer (transfer of funds to the wrong person) or could result indirectly as a credit or market loss. For example, in the Barings case, operational risk events (fraud, lack of demarcation of responsibilities and inadequate oversight of dealer's activities) resulted in a market loss. Alternatively, not marking a lien on a fixed deposit in respect of a loan granted against the security of the deposit by the financial institution could result in a loss to the bank. The loss, though materialising as a loan loss, was actually caused by an operational risk event (non-marking of lien-an act of negligence). Moosa (2007) arguing that distinction should be made between the cause and the factor driving severity, states that the cause of the Barings disaster was an operational loss event but movements in the market aggravated the severity of the loss.

1.4-Operational Risks – Issues and Challenges

Post Liberalisation, Privatisation and Globalisation (LPG),) vis-à-vis the role played by Basel Committee on Banking Supervision [2004], operational risk has

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[11]Cruz M. "Modelling, Measuring and Hedging Operational Risk" , 2002, John Wiley & Sons.

increasingly been considered as an important financial risk and is gaining cognizance similar to or more than market risk and credit risk (Dutta et al, 2006). Across the globe experts are realizing that many losses occurred due to failed operational or internal processes (earlier wrongly accredited to credit risk or market risk failure) were in fact operational risk faults.(Wei, 2006, Cummins et al, 2006]).Similarly, in the early twenty first century also, the American investment banking industry got hit by a series of similar improper activities due to the following:

- Inappropriate use of Investment Research
- Preferential allocations of shares in new Initial Public Offerings (IPO), so-called 'spinning'
- Inappropriate pricing of Mutual Funds
- Inappropriate behaviour in interest rate auctions
- introduction of new products and technologies into the financial system e.g. derivatives

Many such unethical practices, if not downright illegal, had persisted for several years. However, these were brought out when giants like WorldCom, Enron, Barings Bank, Allied Irsih Bank(AIB) and National Australia Bank (NAB) etc. were finally exposed and failed (McConnell,2005). Some of the prominent reasons behind these failures attributed to are–

- Fraudulent/improper activity on the part of one person or group – primarily to protect bonuses;
- Trading in derivative securities – in particular 'selling' options in volatile markets;
- Non-adherence to critical policies and procedures, in particular trade confirmation; and
- an aberrant 'corporate culture' which not only failed to encourage questioning the concerned persons about the risks being taken, but encouraged imprudent risk taking behaviour and that too for making higher profits.

In the year 2008, when similar failures of banks and financial institutions fuelled credit and liquidity crisis across the globe, the core reasons were attributed to greed, mis-selling, rogue trading, increasing complexity of banking and financial products, technological advancement, rapid expansion of banking operations, growing vulnerability of financial institutions, poor risk modelling so on and so forth.

Samad Ali Khan et al (2009) opines that during past 20-25 years, every catastrophic financial loss that had taken place, viz of Barings Bank, Long Term Capital Management, Allied Irish Bank-All First, SociétéGénérale, Bear Stearns, Lehman Brothers, American Insurance Group (AIG) etc. may unquestionably attributed to operational risks failures and mismanagement. Experts believe that major reasons for these massacres, wrongdoings, incidents have been mismanagement of various operational risks emanating from people, processes, systems and the inefficient corporate governance. Mehra (2010) describes the root cause of all such incidences as not "new" or so-called "unknown risks" arising from derivatives or collateralized debt obligations etc. but a meltdown in core ethical values across the banking and financial institutions globally. This financial and ethical meltdown originating from the greed and misdeeds of persons attached with the treasury and investment business line of various banks and financial institutions, shattered the global economy. In India, if we were relatively less affected from such incidences, popularly coined as subprime crisis, credit goes to statutory and regulatory bodies whose strict vigilance and compliance for adherence to the systems and procedures saved the industry from harsh implications.

1.5-Operational Risk and Treasury Management

Internal Audit Standards Board Committee (IASBC, 2010) advises that treasury plays an important role in improving the bottom line of a firm. It also manage firm's balance sheet by reducing risks through hedging sensitive exposures. Treasury operations consist of activities related to funds management- collections, disbursements and the investment management with ultimate goal of optimising performance as per business objectives of the firm and in consonance with the regulatory framework, as well.

In banking parlance, primary role of a treasury and investment operations isto maximise liquidity and mitigate market, operational and financial risks. Treasury and Investment activities normally include-

- monitoring Demand & Time Liabilities (DTLs) for regulatory compliance
- maintaining Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) for meeting statutory requirements
- conducting various money and capital market operations
- optimising yield / income from investments
- ensuring sound ethical and acceptable business practices.

1.6– Treasury Operations- Concerns, Process Flow and Execution

Experts opine treasury activities as most vulnerable banking activities. Treasury activities are faced with numerous risks and challenges arising from market and operational risks. Operational risks arising from inadequate or failed internal processes, changes in policies, processes, systems and procedures, misdeeds of routine employees etc. are harsh, irreversible and sometimes cruel to the extent of closure of an institution. Functioning of treasury operations necessitates clear and transparent functional demarcation, distinction and separation of duties of various functionaries. Various regulatory and statutory bodies put forth guidelines for demarcation of treasury activities in three layers/stages/phases - **Front Office activities, Mid Office activities and Back Office activities**. Based on these statures, organisations segregate treasury activities and assign specific job role to the respective functionaries so as to ensure non-overlapping of their assignments/activities. The demarcation of activities/job roles in these three separate layers/ compartment/cells ensures, inter-alia, lead to avoidance of interrelated clashes of functions/deals. For example, front office activities, mainly consisting of buying and selling of securities, are checked by back office and mid office which ensure that in case a front office person commits a mistake to the extent of blunder (advertently or inadvertently) or manipulate prices of securities, exchange rates, dealing positions, mismatches etc. for his own benefit (e.g. Nick Leeson- Barings Bank), has will be caught hold of by the Back Office. Back office is responsible for ensuring correctness of deals, their follow-up with counter parties, settlement,

reconciliation, accounting, recording and reporting to higher authorities. In addition, mid office also plays its role as of a checker and risk manager and ensures adherence to various procedures and systems, accounting policies through management information systems (MIS), risk management and other control systems tools. We detail hereunder a brief overview of these functional segregations and demarcations:

1.6.1- Front Office Activities

- Dealing in Call Money and other Money Market instruments such as Collateralized Borrowing and Lending Obligations (CBLOs)
- Investment and Trading in SLR securities i.e. Central and State Government Securities, State Development Loans, Bonds, Treasury Bills, etc.
- Investment and Trading in Non-SLR Securities such as -
    - Equity shares / stocks / preference shares/ fully convertible debentures
    - Private Sector Corporate Bonds
    - Units of Mutual Funds
    - Bonds of Various Financial Institutions
    - Commercial Paper (CP)
    - Certificates of Deposit (CD)
    - Venture Capital Funds
    - Private Equity
- Spot / Forward Purchase and Sale of Foreign Currencies
- Swap transactions (simultaneous Buy/Sell or Sell/Buy of currency pairs)
- Spot and Swap Transactions in Gold and other bullions
- Dealing in Derivatives products such as Options/Futures etc.
- Dealing in Currency Futures
- Offering Client Portfolio Management Services

1.6.2- Mid Office Activities- are mainly undertaken to

ensure risk control by conducting various risk management exercises such as Liquidity Risk Analysis, Interest Rate Risk Analysis, Scenario Analysis, VaR, Duration, Modified Duration etc.

1.6.3- Back Office Activities -are conducted to ensure that

- all transactions are in conformity with the mandate given by appropriate authorities;

- all transactions are undertaken, contracted and executed as per laid down norms, instructions and procedures prescribed by the bank;

- accounting, reporting, reviewing of transactions are in accordance with the specified instructions; and

- various statutory, regulatory and external compliances - RBI regulations/GOI instructions/ SEBI Guidelines etc. are strictly adhered to.

1.7-Treasury Operations- A Premier Income Generator

In addition to performing their prime duty of managing statutory responsibilities, treasury operations in a Bank/FI/corporation are also expected to generate regular and consistent income and that too without involving huge operational costs. Treasury and investment activities entail minimum or negligible operational costs in terms of manpower and money, as against usual commercial banking activities which involve huge cost and expenditure. While most of the commercial banking activities are undertaken and managed by almost 99% of a bank staff members, investment banking activities are managed by a very few people and who generate as much as profit, if not more, as their commercial banking counterparts. Out of the two major incomes generating assets heads in a bank's balance sheet in India - "Loans and Advances" and "Investments", treasury outcomes are shown under "Investment" head of assets. We give hereunder data related to these segments of assets in the following Table 1.7.1:

Table- 1.7.1 -Consolidated Balance sheet Data of Scheduled Commercial Indian Banks -Share of Important Assets-(Rs. in crores)

Year ending March 31st	Total Assets Size	Loans and Advances (@)		Investments ($)	
		(in absolute terms)	(in % terms)	(in absolute terms)	(in % terms)
2011	7183522	4298704	59.84%	1916053	26.67%
2010	6025141	3497054	58.04%	1719185	28.53%
2009	5241330	3000906	57.25%	1449474	27.65%
2008	4326166	2476936	57.25%	1177329	27.21%
2007	3463406	1981216	57.20%	950769	27.45%
2006	2785863	1516811	54.45%	866508	31.10%
2005	2355955	1150836	48.85%	869737	36.92%
(@) Loans and Advances include all type of bank credit viz. Bills Purchased and Discounted, Cash Credits, Overdrafts and Term Loans etc..					
($)Investments in Government Securities, Other Approved and Non-Approved Securities					

Source RBI: Statistical Data –Trend & Progress Reports for the year from 2004-05 to 2009-10

From the Table 1.7.1, it may be seen that all along the years from 2005 to 2011, proportion of 'Loans and Advances' and 'Investments', both segments of assets, has remained more or less similar in overall asset composition of the balance sheet of the banks. If the total size of the assets has increased by Rs. 4827567 crores in absolute terms and204.91% in percentage terms from 2005 to 2011, the Loans and Advances have increased by Rs. 3147868 crores in absolute terms and by273.50%in percentage terms and Investments by Rs. 1048613 crores in absolute terms and by120.30% in percentage terms. This indicates that despite massive and enormous rise in the commercial banking activities, through increased number of branches, point of sales, entry of new private sector banks, investment segment of activities have maintained their prominence in the balance sheet consistently during the years under reference. In addition, the absolute return on both the assets, despite 'Loans and Advances' carrying a higher proportion in the balance sheet than 'Investments' segment of assets, has remained more or less similar, which may be from the following Table-1.7.2:

Table- 1.7.2 - Comparative Profitability Analysis of Scheduled Commercial Indian Banks- Return on Assets

			Figures in Percentage Terms (%)
Year	Return on Overall Assets	Return on Advances	Return on Investments
2009-10	1.05	9.3	6.6
2008-09	1.13	9.9	7.0
2007-08	1.12	8.9	7.3
2006-07	1.05	8.9	7.2
2005-06	1.01	8.2	7.7
2004-05	1.01	8.1	7.9

Source RBI: Statistical Data – Trend & Progress Reports for the year from 2004-05 to 2009-10

The above tabulated data clearly show that during the years, though overall return of assets remained almost stagnant, return on advances hovered around 8% to 9%; on investments it had been in the range of 7 to 8%. Besides, in managing Loans and Advances segment of assets, banks incur huge operational costs, precious resources, funds, manpower and most importantly, bear the burden of NPAs income provisioning and writing off of the bad debts etc. On the other hand, investment segment of assets speaks volumes of itself and do not involve all such worrisome and disturbing features. It rather provides banks a comfort on these parameters, and ensures a source of perennial profitability.

1.7.1- Profitability, CASA and NIM

Banks always perform under volatile conditions. Loan asset-quality issues have always been trouble for the sector and fresh slippages leading to higher provisioning requirements hamper the profitability drastically. Now with Basel-III norms demanding capital requirements stricter, banks are required to focus first on profitability and then on balance sheet growth. But on-going capital requirements, persistent high inflation, frequent re-pricing of deposits, rising cost of funds, unstable lending yields (primarily due to lower income recognition on increased NPAs), and frequent restructuring of large-ticket loans, all have impacted banks' profitability

(NIM)[12]and liquidity (CASA deposits)severely. In banking industry, CASA market share and fee based income are the two major key factors in grouting the bottom line. While CASA deposits fuel liquidity, fee based income helps in filling the speedily decreasing NIM. Banks with a higher CASA ratio usually have higher NIM, as the cost associated with CASA is very less (since there is no interest outgo on Current Account deposits and on Savings Bank Account deposits, minimal interest is paid).

1.7.2-CASA, NIM, Fee Income and Treasury Income

While NIM and fee based income pose base for profit and loss account, treasury income strengthen bottom-line and overall profitability of a banking organisation. In the last2-3 decades, CASA share of Indian banks have increased drastically due to sustained GDP growth, rapid branch and ATM expansion, increased urban-centric outlook- particularly by PvtSBs, enhanced efficiency through technological upgradations and increased employee productivity, expansion in retail customer base and superior customer service orientation etc. All these factors combined together have increased banks' balance sheet size and NIM. The following Table 1.7.3 show the importance of treasury income in overall income of the banks.

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[12] Net Interest Margin (NIM) is the spread of the interest earned and the interest expended by the bank.

Table- 1.7.3 – Comparative Profitability Analysis of Major Public and Private Sector Banks – Share of Treasury Income

Data as of 31.03.2012 Figures in Percentage Terms (%)			
Public/Private Sector Banks	NIM (%)	FITI (%)	TITI (%)
State Bank of India	3.85	9.56	1.97
Bank of Baroda	2.97	3.70	4.03
Punjab National Bank	3.50	5.84	2.45
Bank of India	2.52	3.99	3.13
Union Bank of India	3.21	1.55	3.95
I DBI Bank	2.07	5.76	1.30
Indian Bank	3.43	2.99	2.13
Allahabad Bank	3.48	4.98	2.45
Indian Overseas Bank	2.75	4.54	1.99
Andhra Bank	3.80	1.94	1.92
Corporation Bank	2.48	2.72	3.54
Central Bank of India	2.78	3.21	2.45
Syndicate Bank	3.43	2.70	0.81
Dena Bank	3.17	2.11	1.57
Bank of Maharashtra	3.22	5.79	0.96
United Bank of India	3.17	2.10	3.15
State Bank of Mysore	3.71	7.14	1.27
H D F C Bank	4.20	11.05	2.92
I C I C I Bank	2.73	13.24	3.87
Axis Bank	3.59	15.83	2.72
Kotak Mahindra Bank	4.80	4.92	1.27
Indusind Bank	3.29	7.77	3.05
Yes Bank	2.80	8.19	1.05
Federal Bank	3.79	2.87	1.69
I N G Vysya Bank	3.29	10.36	3.53
KarurVysya Bank	3.39	5.36	1.43
South Indian Bank	3.10	1.00	1.86
Development Credit Bank	3.25	9.59	2.27
@			
NIM - (Net Interest Margin)			
FITI - (Fee Income to Total Income)			
TITI - (Treasury Income to Total Income)			

Source: Research Report on Indian Banking Sector by Mayur R. Nakhwa of Nayan M. Vala Securities Pvt. Ltd. accessed from http://www.nayanmvala.com

As may be observed from the above Table 1.7.3, most of the PSBs have witnessed healthy NIM within a range of 2.50% to 3.50%, indicating strong CASA deposits base alongwith ongoing steady liquidity base. During the period under review, the major PSBs, State Bank of India has stood at 3.85%, Andhra Bank at 3.80%, State

Bank of Mysore 3.71%, Punjab National Bank 3.50%, Allahabad Bank 3.48 and Indian Bank at 3.45 NIM for Bank of India with 2.52%, Corporation Bank at 2.48% and IDBI Bank with 2.07% which indicated their strong grass root presence and vast network of branches. On the front of private sector banks, NIM was a better level in the range of 3 to 4% with Kotak Mahindra Bank being highest at 4.80% followed by HDFC Bank at 4.20% due to technological advancements.

1.7.2.1-Fee Income to Total Income (FITI)

Similarly, under the head of Fee Income to Total Income (FITI) also PvtSBs continued to fare relatively better because of their dominant position, competitiveness and sustained traction in streams such as wealth management, transaction banking, cards, forex and capital markets. A few large private sector banks, Axis Bank (15.83%), ICICI Bank (13.24%) and HDFC Bank (11.05%) accounted for a lion's share of fee income to total income streams, compared to public sector banks, State Bank of India at (9.56%), State Bank of Mysore (7.14%),Punjab National Bank (5.84%), Bank of Maharastra (5.79%),IDBI Bank at (5.76%), and Allahabad Bank at (4.98%)as of FY2011-12.

1.7.2.2-Treasury Income to Total Income (TITI)

PSBs have dominant position in Treasury Income % to Total Income. For example, Bank of Baroda(4.03%), Union Bank of India (3.95%), Corporation Bank (3.54%), United Bank of India(3.15%), Bank of India(3.13%), Allahabad Bank (2.45%), Central Bank of India(2.45%) and Punjab National Bank (2.45%) showed generating more income from treasury operations than their overall fee based income. Similar has been the case of private sector banks with ICICI Bank at 3.87%, ING Vysya Bank at 3.53%, Indusind Bank(3.05%), HDFC Bank(2.92%) and Axis Bank(2.72%)who showed importance of their treasury income in overall revenue generation.

All the above tabulated data and their inferences clearly indicate that now the banks dependency to enhance their income from investment banking activities has increased much more than from their traditional core commercial banking activities. One of the major reasons to this effect has been post core banking solutions status of

the banking industry when the banks are facing pressures on their exchange and commission income from traditional remittance and collection businesses. While earlier banks used to generate substantial fee income from such activities, after commencement of Real Time Gross Settlement of funds, these sources are virtually disappearing. Banks are now also facing stiff competition in other fee income based avenues viz. issue of bank guarantees, letter of credit etc. and are compelled to generate income from other avenues viz. treasury operations, investment banking activities. But the major and foremast risk attached to this segment of banking operations lie in its management by a small group of persons who influence the situations for their own gains and also possess the powers to repeat the subprime type aftermaths any time. This raises the necessity for most important risk factor management - Operational Risk Management (ORM).

1.8- Need for the Research

For the past 2-3 decades, organisations across the globe, particularly banks/financial institutions are facing teething problems in managing operational risks. For successful management of ORs, proper analysis, assessment and measurement are necessary. Though several researches/studies/working papers on ORM have been conducted/published during the period, but most of these research studies have remained confined to the calculation of regulatory and economic capital, primarily to adhere statutory requirements. Besides, ORM is also a new concept compared to Market Risk Management (MRM) and Credit Risk Management (CRM). Moreover, OR analysis and assessment is also not easy because of, inter-alia, unavailability of proper and appropriate tools. Experts generally apply MR/CR assessment tools for OR analysis and assessment because of their familiarity and acquaintance with such tools. But these tools, not meant for ORM, fail to capture the unique characteristics of operational risks and do not show results in the desired manner (Scandizzo, 2005).The reason is that analysis of MR and CR is data based where quantitative/ statistical tools help in understanding the rules of the past trend to predict the future. Most of the market and credit risk assessment tools, such as Betas, VaR for market risk and credit rating method and Vasicek modelfor credit risk are based on quantitative and statistical analysis and involve huge data. On the other hand, operational risks contain many *qualitative and subjective factors* such as human

aspects, training, professional experience, severity of processes, controls, technology lacunae etc. which cannot be captured by traditional quantitative statistical tools (Scandizzo,2005). But it is not easy in case of OR analysis. Data based analysis does not help much in predicting the humans behaviour. Operational risks stem from more complex and diverse nature of risk sources and their assessment and measurement is more of an art than a science. Unlike market and credit risks, there is no direct and clear link between the exposure and the likelihood or size of losses in OR assessment. For example, two banks with identical assets and liabilities portfolios, counterparties and instruments, will exhibit exactly the same Market Risk (MR) and Credit Risk (CR) but may differ significantly in their Operational Risk assessment (Holmes 2003). Similarly loss data exercises undertaken to ascertain OR exposure state only the reasons for OR failures not the real sources of such incidences (Holmes 2003). Buchelt and Unteregger (2004) argue that whether or not a loss event is to be classified as an operational loss event is determined by the causes rather than the consequences of the event. Imad A. Moosa (2007) argues that the factor between pure market and credit losses and those linked to operational risk must be the cause. In fact, as pointed out by Scandizzo (2005),there is no mathematical model which can rigorously link the occurrence of a particular OR factor to the market value of a financial institution or with the amount of loss which actually took place. Hence as against the MR and CR assessment and measurement, OR analysis and management is more of an art (due to qualitative factors) and less of science (due to quantitative factors) and assessment tools applicable for MR and CR cannot be replicated for OR assessment. In view of the foregoing, a need has been felt to study quantification and assessment of operational risks in the area of treasury and investment business line of a bank/FI through qualitative aspects. As such, we have conducted this research. Our ultimate goal has been devising a model framework, based on the research outcome, for measurement and management of OR which includes, inter-alia, qualitative aspects of operational risks also.

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Chapter -2 -Literature Review

"We must continually learn to unlearn much that we have learned, and learn to learn that we have not been taught. Only thus do we and our subject grow."

R.L Ackoff[13]

In this section, we review literature survey conducted to study various aspects of operational risks. We include in this chapter a review of pertinent and relevant literature for deeper understanding and conceptual clarity of various OR variables, their characteristics and the theoretical construct that support them. We also explore organizational dynamics of operational risks in connection with its estimation, quantification, measurement and assessment in this chapter.

2.1- Background

During the past 2-3 decades, operational risks have grown immensely across the globe and despite democratisation of information and smooth availability of analytical tools, the institutions are facing teething problems in their management, perhaps due to three reasons, as depicted in the following Figure-2.2.1:

Figure- 2.2.1- Description of Present Risk Status

	First- Risks have also become more global and more complex.
	Second - Risk management is still a relative game. In other words, it is not just how well a business or investor assesses the risk but how well it relates to the competition, that matters.
	Third – Most critical component for success for risk management is to pick up the right tool for assessment in the light of sharp advancement in technology and availability of innumerable data analysis tools.

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[13] 'The Art of Problem Solving', John Wiley & Sons, 1978, page 6.

There are few important facets of good risk assessment. Inadequate understanding of risk sources, causes and too much faith and undue reliance on risk models, despite their inherent weaknesses, have resulted in poor risk management (Sinha, 2012). This requires necessary strengthening of risk culture, risk awareness and appreciation for invigorating risk exposure vis-à-vis risk management. Risk exposure is measured both in quantitative and qualitative terms to specify whether the impact of a given risk will be large or small albeit not specifying how large or small it will be. In quantitative terms risk exposure can be assessed and measured by providing a numerical measurement unit to the possible effect. In qualitative terms it can be measured by assessing its gravity on a subjective scale of, say, high, average or low or on its gradation on a scale from 1–10 (Sinha,2012).

One is availability of timely and better quality information, so that the element of surprise is reduced. Another is availability of data, data analysis tools such as simulations, scenario analysis alongwith people possessing special skills for converting these raw data into risk measures. One more issue relates to deciding severity of risk. For example, if the risk being assessed is exposed to a business line on a regular basis, say price movements, one should look its impact on earnings or market value of the asset on a historical basis. If the risk being assessed is a low-probability event for which there is little history, say as of American 9/11 or Indian 26/11 terror strikes, the assessment should be made on the potential impact of such incidents (Damodaran, 2007).

But superior information and best analytical tools may not lead to better decisions. Sinha (2012) says that the best way to deal with uncertainty is to be aware of its existence. Risk assessment helps in creating awareness about existence of risks and facilitates in developing tools and skills for its quantification and also initiating further steps. Butrisk assessment does not eliminate risks. Risk assessment cannot be used as an alibi for poor decisions making. The irony of good risk assessment is that it makes decision makers more uncomfortable, instead of making them relaxed and satisfied. Damodaran (2007) says that more information can often lead to more uncertainty rather than less. Sinha (2012) echoes similar views that global crisis has taught us that no financial institution can be resistant to all possible crises and no

quantitative model can fully capture all the risks. Hence qualitative judgement, experience and common sense should be the guiding factors in dealing with risk.

2.2-Operational Risks -Different Issues Related to Assessment and Measurement

Operational Risks account for some of the biggest losses in history (Moosa, 2007; Gallati, 2003). For successful estimation, assessment, measurement and management of ORs, identification of risk resources/causes and plugging of loopholes in time, are necessary. Majority of assessment and measurement models available presently, including the Basic and Standardized approaches of BCBS, are meant for capital requirement calculations and not for risk management. We review hereunder mainfeaturesof these assessment tools-

2.2.1- Basel Accord and ORM

Basel II guidelines advise three methods for calculation of operational risk capital, as shown in the following Figure-2.2.2-

Figure- 2.2.2- Description of Operational Risk as per Basel Accord [14]
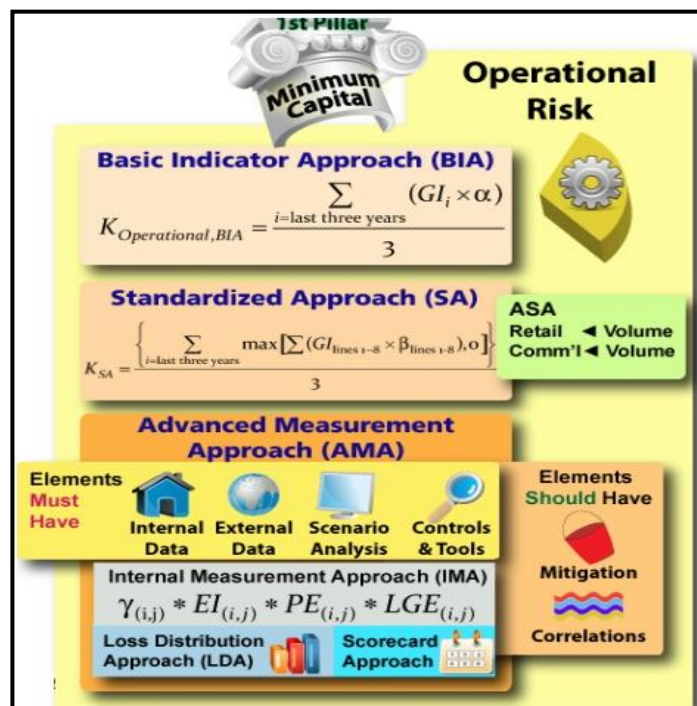
[14] Source- www.bionicturtle.com/

- Basic Indicator Approach (BIA),

- Standardized Approach (STA) and

- Advanced Measurement Approach (AMA)

Both the BIA and STA help in calculation of risk capital charge but carry a fundamental drawback by calculation of risk capital as a linear function of the bank's gross income. In BIA a flat capital charge @15% of gross income is set aside whereas under STA, percentage of gross income differs for each business line and ranges from 12% to 18%. However, the third method, AMA, tries to minimise such anomalies and allows banks to develop their own models. The AMA is based on banks' internal models to quantify operational risk. Banks are required to factor in four key elements in designing their Advanced Measurement Approach framework: internal loss data, external loss data, scenario analysis and bank specific business environmental and internal control factors. The Accord also specifies the standard matrix of business lines and risk types to facilitate validation across the Advanced Measurement Approaches. The framework gives flexibility to the banks in the characteristics of the choice of internal models, and to use their own loss data as well as other internal and external data[15] and also the flexibility in deciding holding period and confidence interval, within the range specified by the regulatory authority (Ariane Chapelle et al,2004; Kalyvas et al 2006). The major elements of AMA include:

- Internal data
- External data
- Scenario analysis
- Internal control and business environment factors

We reproduce these in the following Figure- 2.2.3:

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[15] In their paper "LDA at Work", Falko et al (2007) recommends following data sources for their designed model:
  - Internal loss data: A loss history of more than five years
  - Consortium data: from The Operational RiskdataeXchange Association (ORX).
  - Commercial loss data base: data from OpVantage, a subsidiary of Fitch Risk.
  - Generated scenarios: specified by experts in divisions, control & support functions and regions.

Figure- 2.2.3- Description of Advanced Measurement Approach as per Basel Accord [16]
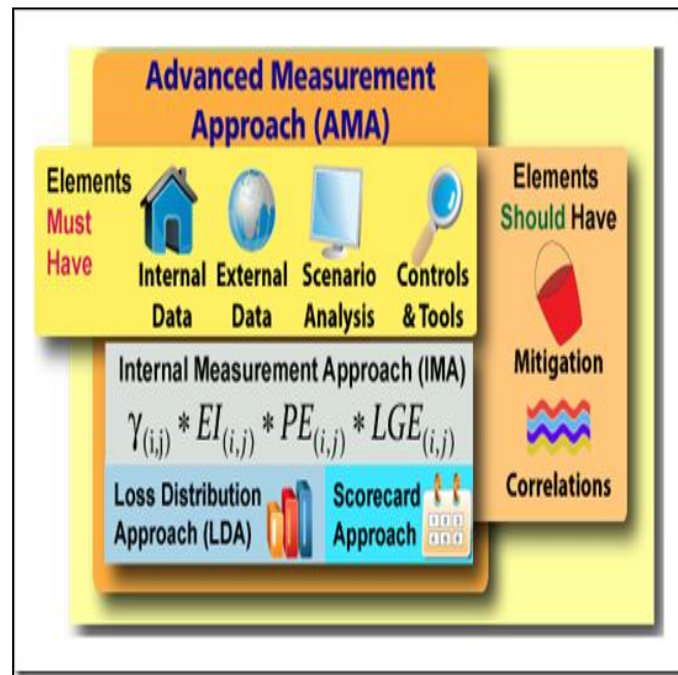
Basel –II also specifies that AMA should consider:

- Risk mitigation through insurance etc. and
- Correct correlations between types of risks

Under AMA, Basel accord suggests three sub approaches for risk assessment-

- Internal Measurement Approach (IMA)
- Loss Distribution Approach (LDA)
- Scorecard Approach

In their paper Gourier et al.(2009); Neil et al. (2005); Cowell et al.(2007) and Cornalbaet al. (2004) discuss all these approaches and highlight the role of advanced statistical tools in calculating operational risk capital. Other few major aspects of these approaches are summarised hereunder -

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[16] Source- www.bionicturtle.com/

2.2.1.1- Internal Measurement Approach (IMA)

Internal Measurement Approach (IMA) is very similar to the Internal Ratings-based Approach (IRA) under credit risk. In this approach, the required capital is a function of operational risk exposure indicators (EI), probability of a loss event (PE), and losses given the events (LGE). That is, expected operational losses are equal to EI x PE x LGE, much like expected credit losses are equal to EAD x PD x LGD[17]. Regulators supply a fixed percentage ("gamma factor"), a *'multiplier'* for each business line. The capital charge is calculated as the summation of expected loss multiplied by gamma across particular business lines. This is given by:

$$K_{i,j} \;=\; \gamma_{i,j} * EI_{i,j} * PE_{i,j} * LGE_{i,j} \;=\; \gamma_{i,j} * EL_{i,j}$$

where-

     $i =$ business line

     $j =$ risk type

     EI = operational risk Exposure Indicator

     PE = Probability of a Loss Event

     LGE = Losses Given such Events

     EL = Expected Loss

     $K_{i,j}$ = IMA capital charge for each business line i and event type j combination

     $EI_{i,j}$ = Exposure indicator for each business line i and event type j combination which is a proxy for the size or amount of risk

As may be observed, that IMA is heavily based on qualitative aspects and mainly deals in OR capital calculation.

2.2.1.2- Loss Distribution Approach (LDA)

In the second approach- LDA, a bank estimates, for its each business line and risk type combination, the likely distribution of operational losses over some time in future. The distribution tails are modelled and capital charge is based on a high

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[17]EAD= Economic At Default, PD= Probability of Default , LGD= Loss Given Default

percentile of the loss distribution. According to Basel II, seven different types of distribution are considered in reference to business lines and loss events:

- Internal and external fraud
- Products and business practices
- Execution, delivery and process management
- Clients
- Damage to physical assets
- Systems failures
- Business distributions

In their paper on LDA, Falko et al (2007) advise occurrence of major operational losses due to internal frauds, human errors or failed transactions and propose a dynamical model. They discuss in their model processes of losses, generated through the interplay of random noise, interactions with other processes and also the efforts a bank can make to avoid losses. The researchers show how some relevant parameters of the model can be estimated from a database of historical operational losses. But this approach is also solely based on loss data.

2.2.1.3- Scorecard Approach

In its third approach under AMA, the Basel guidelines allow a bank to determine an initial level of operational risk capital charge at the institution or business-line level, on the basis of risk indicators, which can be modified over time. The scorecard approach combines loss data with risk indicators and performs a self-assessment of the potential operational risks on the business lines.

As may be observed, all these approaches neither provide focused insight into the generation of various operational losses nor any strategy for measuring or lowering them (McNeil et al., 2005; Cruz, 2002); whereas unique characteristics of operational risks require assessment approaches which inculcate both quantitative and qualitative aspects which is not an easy task. We try to identify major reasons behind this –

2.3- Issues related to Quantitative and Qualitative aspects

Risk management is a process. The incidents like terrorist attacks, sub-prime crisis, internet disruptions in Asia, Middle East and North Africa, caused due to damaged undersea cables, and similar acts, have not only cascading effects on the concerned organisations but also on the related countries. Such incidences provoke economic and regulatory fallout and change the debate on tools and ways of operational risk assessment and measurement(Skinner, 2006; Davis, 2009). Despite repeated occurrence of such incidences and continuous debate/discussions aftermaths, there is little progress and consensus on universally applicable operational risks approaches and statistical tools for successful estimation, assessment, measurement and management(Gallati, 2003; Moosa, 2007). Though one of the universally applied time tested watch dog-continuous process of audit (concurrent, internal, self-audit, statutory, regulatory etc.), help organisations in enforcing and improving subjective and qualitative aspects of operational functioning(Laviada2007), the increased dependency on technology and growing complexities in day- to-day banking operations have forced these preventive measures to go obsolete. These tools have become blunt and to some extent lost their sharpness for effective risk management.

Today, various tools available for OR assessment are mainly meant for calculation of capital charge to meet statutory obligations and these have not been designed for risk management, especially to plug in the re-occurrence of Barings Bank like incidents (McNeil et al.,2005; Cruz, 2002). These risk capital calculation centered quantitative tools also fail to take into account OR risk sources and exposures which contain non-linear, multidimensional, heterogeneous and untypical factors viz. human factors, which are diverse, complex (prone to positive feedbacks and dynamic coupling) and are context-dependent. The point is "*which tool should be used to assess risk source/exposure*". Experts opine that all tools can be applied to assess all types of risks but the desired outcome depends on the application of tools and the methodology adopted. Few believe that some risks are too qualitative to assess and cannot be evaluated because of their likelihood of occurrence and more or less, their unpredictable nature (Damodaran, 2007).But it is not true fully all the time and there are reasons to believe otherwise.

In fact, experts believe that the success lies in adopting the right assessment tools which may help in identifying "*the risk that matters the most*". A relevant, focused and short but meaningful risk assessment is much more useful than an assessment which is comprehensive but rambling.

2.4- Issues related to Quantitative Modelling

Quantitative models function on some primary assumptions such as -Normality - that is, the asset values are assumed to follow a normal distribution (Sinha, 2012). However, in certain periods, particularly periods of high stress, the normality assumption is an unsustainable abstraction from reality. Under normal distribution, probability of occurrence of events is farther removed if mean outcome (more than 3 standard deviations or sigma) fall rapidly. For example, the probability of a 5-sigma loss on any given day would mean that such an occurrence should happen once in about 14,000 years (assuming 250 trading days in a year), that is much longer than the period of time that has elapsed since human civilisation evolved. During the crisis, however, the Wall Street Journal (2007)[18] reported that events that models had predicted would happen only once in 10,000 years, but those happened every day for 3 days. Such large sigma movements have happened earlier also. During the European Exchange Rate Mechanism debacle in 1992, 50 sigma moves in interest rates were witnessed, while 1987's Black Monday was a 20 sigma event. During summer 1998 upheavals that eventually brought down the Long Term Capital Management (LTCM), 15-plus sigma deviations became the norm. It is thus clear that the assumption of normality in the probability distribution does not correspond to reality, particularly, in highly stressed situations (Sinha 2012).

The underlying assumption behind normal distribution is that it represents a collective view of markets by a large number of participants who act rationally and largely independently, and their behaviour is stable across time zones, which enables the past data to predict the future. On a closer examination, this

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[18]Sinha, Anand, 2012,"Perspectives on Risk and Governance",pp 4, available from http://rbi.org.in/scripts/BS_SpeechesView.aspx?Id=720

assumption is highly inaccurate because the economic agents react to news and information and suffer irrational behaviour bias when the news is either very good or very pessimistic. In fact, their behaviour is conditioned by 'disaster myopia' and, hence, when pessimism takes a grip, they act in a herd, driving down the asset prices very sharply resulting in fat tails in the distribution: that is, the losses are much higher than what the VaR model would predict. In a financial crisis it is the large swings in correlation that are of key importance and using a model that does not allow for such changes is of limited use. It is due to this psychology and the burden of debt carried from the boom period that growth has not picked up in the advanced economies despite all the stimuli(Sinha 2012).

As regards the past being a good indicator of the future, the assumption is highly flawed. With the rapid development of technology, increased integration of markets and entry of sophisticated players, the present and the future are much different from the past and it would be very naïve to predict the future based on the past data. Pablo Triana in his book "Lecturing Birds on Flying" very succinctly argues that when LTCM tried predicting the future with its sophisticated models, it went awfully wrong in not realizing that a LTCM-less past could not be a reliable guide to an LTCM-dominated present (Sinha 2012).

Damodaran (2007) also cautions on the same grounds. He states that risk decisions/ judgments are made by individuals, who, in the best of their acumen and wisdom are influenced by the weight of recent history and overestimate exposure from the recently manifested risks. For example, likelihood and impact of incidents viz. terrorist attacks, right after well-publicized attacks elsewhere will affect the decisions of individuals and they will overestimate these in their assessment.

Decision makers need to understand the risk sources and involve themselves into the risk assessment process. For risk assessments leading to better decisions, three things are needed-Firs, risk assessors and decision makers, both have to understand the each other's requirements and preferences. Second, risk assessors have to understand the situations from the decision makers' point of view; and third, those who take decisions have to recognize the flaws and limitations of the information used by risk

assessors and need to understand the broad contours of the tools being used in the risk assessment process (Damodaran, 2007).

2.4.1- Issues related to Assessment and Modelling of Operational Risk

Peccia (2003) observes that environment in which banks operate has changed dramatically and hence modelling of operational risk has also changed, and to some extent, become difficult also. In their paper Patrick et al (2004) examine risk quantification models to estimate operational risk and advise that most of the banks use variants of VaR (Value at Risk) models for estimating frequency, severity and loss distributions in OR. But VaR models are statistical in nature, not causal, and therefore, they use past data to predict the asset values in future (Sinha 2012).

Alejandro Reveiz et al (2009) advise that OR assessment requires those models/tools which do not rely exclusively on traditional quantitative approaches. Unique characteristics of operational risks emphasise models which are able to deal efficiently not only with quantitative factors of an event but also with its qualitative aspects. Moosa (2007) describes these characteristics and the reasons. He states that OR events can be divided into two groups:

      i.   low-frequency-high-impact (such as rogue trading, major lawsuits, terrorism and natural disasters) and

     ii.   high-frequency-low-impact events (such as settlement errors and credit card fraud).

While occurrence of latter results in efficiency losses, happening of low-frequency-high- impact events shatters the organisation, its capital, reputation and in extreme cases its existence (Holmes, 2003). One of the major reasons for such situations is the inability of traditional approaches to assess risk sensitivities, underlying factors and the overall impact on the basis of past loss data and experience. Moreover, the result of such low-frequency-high-severity risk events calculations can also not be helpful for future references as the relevant loss data is related to those events which are classified, at times, rare events (Austrian National Bank, 2006; Shah, 2004;

Alexander,2003; Gallati,2003;Holmes, 2003; BCBS,2001). Besides, following such incidences risk and control environment gets improved and the statistical distribution underlying such events also gets changed sharply (Scandizzo,2005).

2.4.2- Issues related to Data Scarcity, Data Sharing and Data Horizon

A traditional decision for surmounting the problems stated in above paras, is using industry's (external) information. But unlike for MR and CR, loss data for OR analysis are scarce. Holmes (2003) asserts that data scarcities stem serious concerns in validation and backtesting of OR models and reduce their reliability or usefulness in predicting future outcomes. H.S et al (2005) supplement that one of the major problems in calculating operational risk is non-availability of sufficient data within and among the financial institutions. Contrary to this N. Baud et al (2002) cautions not to combine data originating from different business lines and financial institutions together as the results may be statistically incorrect, especially for low-frequency-high-severity events. Besides, this alternative may also not be trouble-free as it assumes that a common loss distribution exists for whole of the industry. Moosa (2007) asserts that shared information may not be accurate because it is inconceivable that any firm will share publicly its important and at times confidential, operational loss data. Any organisation will make usually public only those loss events data which are required either for meeting regulatory requirements or to keep the reputational impulses within bounds.

Another important issue is data horizon. Sinha (2012) opines that reliance on a short time horizon from the past becomes misleading as it may fail to capture the stress period data. Even if such data is captured, it is unlikely that the future would be predictable with significantly enhanced accuracy, because it is very difficult to predict and model the human behaviour.

2.4.3 Issues related to Context Dependency of Data

One major issue related to OR assessment through quantitative statistical tools is context dependency of data. Alejandro Reveiz et al, (2009) states that in addition to scarcity, OR data is highly context dependent. OR context dependency is data alteration due to continuous environmental changes and technological updation.

Context dependency determines how relevant is past data for the systems under analysis. If systems/processes change rapidly, the predictive ability of a model based on past data gets quite limited (Alejandro Reveiz et al, 2009).

As Holmes (2003) states, CR and MR show a moderate level of context dependency because of some stability and reliability in statistical properties whereas OR statistical properties are dynamic all the time. Though using past operational losses data and statistical methods such as OR Value at Risk may yield risk measures, but these would be useless when trying to manage OR (Pézier,2003;Cruz, 2002). Sinha (2012) opines that a bank can achieve higher performance in terms of data quality only by integrating data models, processes and methodologies.

2.5- Issues related to Measurement Approaches

Pareek (2011) advises that a firm willing to reduce OR may be tempted to undertake as much mitigation efforts as possible viz. implementation of additional controls, hiring more skilled manpower, installing new and upgraded versions of software etc, but such efforts might result in building of systems complexity and thus defeating the very purpose of controlling, monitoring and mitigation of various risks. Systems complexity build-up arises from the additional interactions created by the implementation of mitigation efforts. For example, implementation of a new software for mitigating ORs may create new sources for OR and this may further necessitate induction of new controls. This is akin to the decision of a firm to hedge via a complex derivative instrument so that its market risk exposure is reduced. Nevertheless, if the firm's expertise in designing derivative products is not adequate, the complexity of the chosen instrument may result into an undesired or unplanned outcome. As presented by Dowd (2003), the use of sophisticated techniques to mitigate CR and MR (e.g. collateralization, netting, credit derivatives, asset securitization) may transform themselves into operational risks. It is possible that such steps initiated to plug in the loopholes and mitigate risks may themselves lead to the rise of an unnoticed and, yet probable, potential significant source of OR.

This raises quest for quantitative and non-quantitative measurement approaches, which can be applied effectively. This becomes all the more important if it is realised that there are risks, which cannot be measured by statistical models. An effective assessment and measurement approach should be able to respond existing, known, unknowable, probable and possible risks, risk sources and risk causes through the analysis of various quantitative and qualitative aspects. It should be able to provide high level of insights and consistent communication to higher authorities so that necessary steps may be initiated in time.

2.5.1-Why quantitative /statistical based approaches cannot be applied for ORM

Before proceeding further an issue arises; Why quantitative /statistical based approaches cannot be applied for ORM whose result will be more scientific than the outcome of qualitative aspects based approach? The answer is quantitative analysis through statistical tools cannot study human aspects, which signify a lot towards operational risks. It should be recalled that most of the quantitative models are based on physics. Sinha (2012) advises that there are very fundamental differences between physics and quantitative aspect of finance, comprising of business, economics, and management streams. Physics deals with the laws of nature governing the universe. The objects have unique physical attributes (i.e. position, velocity, temperature, etc.) and the universe evolves according to the immutable laws of nature. Any observation or measurement of physical attributes does not change them or even if it does, it does so in a predictable way so that the true value of the attribute before measurement can be known with complete accuracy. The physics of the microscopic world (quantum mechanics) is far too complex and there are no settled views on the nature of reality. Even then, the microscopic world evolves according to defined laws in a deterministic way. However, during measurement interactions the results are not deterministic but follow a probability distribution which, however, is stable. On the other hand, in finance, there is no such law of financial markets. The 'values' of assets are not inherent attributes of the financial instruments and the economic agents are not outside observers of the financial system. In fact, it is the human mind, its ambitions, drive, competitiveness, caprice and greed which drive the actions of the economic agents and it is these actions which determine the value of the financial

instruments. Thus, unlike in physics, in finance, it is the observers who provide value to the financial instruments. There is no unique value: it is determined by the collective psychology of economic agents and hence such valuations tend to be on the extreme when there is a collective feeling of euphoria or pessimism. Financial risk modelling, therefore, is far more complex than modelling in physics. As Pablo Triana[19] mentions in his book, "There are no immutable laws when it comes to the values of financial assets….In finance there is no truth. A new reality is created every minute through the unpredictability of utility seeking humans."

All these highlight the role played by gaps in quantitative aspects based approaches of risk modelling. Consequences of global crisis have prompted preferred attention to strengthening of qualitative based analysis approaches such as KRIs/RCSA from so far focused quantitative and statistical based approach. As such, we discuss here two major approaches under Advance Measurement Approach (AMA)- Scenario Analysis and Expert Knowledge Based - KRIs/RCSA Approach which are primarily based on qualitative aspects of risk management.

2.5.2- Scenario Analysis Based Approach

Dutta et al (2010) discuss measurement of operational risk exposure through scenario analysis and internal loss data method. They evaluate impact of each scenario in estimation of operational risk capital and show how the proposed method can be used in different situations e.g. stress testing, what-if analysis etc.. Away from this, Bakhodir (2010)offers another view on scenario-based approach. He states that in quantification process incorporating valuable information related to worst-case scenarios in the form of lower bound constraints, on the specific quantiles of severity distribution, may be lost and which may distort the results. Holmes (2003) advises that scenario analysis is based on historical/loss data and, as discussed earlier, loss data exercises state the *reasons* of OR failures not the real sources of such incidences. In view of all these aspects, this approach has not been considered appropriate in our research for devising a model framework.

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[19] Triana, Pablo (2009), "Lecturing Birds on Flying", chapter 1, pp 4, John Wiley & Sons, Inc.

2.5.3-Expert Knowledge Based Approach – KRIs/RCSA based Framework

Many researches have also been carried out on the evaluation of this form of measurement and experts have suggested ways to improve the processes, especially measures to overcome the deficiencies of scenario based approach. Chapelle et al (2004) recommend in their paper four axes of operational risk management- Incident Reporting, Dashboards, KPIs (Key Performance Indicators), and KRIs & RCSA (Key Risk Indicators and Risk Control & Self-Assessment) and observe that KRIs/RCSA based form of assessment tries to minimise the deficiencies of scenario based approach. In his papers Shah (2002, 2003) recommends use of expert knowledge for overcoming flaws of purely quantitative approaches. He suggests that models capable of combining expert knowledge with data analysis are better suited for OR modelling. Bolton et al (2005) recommend this approach by quoting references from the "Sound Practices Paper" of Basel II, which rate this approach as an excellent outline for designing an operational risk management framework. They advise that KRIs/RCSA based approach shows tangible benefits and does not get distracted by challenges of operational risk modelling. In his paper, Ashish Dev (2007) asserts similar views and describes effectiveness of RCSA as a risk management framework from operational risk management perspective. Jim Ryan et al (2007) also observe that those organisations which display immature state for scenario analysis and capital risk modelling due to its more technical and statistical perspective, show comfort and inclination for Key Risk Indicators and RCSA based approach due to its simplicity and less statistical nature. Echoing similar views, Kumar Vijay T. (2008) advocates RCSA as an excellent process through which operational risks and effectiveness of controls may be assessed. Wood (2008) also accepts the effectiveness of KRI/RCSA based approach and he states that these approaches provide necessary focus on corrective action thus leading to true control of operational risks rather than just measuring it.

2.6-Status of Preparedness of Indian Banks in Managing Operational Risk[20&21]

With this in the background, D. Tripati Rao, (2008) carried out a survey on the preparedness of Indian banks in managing OR. In the study, she highlighted different methods of allocating capital and the importance of measurement as well as management aspects of OR for banks' operational excellence. The author noted from the analysis of findings that the risk management for Indian banks goes beyond regulatory compliances and OR is perceived to be important because it directly affects the bottom-line. However, most of the banks were still in the preparatory stage of OR management and lack competitiveness. Besides, inherent vagueness and lack of historical data, the difficulty is mathematical modelling OR. Similarly in her paper on "State of preparedness of the Banking System in India in the area of Operational Risk in the context of Basel II", Janakiramani (2008) presents the results of a survey conducted on twenty two Indian banks which indicate insufficient internal data, difficulties in collection of external loss data and modelling complexities as significant impediments in the implementation of operational risk management framework in banks in India. The major findings of the survey were:

- While most of the major banks in advanced countries have made considerable progress in the area of operational risk management over the last decade, the awareness of operational risk is a recent phenomenon in the emerging markets.

- Majority of the banks had completed the work of identifying/assessing the operational risk in their material activities, products, processes and systems. However, they had in their comments, expressed difficulties in designing the framework for measuring operational risk, given non-standardisation in approaches and difficulties in modelling.

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[20] D Tripati Rao,2008, "Preparedness of Indian Banks in Managing Operational Risk", Economic & Political Weekly, Vol. 43, No. 18, pp. 47-53.

[21]UshaJanakiramani, 2008, Operational Risk Management in Indian Banks in the context of Basel II: A Survey of the State of Preparedness and Challenges in Developing the Framework, Asia Pacific Journal of Finance and Banking Research Vol. 2.No. 2. pp. 26-44

- Very few banks had a model for quantifying operational risk and most of the banks were largely making only a qualitative assessment of operational risk.

- Many banks had only begun the process of event identification and capture as well as loss data capture. Fourteen banks had undertaken the process of identification of operational risk inherent in material activities, products, processes, systems and people.

- Results show that almost all the banks were using some sort of tool for assessing operational risk.

- Non-standardisation of models/modelling difficulties were listed by a few banks as a limiting factor in their efforts to move to Advanced Measurement Approach.

- Insufficient data, and difficulty in gathering external data modelling were also listed by a majority of the banks as very significant obstacles in the implementation of Advanced Measurement Approach.

- Lack of regulatory clarity, lack of expertise, difficulty in gathering external data, integrating quantitative and qualitative factors, and lack of technological support were other limitations in designing and implementing an Operational Risk Framework.

- It was also transpired from the results that most of the banks were making only a qualitative assessment of operational risk. Eight banks had stated that they plan to use all the factors (Internal data, external data, scenario analysis, business environment & internal control factors/KRIs) in measuring the operational risk capital.

- Most of the other banks listed internal data and internal control factors as the combination that they plan to use for Advanced Measurement Approach.

- Twelve banks listed Key Risk Indicators (KRIs) as an important tool for assessment.

- Most of the Banks were also using inspection/audit report findings as an operational risk tool.

2.7-Gaps Identified in Research

In the banking industry, most of the operational risk management is done at the "macro", or top level as the banks are normally more concerned for getting their

operational risk capital models approved by the regulators while in fact, it is the "micro" or business unit level where operational risk losses do occur (Marco,2004). This is mainly for two reasons- regulatory compliance under Basel guidelines and the problems attached with the quantification of operational risk, especially at the micro level.

Banks have now started realizing importance of measuring, modelling and managing operational risk at the "micro" or business unit level. But the problem lies in the data availability and selection of suitable models as the output of a model can only be as good as the data fed into it (Peter,1997). Besides, shortage of modelling experts also complicates systematic measurement and consistent regulation of operational risk losses. Though the development of operational risk models has evolved rapidly over recent years but risk models by their very nature simplify reality and sometimes oversimplify. While some operational risk exposure follows predictable stochastic patterns, there are many other types of operational risks for which there is hardly any data to support. So there are two important aspects- data constraints and selection of suitable model, which need to be measured on the ground of not only being logically sound and appropriate for the problem at hand but also in the dimensions of being "robust, cost effective and flexible to meet current and future organizational needs and potentially uncertain regulatory requirements."(Cottrell, 2002).

Basel II (2006) guidelines under para 676 of "Business Environment and Internal Control Factors" suggest that in addition to using loss data, whether actual or scenario-based, a bank's firm-wide risk assessment methodology must capture key business environment and internal control factors which can change its operational risk profile. Those factors will make a bank's risk assessments more forward-looking, directly reflective of the quality of the bank's control and operating environments. These will also help align capital assessments with risk management objectives, and recognise both improvements and deterioration in operational risk profiles in a more immediate fashion. Accord specifies that to qualify for regulatory capital purposes, the use of these factors in a bank's risk measurement framework must meet the following standards:

- The choice of each factor needs to be justified as a meaningful driver of risk, based on experience and involving the expert judgment of the affected business areas. Whenever possible, the factors should be translatable into quantitative measures that lend themselves to verification.

- The sensitivity of a bank's risk estimates to changes in the factors and the relative weighting of the various factors need to be well reasoned. In addition to capturing changes in risk due to improvements in risk controls, the framework must also capture potential increases in risk due to greater complexity of activities or increased business volume.

- The framework and each instance of its application, including the supporting rationale for any adjustments to empirical estimates, must be documented and subjected to independent review within the bank and by supervisors.

- Over time, the process and the outcomes need to be validated through comparison to actual internal loss experience, relevant external data, and appropriate adjustments made.

All the above observations cum stipulations necessitate use of those assessment approaches, which include both the quantitative and qualitative aspects in the analysis. Across the globe, banks are striving to identify and finalise these according to their resources and risk appetite. Janakiramani (2008) opines that one major feature of the Basel Accord is the explicit recognition of operational risk in the regulatory capital canvas and given the distinctive nature of operational risk as compared to the other major risks faced by financial institutions such as credit, market and liquidity, the development of a framework for operational risk poses a major challenge for banks and regulators the world over.

In the backdrop of literature survey and the identified research gaps viz.

- loss data do not capture key business environment and internal control factors

- lack of research studies to capture risk factors and their potential impact which can be documented and subjected to independent review within the bank and by supervisors and

- few studies have been conducted so far in Indian context which include both the quantitative and qualitative aspects in the analysis in treasury and investment banking to capture operational risk,

we have undertaken this research to assess and identify the most important risk contributor in the area of treasury and investment business line of a bank. It may be added hereby that in India, most of the treasury operations are supervised and monitored by the regulatory bodies, RBI,SEBI, which stipulate   meticulous compliance of various norms and directives which save them, normally, from the effect of global market implications, particularly negative implications. Hence, as the external events do not influence the treasury activities in India as much as in other countries, these have been repudiated in our research and we have concentrated only on the remaining three major risk factors- people, process and systems.

We have adopted experts' opinion based KRI/RCSA approach for our model framework because of its bottom down approach characteristics where the participants themselves get involved in the process and are allowed to offer suggestions/ ideas for improvement. Secondly, KRI based approach is primarily qualitative aspects based approach and entails less quantitative and statistical requirements, which may help a normal commercial banker in ORM who face several constraints in applying statistical and quantitative tools for data analysis. From the management perspective, risk management is a process and consistent and continuous evaluation of risk contributing factors is necessary. Regular and incessant review, revision and rejuvenation of KRIs/RCSA exercises enhance risk awareness among the participants and also help in identifying invigorating risk resources and estimating loss frequencies, if any. Keeping in view all these aspects we have chosen this approach for our research.

The area of Treasury and Investment business line has been selected because of researcher's hands on experience of working in a Treasury and Investment Department of a major Public Sector Bank in India. In addition, while reviewing literature, the researcher has not come across any research/study discussing operational risks and their effective management in the area of treasury and

investment business line of an Indian Financial Institution. The researcher also has not found any literature on the subject, which discusses quantification and assessment of operational risk, its various contributors viz. people, processes and systems through qualitative aspects such as Risk Control & Self-Assessment (RCSA)/Key Risk Indicators (KRIs) approach. Based on all these aspects, we have tried in our research to devise an ORM framework, which ensures that a bank/FI is able to achieve its stated goals within the chosen risk appetite framework.

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Chapter 3-Research Design and Process

"Events can be caused by people and by acts of nature as well. They can also be caused or exacerbated by negligence and incompetence or through conscious and deliberate acts of wrongdoing. In some cases, the perpetrators may intend to benefit one or more parties, in other cases they may intend to harm one party and/or benefit another. And in certain other cases they may not intend to harm anyone, even though the expected outcome might result in harm to another party[22]."

In the last chapter we summarized different aspects of operational risks related to estimation, measurement and assessment. In this chapter we discuss research design and process. A research design is a plan or blueprint that focuses on the approach used for undertaking the research. We focus here in this chapter on the end product of research design by addressing the issues such as-

- ➢ What kind of study is being planned?
- ➢ What are the objectives of the study being planned?
- ➢ What kind of result it aims at?
- ➢ What are the steps for operational risk mapping?

We also discuss various stages of formulation of our model framework.

3.1-Background

Keeping in view the outcome of the literature search and review, we have attempted to undertake a research that is exploratory, empirical and qualitative in nature. As the word empirical indicates that although a particular correlation between/among parameters exits, but so far, no theory for mechanism of the connection is known. Hence, within the ambit of primary research questions, we have conducted the study

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[22]adapted from the working paper- "A New Approach for Managing Operational Risk" (2009), submitted by Joint Risk Management Section Society of Actuaries, Canadian Institute of Actuaries and Casualty Actuarial Society

by exploring and understanding the prevalent practices in treasury and investment business line of a bank/ financial institution vis-à-vis key operational risk contributors and tried to identify major key operational risk indicators. The research involves-

- Identification of control factors
- Identification of KRIs
- Explaining the role of KRIs in the Framework
- Identification of various stages in operational risk mapping and
- Identification of various steps for formulation of model framework.

The research study connotes using testable hypothesis, supported by variables. It involves systematic collection of observable and measurable data followed by their statistical analysis. The research study has been aimed at linking quantitative and qualitative relationship through a specified set of variables, which contribute most to the operational risks in Indian business environment of treasury and investment activities operations in a banking and financial institution.

3.2-Objectives of the Study

Objectives of this research have been the identification of the most important operational risk factor out of the four- people, process, system and external events- in treasury and investment activities of a financial institution/ bank. Within the ambit of primary and general motives of the research, detailed hereinabove in para 3.1, following major objectives were envisaged:

- To identify criticality of significant risks arising from - people, process and systems in managing operational risks in treasury and investment operations.

- To develop a model framework for measuring and managing operational risks in banks/ financial institutions.

During the identification and evaluation process, we have tried to test independently assorted proportions of major key control functions in treasury and investment

business line of banks and financial institutions. As such, our research process involved-

- Identification and study of various Operational Risk Areas- People, Process, Systems and including External Events (for having a brief glimpse of the tinderboxes, if any)
- Identification and study of various treasury and investment business related Pre- investment, Investment Capturing and Post- investment Activities
- Identification and assessment of sub processes related to investment process, trading process, trading quality and systems related activities
- Identification of various, existing as well as prospective, loss events, near loss events, risk contributing factors related to investment activities
- Identification and assess severity of risk -high, medium, moderate, slight, low attached to investment activities
- Finding out correlation between the People, Process, System and External Events
- Studying various elements and features of people related operational risks vis-à-vis other risk contributing factors – processes, systems and external events
- Studying strengths and weaknesses of processes related operational risks vis-à-vis other risk contributing factors –people, systems and external events
- Studying various dimensions of systems related operational risks vis-à-vis other risk contributing factors – people, processes, and external events
- Studying impact and influence of external events related operational risks vis-à-vis other risk contributing factors – people, processes and systems.
- Studying role and responsibilities of dealers/traders/fund managers/ investment managers, their psychology, working style and functioning, in connection with generation, measurement, assessment and modelling of operational risks.
- Studying role and responsibilities of supervisors, senior managers, systems manager, head of the departments, their monitoring and controlling style in managing operational risks.

3.2.1-Organization of study

Identification of major risk contributor among various operational risks factors in a Treasury and Investment business line of a bank/ financial institution has remained so far more or less an unexplored area. Hence, research study has been organized, in different steps, to test and identify significant variables, severity, degree and level of risk, which affect most operational risk management. Study starts with deciding rationales for formulation and identification of control risk factors, which is followed by developing hypotheses and analyzing data collected from the respondents of questionnaire. This data analysis helps in identification of major operational risk contributor and thus meets our objective.

3.3-Formulation of Hypotheses:

Hypotheses are statements that describe relationship or difference between two or more variables related to a research problem or statement. Hypotheses are generated in two ways. Firstly, they are deducted from existing theories and models within a discipline. Secondly, they are inductively derived from observations, experience and visualization. Hypotheses are normally formulated as relationships that need to be. A hypothesis can also be described as conjectural statement of the relationship that exists between two or more variables. Keeping in view these, we have framed following hypotheses to determine correctness of research questions.

3.3.1 - Degree of Risk (High or Medium) associated with Pre, During and Post-investment Activities- Hypothesis 1:

| Ho | Most of the functions related to pre- investment, investment capturing and post- investment activities entail low risk as against high risk. |
| Ha | Most of the functions related to pre- investment, investment capturing and post- investment activities entail high risk as against low risk |

3.3.2- Degree of Risk (High or Low) associated with Pre, During and Post-investment Activities- Hypothesis 2:

Ho	Most of the functions related to pre- investment, investment capturing and post- investment activities entail low risk as against high risk.
Ha	Most of the functions related to pre- investment, investment capturing and post- investment activities entail high risk as against low risk

3.3.3 - Severity of Risk (Low) associated with Processes and People – Hypothesis 3:

H0	Most of the Low risks arise from People instead of Processes.
Ha	Most of the Low risks arise from Processes instead of People.

3.3.4- Severity of Risk (Low) associated with Systems and Processes – Hypothesis 4:

Ho	Most of the Low risks arise from Processes instead of Systems.
Ha	Most of the Low risks arise from Systems instead of Processes.

3.3.5- Severity of Risk (Low) associated with Systems and People – Hypothesis 5:

Ho	Most of the Low risks arise from People instead of Systems.
Ha	Most of the Low risks arise from Systems instead of People.

3.3.6 Severity of Risk (Medium) associated with Processes and People– Hypothesis 6:

Ho	Most of the Medium risks arise from People instead of Systems.
Ha	Most of the Medium risks arise from Systems instead of People.

3.3.7- Severity of Risk (Medium) associated with Systems and Processes- Hypothesis 7:

Ho	Most of the Medium risks arise from Systems instead of Processes.
Ha	Most of the Medium risks arise from Processes instead of Systems.

3.3.8- Severity of Risk (Medium) associated with Systems and People- Hypothesis 8:

Ho	Most of the Medium risks arise from People instead of Processes.
Ha	Most of the Medium risks arise from Processes instead of People.

3.3.9- Severity of Risk (High) associated with Processes and People- Hypothesis 9:

Ho	Most of the High risks arise from Systems instead of Processes.
Ha	Most of the High risks arise from Processes instead of Systems.

3.3.10- Severity of Risk (High) associated with Systems and Processes- Hypothesis 10:

Ho	Most of the High risks arise from Processes instead of People.
Ha	Most of the High risks arise from People instead of Processes.

3.3.11- Severity of Risk (High) associated with Systems and People – Hypothesis 11:

Ho	Most of the High risks arise from Systems instead of People.
Ha	Most of the High risks arise from People instead of Systems.

3.3.12- Level of Risk Associated with Processes and Systems - Hypothesis 12:

Ho	Most of the risk contributing factors arise from Systems instead of Processes.
Ha	Most of the risk contributing factors arise from Processes instead of Systems.

3.3.13- Level of Risk Associated with Processes and People -Hypothesis 13:

Ho	Most of the risk contributing factors arise from Processes instead of People.
Ha	Most of the risk contributing factors arise from People instead of Processes.

3.3.14- Level of Risk Associated with Systems and People- Hypothesis 14:

Ho	Most of the risk contributing factors arise from Systems instead of People.
Ha	Most of the risk contributing factors arise from People instead of Systems.

We frame and test these hypotheses to identify major risk contributors as well as to decide their risk categories through five independent levels as High Risk, Medium Risk, Moderate Risk, Slight Risk, and Low Risk and with all operational risk contributing elements-people, process and systems, as the dependent variables.

3.4-Operational Risk Mapping for Model Framework

Scandizzo (2005) suggests that risk mapping is the basis for successful OR management. We start operational risk mapping by identifying various aspects of operational risks. Gallati (2003) advises that there are two common approaches for identifying operational risks- top-down approach and bottom-up approach. While a top-down approach focuses on identification of operational risks through combination of external or internal database of loss events alongwith traditional risk discovery techniques such as workshops, checklists, questionnaires, where identified risks are aggregated into risk categories, a bottom-up approach focuses primarily on the identification of the potential sources or causes, as against relying on effective or potential losses (symptoms)of OR within an organization .

Based on these dimensions, we extract important aspects from both the approaches, particularly from bottom-up approach to recognise key operational risk control factors and their interrelations on-linear cause-and-effect relationship. With a view to prepare a base for devising our model framework, we present a process flow chart, primarily to-

- determine the magnitude of exposure of each major operational risk vis-à-vis the risk tolerance standards set by a bank/ financial institution,
- analyse the impact of changes, if any, in the level of operational risk specially in determining whether the incremental profits remain commensurate with the incremental risk.

Keeping in view these two aspects, decision factors for identifying control risk factors, KRIs and questionnaires, have been derived from various guidelines and circular instructions issued by the statutory bodies like RBI, SEBI, and which are available in public domain. Rationales behind deciding control risk factors have been primarily to determine magnitude of exposure of each major operational risk vis-à-vis the risk tolerance standards set by banks/ financial institutions. Another decision factor for identifying control risks factors has been analyzing the impact of changes, if any, in the level of operational risk specially in determining whether the incremental profits remain commensurate with the incremental risk. During the

process, it was also ensured that control risk factors are derived from various guidelines and circular instructions issued by the statutory bodies like RBI, SEBI, and which are available in public domain. Later on, these decision factors as well as KRIs and the questionnaires were analysed, assessed and vetted for their tactical, technical and procedural information as well as their adherence to the best global practices by fifteen experts from the industry.

Based on these, we outline hereby, in the following Figure- 3.4.1 a flow chart detailing process instructions step- by- step for developing a basic understanding for preparing a model framework. Our process flow chart provides an overview of the model framework at a single glance and may help those involved in understanding the process. Flow chart includes identification and specification of various treasury related key steps, sequence of actions, details of important activities, sub activities, important decisions making points etc.

Figure-3.4.1- Operational Risk Mapping- Flowchart for a Model Framework Formulation
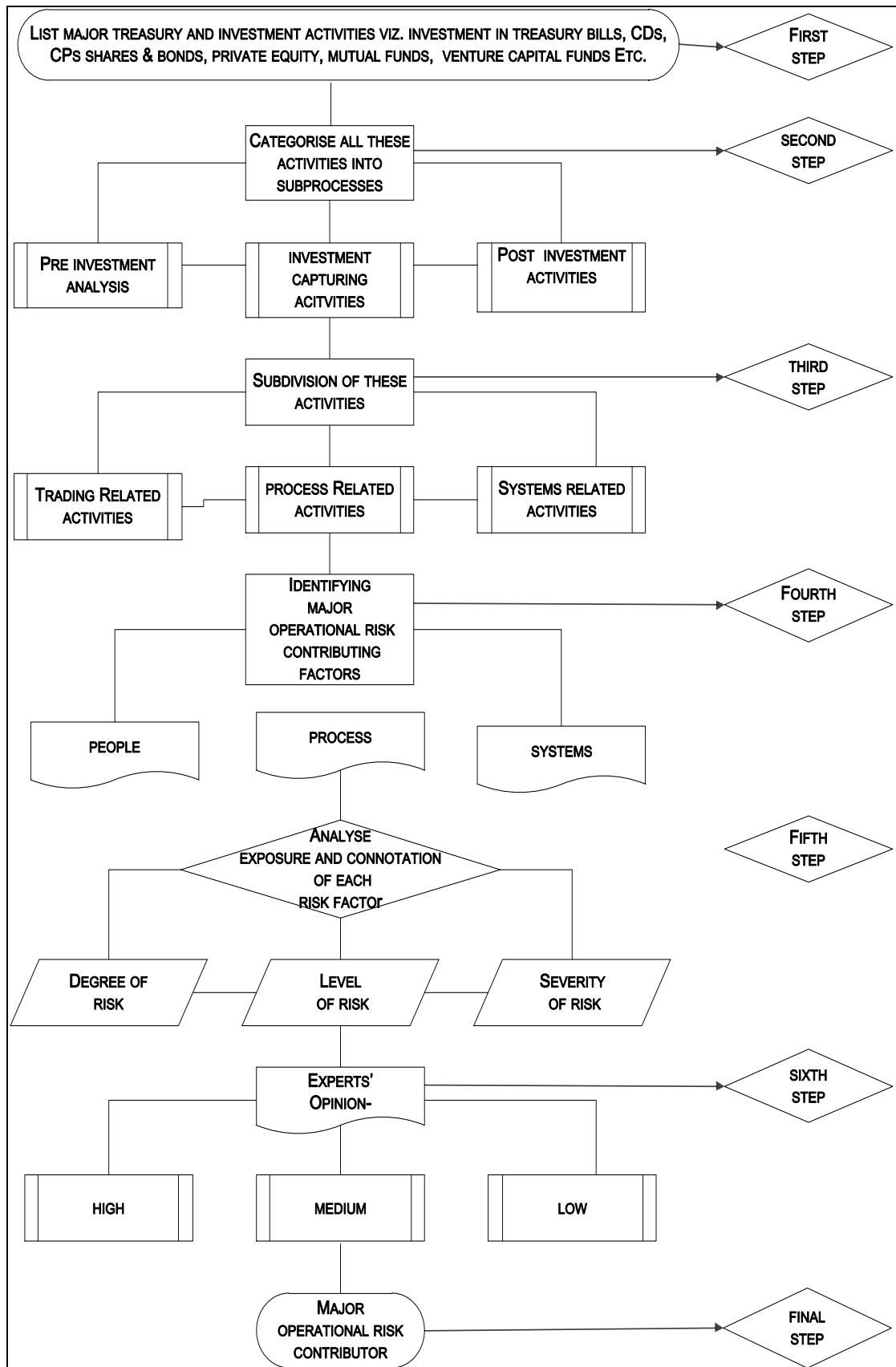
Source- Researcher's elaboration

The detailed analysis of the above process flow is described in the following four stages of model formulation framework:

3.5- Model Framework Stage–I-Identification of Control Risk Factors

A prerequisite to managing operational risks is first identifying control factors and their core characteristics from a management (i.e., risk and control) point of view. Controls associated with inadvertent events are very different from those caused by conscious acts of wrongdoing. Suitably identified control factors help key decision makers in accomplishing the task smoothly. Based on these dimensions we identify control risk factors for the purpose of identifying major operational risk contributors-people, processes, systems and external events and sum up hereunder a summarised version of extracts of these guidelines, checklists, observations, ideas, tips from dealers, practicenors, experts etc.

3.5.1.1 Process Related Risk Control Factors-

Process related risk factors are usually associated with workflow and processes encompassing-

- ✓ variable flow
- ✓ under-resourcing
- ✓ pressure points
- ✓ disruption
- ✓ lack of knowledge
- ✓ unnecessary complex procedures
- ✓ cross-border processes

Based on the above broad dimensions, following risk factors arising from various processes in the functioning of Treasury and Investment activities were identified:

- non-adhering to formulated investment policy
- failure in timely review of portfolio at various time intervals as per investment policy guidelines.
- poor identification of prospective securities as well as analysis of value anchor investments.

- inappropriate /faulty decision making process in identification of securities for buying or holding or disposing off.

- non adherence to a specific plan and failure in making critical appraisal with respect to nature of investment, horizon, liquidity considerations, policy guidelines etc.

- failure in opting appropriate approach viz. Fundamental/Psychological/Academic /or Eclectic Approach, a combination of all , while conducting investment analysis.

- making investment in un-rated and un-specified securities.

- failure in making reference to RBI Defaulters' List / Wilful Defaulters' List, whenever warranted.

- not adhering to various guidelines with regard to volume, maturity, holding period, duration, stop loss, defeasance period etc. for Trading Book and HTM Portfolio of securities as specified by the regulatory body.

- failure in not adhering to guideline related to duration/modified duration and reporting its deviations to the appropriate authorities.

- not adhering to regulatory requirement of maintaining the exposure to Capital Market limit to be well within the overall ceiling of 40 per cent of net worth of the bank.

- not adhering to regulatory requirement of containing investment in shares, convertible bonds, debentures, units of equity-oriented mutual funds and Venture Capital Funds (VCFs) less than 20 per cent of bank's net worth.

- not adhering to regulatory requirement of making investment in unlisted companies not more than 10% of the portfolio.

- making slips in adhering to RBI Calendar of Reviews and submitting various reports at times.

- inadequate, non- compliance of various act, rules and regulations, notifications, guidelines, instructions from RBI, SEBI, Government of India, Board of Directors of the Bank or any other regulatory, quasi or semi quasi body.

- poor and opaque demarcation of responsibilities/duties of various treasury functionaries- Front Office (Trading), Mid-Office (policy framing and risk control) and Back Office (processing, control and accounting).

- involvement of front office in accounting or reconciliation activities

- inadequate and inappropriate demarcation of administrative/ financial powers and slippages in decisions making process.

- showing hiccups in judicious exercise of delegated powers and prompt reporting of deviations, if any.

- deficiencies in timely and accurate processing, recording, authorising, reporting and reviewing of investment transactions.

- slippages in ensuring that the deals undertaken are in line with the market practices and policy guidelines/ rules from RBI, SEBI, ISDA, Fixed Income Money Market and Derivatives Association (FIMMDA), FEDAI, Clearing Corporation of India Ltd etc.

- faulty and delayed reconciliation of securities as per in- house record and possession certificates from various agencies viz -NSDL, SHCL.

- delayed and improper updation of various policies, instructions and guidelines as per various regulatory /statutory requirements and RBI directives.

- furnishing false confirmation in having adhered to various policies/ guidelines issued by regulatory, statutory, quasi; semi- quasi bodies and the bank.

- inadequate, insufficient, ineffectual and infrequent review of various exposure limits -counterparty limits, financial instrument limits, broker turnover limits and other prudential limits etc.

- inapt, irregular and infrequent review of counterparties and brokers' list and exercising restraints in blacklisting, wherever warranted.

- incomplete identification of counter parties as per "KYC" norms and faulty execution of documents against the spirit of firm's instructions and procedures and also on the wrong formats.

- failure in ensuring adherence to a code of conduct by the approved/empanelled brokers and getting it renewed periodically.

- failure in timely reporting of all delegated powers exercised, outstanding deals for confirmation to the next higher/appropriate authority.

- failure in identification of problem cases and initiation of adequate corrective action as well.

- failure in timely review of portfolio and initiation of necessary follow-up with respect to redemptions, interest payments, overdue interest etc. and reporting of deviations , if any to the appropriate authority.

- failure in ensuring execution of trades/deals on clear and correctly documented agreements and fulfilment of necessary confirmations of deal details (e.g. Amount, Price, Deal Date, Value Date, etc.) as per sanction and other supporting documents.

- failure in ensuring proper and timely generation of accounting entries, deal tickets, double validation of deals.

- failure in obtaining deal confirmation from counterparties and their half-heartedly verification for accuracy and genuineness.

- delayed/ partial and irregular generation of various daily and periodical reports for any breach out in limit / violation made or the limits which are about to breach such as Stop Loss etc. and their reporting to higher authorities, timely and as per laid down norms.

- improper use of voice recorders in the dealing room.

- slippages in ensuring that the business lines, performing various regulatory compliances are complete and without overlapping (e.g collection, updation and monitoring of data for calculation and maintenance of CRR are separate yet interlinked).

3.5.1.2 -Systems Related Risk Control Factors-
Systems Risks arise due to:
- ✓ lack of knowledge of systems
- ✓ inability to manage projects
- ✓ lack of support for systems
- ✓ lack of awareness of systems capability and scope
- ✓ inappropriate systems for the business
- ✓ old and outdated technology
- ✓ access – hackers and viruses, malicious attack

Ideal systems should adopt and integrate necessary clinchers and technological apparatus to identify, manage, and report risks to higher authorities. A strengthened

systems supported by robust information technology platform is a necessary pre-condition for enhancing Board efficiency in oversight and decision making (RBI Sinha, 2012). Based on the above broad dimensions, following risk factors arising from systems/technology in the functioning of Treasury and Investment activities were identified:

- failure in ensuring system's capacity and capability in line with the bank/ financial institution's strategic objectives.
- failure in meeting system's consistency and adequacy for various regulatory requirements/ directives related to reporting, privacy and other compliances.
- deficiencies in creation of securities' related master data such as wrong feeding of instruments' list, faulty assignment of security codes etc.
- failure in timely backup of data, essentials for continuity of treasury operations.
- failure in maintaining effective security controls over backup data and other media files.
- failure in maintaining storage of backup files in the electronic medium and placing it in a fire proof vault and at an off-site location.
- incomplete, insufficient and undue delay in updation of data related to brokers/counterparties.
- failure in ensuring uninterrupted availability of systems support for meeting various administrative controls e.g., transaction controls, limit controls, accounting controls.
- missing of check signal for breach out of limit of brokers and counter parties.
- failure in ensuring correctness and completeness in execution and settlement of various transactions.
- irregular and insufficient implementation, review, testing and updation of disaster recovery and business continuity plan (DRP and BCP)
- failure in generating due awareness among the staff about DRP/BCP and their respective role therein for ensuring, at a short notice, smooth continuation of trading activities and installing necessary back-up facilities.
- failure in identifying system's threats viz. unauthorized monitoring of data, disclosure of proprietary or private information, modification or destruction

of related computer capabilities (i.e., programming codes, networks, databases), and manipulation of computer, or communications services resulting in fraud, financial loss or other criminal violations.

- failure in monitoring control exceptions detected and/or not detected by the systems controls/check points.

- failure in ensuring timely and multi-level functioning of triggers for holding securities in HFT portfolio beyond 90 days, triggers for generating various management information system reports etc..

- failure in giving due attention to various system related risks identified by a professionally qualified auditor, CISA /CISSP etc., and /or by an outside agency - RBI, CCIL etc.

- inefficient monitoring of changes made in the hardware and software during the year and inadequate, improper and timely recording of these changes made in the systems.

- failure in initiating process, in time, of hiring or acquiring new systems during the remainder of the current year or in the next year.

- failure in demanding timely, safe and efficient services from the vendors.

- failure in initiating appropriate steps for maintaining password control by the users.

- failure in imparting adequate training and user documentation for the system related activities.

3.5.1.3 -People Related Risk Control Factors:

People risk is associated with individuals or teams of people and is often about their potential as a source of risk. One obvious people risk is the level of human error in the processes, the knowledge levels both procedural and business and the ability to work in environments particular to business units, products, services, and so on. Another source may include personnel risk which occur because of poor recruitment, environments, uncompetitive remuneration, lack of or ineffective training and development, and so on. Employment Law is also part of this risk and includes areas such as Diversity in the Workplace Directives and training, unfair dismissal etc. Based on the above broad dimensions, following risk factors arising from people factor in the functioning of Treasury and Investment activities were identified:

- making inefficient review of various market changes and their impacts.

- failure in adhering to code of conduct issued by FEDAI/ FIMMDA

- failure in maintaining strict confidence related to investment, especially trading activities.

- failure in observing degree to which trades/deals are in line with the market conditions and initiating effective steps accordingly and in time.

- failure in adhering to various norms related to investment categorization, shifting, valuation, income recognition and classification.

- making slippages in identifying reasons for success/failure in trading activities, on periodical basis.

- failure in making due, proper and timely analyses of various risks associated with trading activities

- issues related to performance measurement – unrealistic profit targets and unclear rules for meeting objectives.

- issues related to Trading Disclosures

- making slippage in ensuring that dealing activities are undertaken during predetermined business hours and confined to the Dealing Room only

- failure in ensuring that all trades are concluded over recorded lines and recordings of telephonic conversations are maintained for each deal undertaken.

- failure in ensuring that investments in SLR securities under HTM category as to not exceed 25% of the DTL of the bank as per RBI guidelines.

- issues related with defeasance period- hazards attached with the holding of trades made under 'Held for Trading' (HFT), wrong calculation of days etc. for transferring trades executed under HFT before expiry of 90 days to the "Available For Sale" category of investments and failure in making provisions as per "Mark to Market" valuation norms of RBI or sell the scrip and book losses, if any.

- failure in ensuring that the total deals put through a broker do not exceed the ceiling of 5% of all deals in a particular financial year.

- failure in ensuring that various rules/guidelines/instructions laid down in different policies for cut loss limits are adhered to.

- issues related to Trading Attitude e.g. perceptual biases and tendency for the boredom.

- issues related to the Trading Attitude e.g. unable to remain cool and calm under stress.

- issues related to the Trading Attitude e.g. diehard love for experiencing "Big Figure Mistake" adventure.

- issues related to the Trading Attitude e.g. unaware and uncomfortable with fast relaxation techniques.

- issues arising from misplaced love for cheap stock and/or falling flat for buying shares of familiar companies to the extent of having odds against one.

- issues related to the incomplete and unfruitful recognition and interpretation of "Charts and Chart patterns".

- issues related to the Trading Decisions e.g. falling flat for taking quick decisions or carrying hasty decision-making tendency.

- issues related to ineffective application of "ABC Rating System"- where necessary.

- failure in conducting fundamental and technical analysis for establishing value anchors

- failure in performing productive technical analysis to state market psychology.

- failure in maintaining daily appraisal rules, preparing /maintaining written records.

- issues related to trifling attitude for sticking with pre-defined entry and exit points.

- insufficient desire and attitude for attaining high level of knowledge, skill and their timely updation.

- failure in timely identification of "Day-Trading Challenges".

- issues related to the Price Information Discovery e.g. insufficient desire and attitude in gathering information from various sources on a stock and utilising this for trading or investment purposes.

- issues related to not making mental rehearsals for paper trading and poor commitment for tactical plans before entering into real market battle.

- issues related to non-adherence to various parameters of model code of conduct such as: no use of mobile phones in the dealing room, compulsory availing two weeks' leave during a year etc.

- issues related to 'over diversification '/'under diversification' status of portfolio.

- failure in making pre-trading preparation and adherence to "Daily Plan", frequent slippages in maintaining trading diary, traders' spread sheet etc.

- issues related to the tendency for speculation, excessive zeal for "beating the market" and scant desire for learning from mistakes.

- issues related to poor time management.

- Unwary of fulfilling SEBI/regulators' guidelines for trading and settlements

- issues related to Training- poorly or badly trained trader.

- issues related to Trading Career.

- issues related to Trading Choices.

- issues related to Trading Priorities.

- issues related to Trading Records.

- issues related to Trends and Patterns, Type of approach employed – trend following, stochastic etc.

3.6 Model Framework Stage–II -Identification of KRIs

After finalising major control factors, the next important stage in formulating the framework is identification of key risk indicators. KRIs are "mathematical functions that include all those parameters that describe the operational variation of specific operations within a particular business line." Alejandro Reveiz (2009) advises that efficient KRIs should observe five convenient features:

- Relevancy (variables should effectively capture a specific KRI class)

- Generality (variables can be used across firms, processes or tasks)

- Non-redundancy (avoid correlated KRIs)

- Measurability (variables should be quantifiable and verifiable)

- Monitoring facility (cost and simplicity of monitoring)

Identification of KRIs is highly multidimensional and non-linear as the inputs are captured from various qualitative and quantitative information/data. These inputs come mainly from expert-human knowledge who also offer at times warranted or unwarranted solutions to complex problems whether beneficial or not. Nonetheless, where traditional quantitative approaches alone are slated to fail, KRIs based solutions help in evaluating updated qualitative and quantitative OR factors. Haubenstock (2003) supplements that suitably identified KRIs and self-assessment help key decision makers in unveiling and discussing risk across the organization as well as in accomplishing the following:

- determining the magnitude of exposure of each major operational risk with reference to existing control environments
- ensuring that these control levels are in line with the risk tolerance limit set by the stakeholder
- scrutinising whether the respective business line has optimized the risk-control and risk-transfer relationships with reference to cost-benefit analysis
- providing key decision makers the ability to measure the expected and unexpected loss, inter-alia, with respect to adhering to various internal, external and regulatory norms and standards.

KRIs identification starts with breaking down of business line activities into its core processes, sub-processes and major tasks. Haubenstock (2003) writes that at this stage, risk mapping should include quantitative factors (frequency) and qualitative factors (severity-high, medium, low). In accordance with such observations, we identify KRIs by dividing overall major treasury and investment management activities into following four stages–

a) Identifying and segregating various investment activities
b) Identifying Operational Risk Contributing Factors consisting of people, processes and systems
c) Identifying Risk Areas/ Intervention Points
d) Deciding Risk Severity

We elaborate these stages of segregation and division in the following paras:

3.6.1- Identifying and segregating various investment activities

We divide these activities into three stages-

- Pre- investment Analysis Activities,
- Investment Capturing Activities and
- Post- investment Activities.

We further segregate these activities into few other major sub activities comprising of Trading/Process/Systems as tabulated in the following Figure 3.6.1:

Figure-3.6.1-Identifying and segregating various investment activities
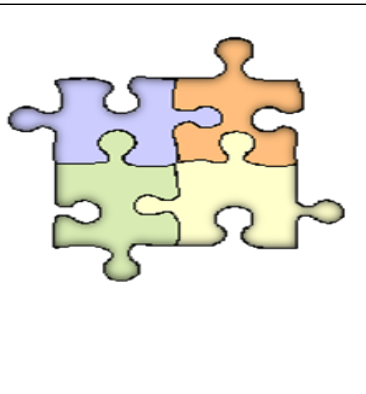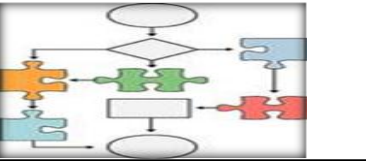
This segregation has helped in concentrating various aspects of people, process and systems, thus devising Key Risk Indicators for these areas.

3.6.2- Identifying operational risk contributing factors consisting of people, processes and systems-

In order to initiate appropriate and suitable steps in time, identification and classification of risk sources is vital. Operational risk sources and exposures are diverse and complex. People, Process and Systems are three major sources of OR. Basel Accord definition itself emphasizes importance of these three risks contributors. Hence, in order to identify significant, pertinent, specific and relevant risk indicators, proper classification and identification of various risk control factors is necessary. In the following Figure 3.6.2, we delineate, major features for identifying operational risk contributing factors comprising of people, processes and systems-

Figure-3.6.2- Identifying operational risk contributing factors consisting of people, processes and systems-

	(b) Identifying Operational Risk Contributing Factors	
People	People	People related risks arising from- human error, incompetency, complacency, fraud (internal or external), reliance on key individuals, insufficient skill or training, lack of a culture of control etc.
	Process	Process related risks arising from- • Model risk- Model / methodology error (assumptions, parameters, data) • Transaction Risk — Execution error, product complexity, documentation / contract risk etc.) • Operational Control Risk — Exceeding limits, security risks, volume risk.
	Systems	Systems related risks arising from- system failure, programming error, telecommunication error etc.

3.6.3-Identifying Risk Areas/ Intervention Points

Major risk areas / intervention points consist of

    i.   Loss events

    ii.   Existing and prospective risk contributing factors

    iii. Other aspects

These are further delineated in the followingFigure-3.6.3 -

Figure-3.6.3- Identifying Risk areas/Intervention points
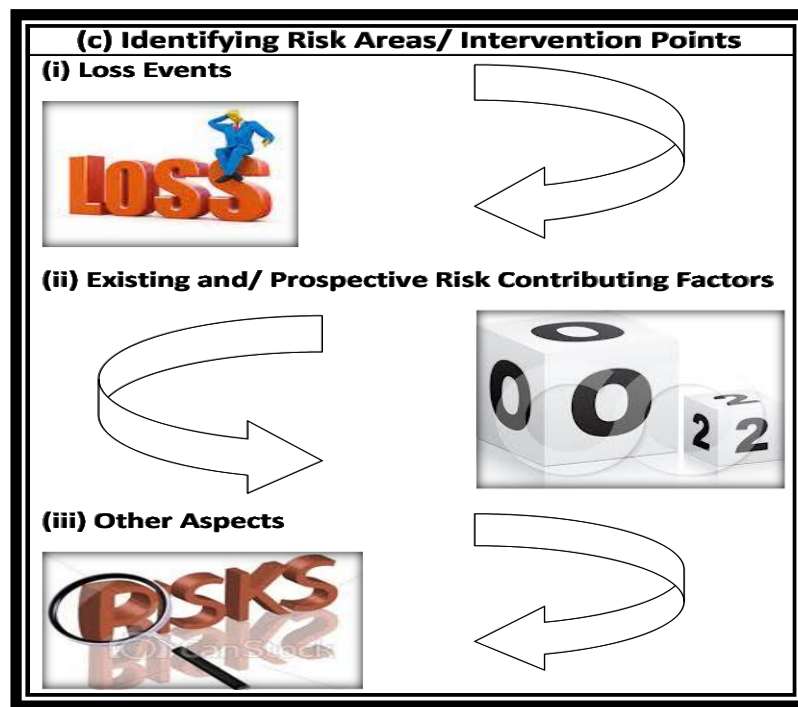
Examples of all these three risk areas/intervention points are also summarised in the following figures and tables:

3.6.3.1-Loss Events-These loss events, as defined by Basel guidelines (2006) are summarised in the following Table -3.6.1

Table-3.6.1- Examples of Loss Events

Types of Operational Risk	Examples of Loss Events
Internal Fraud	Unauthorized transaction resulting in monetary loss
	Embezzlement of funds
External Fraud	Branch robbery
	Hacking damage (systems security)
Employment Practices & Workplace Safety	Employee discrimination issues
	Inadequate employee health or safety rules
Clients, Products & Business Practices	Money laundering
	Lender liability from disclosure violations oraggressive sales
Damage to Physical Assets	Natural disasters, e.g. earthquakes
	Terrorist activities
Business Disruption and System Failures	Utility outage (e.g. blackout)
Execution, Delivery & Process Management	Data entry error
	Incomplete or missing legal documents
	Disputes with vendors/outsourcing

3.6.3.2-Existing and Prospective Risk contributing Factors

Examples of this aspect of risk areas/ intervention points mainly are

- non –identification of objectives
- non monitoring of the processes and systems frequently and in a planned way
- adjusting systems and procedures (i.e. bypassing the important processes) to meet dead lines
- non assignment of responsibility.

3.6.3.3-Examples of Other Aspects –
Thesehave been defined by Basel Guidelines (2006) which are tabulated in the following Table 3.6.2-

Table- 3.6.2- Examples of Other aspects

Other aspects-	Reasons/ Causes	Examples
Legal and Liability issues	Lost legal suit	External legal and other related costs in response to an operational risk event
Regulatory, Compliance and Taxation Penalties	Penalties paid to the regulator	Fines or the direct cost of any other penalties, such as license revocation-associated costs (excludes lost/forgone revenues)
Loss or Damage to Assets	Neglect, accident, fire, earthquake	Reduction in the value of the firm's non-financial assets and property
Restitution	Interest claims -(note: excludes legal damages that are addressed under Legal and Liability costs)	Payments to third parties of principal and/or interest, or the cost of any other form of compensation paid to clients and/or third parties
Loss of Recourse	Inability to enforce a legal claim on a third party for the recovery of assets due to an operational error	Payments made to incorrect parties and not recovered; includes losses arising from incomplete registration of collateral and inability to enforce positions
Write Downs	Fraud, misrepresented market and/or credit risks	Direct reduction in value of financial assets as a result of operational events

3.6.4- Deciding Risk Severity

Severity refers to a stage or degree attached to the happening of an event, situation, condition or plight which will impact the course of action to the extent of perceived harm. The following Figure-3.6.4 show the major relationship and features of risk severity-

Figure-3.6.4- Deciding Risk Severity
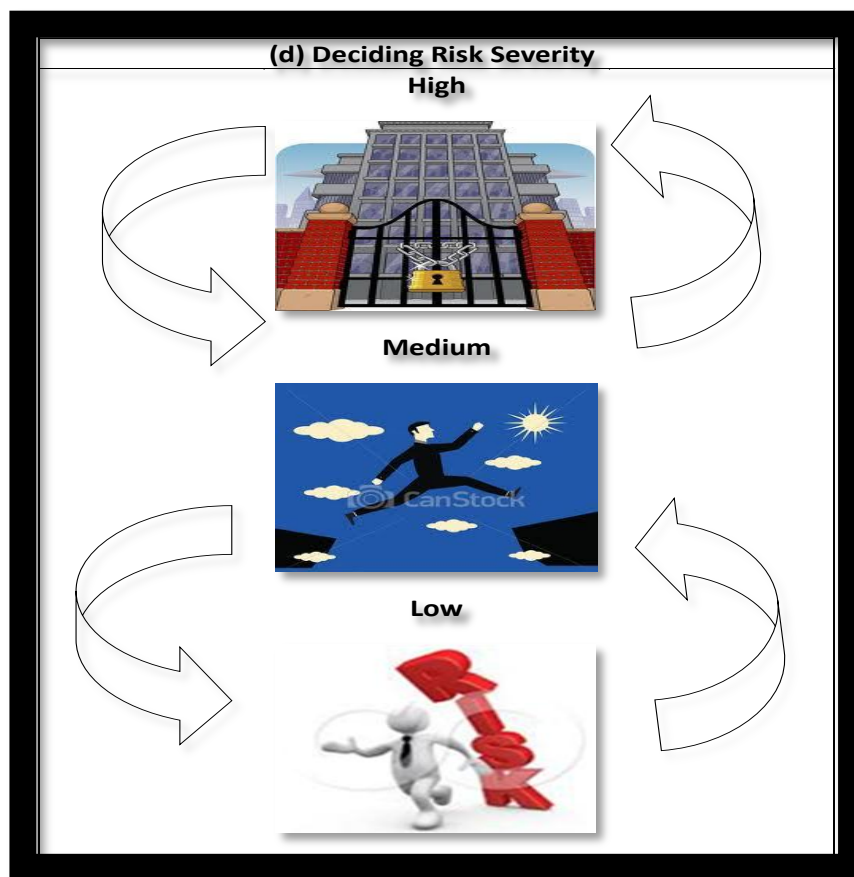
In "Pocket Guide to Operational Risk Management", severity levels have been defined as catastrophic, critical, moderate and negligible. Based on these definitions, we have tried to modify theseterms with respect to the level of severity attached with operational risk related factors in the functioning of treasury and investment business activities in a bank/ financial institution. These are defined as following;

Catastrophic - *Complete failure-* sudden death or loss of people, complete collapse of processes, total breakdown of systems.

Critical - *Major failure* - severe injury, illness of people, major failure in systems & procedures, or major damage to the systems.

Moderate - *Minor failure* - minor injury, illness of people, minor failure in systems & procedures, or minor damage to the systems.

Negligible - Less than minor injury, illness of people, insignificant or minor failure in systems & procedures, or limited damage to the systems.

Based on these, we have envisaged the severity level of risks attached with the operational risk control factors and identified Key Risk Indicators (KRIs) accordingly. Based on the KRIs we have devised questionnaires on Likert scale method and put forth five options, High Risk, Medium Risk, Moderate Risk, Slight Risk and Low Risk to the respondents While devising the questionnaire and their options we have kept in mind the severity and degree of risk attached with each and every question and accordingly have modified the options-

High Risk: attached to the situation/ event if that occurs, the bank will have to bear massive expenditure and possibly could not be able to revive the things, substance for good.

Medium Risk: attached to the situation/ event if that occurs, the bank will have to bear huge expenditure but possibly will be able to revive the things, substance.

Moderate Risk: attached to the situation/ event if that occurs, the bank will have to bear good amount of expenditure but will be able to revive the things, substance smoothly.

Slight Risk: attached to the situation/ event if that occurs, the bank will have to incur sizable expenditure and will be able to revive the things, substance.

Low Risk: attached to the situation/ event if that occurs, the bank will have to bear negligible cost.

With the completion of identification process we move to next stage of formulation of framework.

3.7- Model Framework Stage–III -Deciding Optimal number of KRIs

Though the KRIs were identified and selected keeping in view the best global practices, regulatory guidelines, audit checklists etc., however the decision for deciding optimal numbers, for an appropriate and suitable model for managing operational risks in a treasury department and devising questionnaire for collecting data from the participants as well was finalised on the advices from the experts. It may be added that during the literature survey as well reviewing various papers and articles, the researcher has not come across any such literature or paper which describes optimal number of KRIs selection for arriving at an expected OR figure/decision. As such, for assessing and measuring risks attached with the functioning and working style of Dealers/Traders/ Investment Managers, the researcher has considered various instances/events/instructions/guidelines/directives related to Operational Risk Management and devised 173 major KPIs/KRIs, out of which 131 were from people, process and systems related areas and 42 were based on human behaviour related rationales (Annexure-1).The identified KRIs were got analysed, assessed and vetted by *fifteen* experts (Annexure-2)-*five* related to front office: trading and investment activities, t*wo* related to mid office*, three* from back office, *two* experts from systems related activities and *two* experts for providing information on regulatory guidelines issued by RBI and SEBI, and one for tactical and overall guidelines, in order to ensure authenticity and linkages of the KRIs with the real world of treasury and investment operations. Based on these KRIs, the researcher has devised questionnaires for collecting data from professionals.

3.8- Model Framework Stage–IV-Other Aspects

Treasury & Investment operations are sensitive business. In any financial institution, treasury manual remains available, which contains detailed guidelines or step-by-step process, inter-alia, for day to day operations. Treasury manual is normally a confidential reference book which is devised by an institution according to its

business strategy, vision and risk tolerance capacity. Banks'/financial institutions' treasuries are required to function with an overall framework, decided by the country's respective regulatory statutory body and are subject to various audits. Guidelines issued by regulatory authorities are applicable to the banks and other financial institutions and are usually available in public domain. In India, treasury functions are monitored mainly by RBI and SEBI, who issue directives, guidelines from time to time. We have referred these guidelines issued by RBI and SEBI and tried to extract relevant important information and data. Based on these guidelines primarily and taking references from numerous articles, working papers, checklist from auditing bodies, we have tried to conclude major Operational Risks Contributing factors (ORC) in a Treasury & Investment Business line in India. Based on these KRIs the rationales detailed in Annexure -1, we have identified KRIs. Each KRI carries weight on the basis of its impact on OR figure. Most of the parameters have been finalised and vetted by domain experts. During the process, it was ensured that domain experts are completely aware of the role played by each parameter and

1. as much as possible only those processes/activities are included which are applied across the business line. It was also ensured that no specific (institution related or activity related) processes are included.

2. The processes are identified according to the globally applicable best practices, regulatory guidelines, audit checklists, experts opinions etc. and not on the basis of internal guidelines, directives of a specific bank/organisation.

3. All the parameters are invariably assessed and vetted by domain experts.

4. Lessons from numerous operational risks incidents, financial scams are kept in mind.(Annexure-4)

Based on the above broad dimensions, we devise a basic framework (Chapter-6, Figure – 6.1.1)for finalising Key Risk Indicators (KRIs) and thus prioritizing resources accordingly. With this model framework, risk sources and KRIs can be clearly identified in a treasury and investment business line of a Bank/FI and then

mitigation efforts can be evaluated. It may be added that monitoring of operational risk resources, especially related to procedures, controls, systems, technology etc. and identification of KRIs is foremost and most import step in formation of a model framework for any business line of a bank/FI.

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Chapter 4- Research Methodology and Tools

In the last chapter we discussed different aspects of operational risk mapping in connection with formulation of a model framework, identification of control factors and key risk indicators. We cover in this chapter methodological aspect of research and discuss formulation of questions, data collections tools, population and sampling methods, data transformation and other research analysis tools and techniques. We proceed for conducting our study through various research tools and techniques to identify the most important operational risk contributor in Treasury and Investment business line of a bank/ FI.

4.1- Research Tools and Techniques

We adopt and apply following research design and data analysis tools for conducting research and data analysis as detailed in Table-4.1.1;

Table - 4.1.1 –Research Design and Data Analysis Tools

Research Design	
Universe of Population	Identified as of those scheduled commercial banks comprising of Public Sector Banks, Private Sector Banks and financial institutions viz. Brokerage Houses, Mutual Fund Houses, Venture Capital Fund, Research Houses, whose treasury/investment department are located in Mumbai.
Sample Unit	Identified from the above universe of population as of those scheduled commercial banks comprising of Public Sector Banks, Private Sector Banks and financial institutions such Brokerage Houses, Mutual Fund Houses, Venture Capital Fund, Research Houses which are actively involved in the day-to-day treasury and investment related market operations and have made their market presence felt among the fellow organizations.
Unit of Analysis	Dealers/Traders, Fund Managers, Investment Managers, Supervisors/ Senior Managers and System Managers
Sampling Technique	Probabilistic (Stratified sampling- population being specific cluster of banks/FIs) and Non-probabilistic, Purposive Judgemental Sampling

Sample Size	Gupta and Rangi (2011)[23] opine that a sample size is considered optimum if it fulfils the requirements of efficiency, representativeness, reliability and flexibility. Hence the responses from 116 respondents were as considered as adequate sample size to represent the homogenous views of various professionals working in the identified strata of banks/FIs
Data Collection , Analysis and Interpretation	
Questionnaires Method	Questions based on control risks factors and KRIs which were got reviewed, vetted and pretested by the experts. Questionnaire survey method was based on Likert scale method
Data Collection	Through emails and personal visits
Data Analysis	Rating method
Statistical Analysis	Data Analysis programme in Excel of MS Office 2007 and Statistical software XLSTAT (Demo version) both were used to manage and analyse data, as well as to test hypotheses and decide relationships between and among the variables- people, process and systems.
Hypotheses Analyses	For normalcy test, Shapiro-Wilk test was applied as it is suggested to be best suited for the samples of less than 5000 observations. Since the total numbers of sample observations are about 5000, it was used. Hypothesis testing was conducted through Parametric and Paired Samples Tests- T Test.
Data Interpretation	of respondents' observations was finalised through - Hypotheses Results - Pie Chart Description - deciding Correlation and Association among Control Risk Factors - Relevancy Ranking of major Key Risk Indicator
Reporting of Results	Through Model Frameworks on KRIs, ORM and People concerted Model

The above research design steps and data analysis methods were initiated and implemented as following:

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[23]Excerpts from the Book, "Research Methods in Management" by Gupta and Rangi (2011), pp 6.17

4.2- Developing Questionnaires

Questionnaire is essential tool for empirical research study, which was adopted for our data collection. Operational risks majorly constitute of three important elements- people, process and systems. In the last chapter, we identified control factors and KRIs primarily to –

- identify various human skills and psychological aspects, necessary for occupational success and occupational commitment of Traders, Fund Managers, Investment Managers, Research Analysts and System Managers.

- connect and establish role of controlling and monitoring aspects in measuring individual's - Trader, Fund Manager, Investment Manager, Research Analyst and System Manage, occupational commitment to his/her occupation by few supervisors/ senior managers.

- identify various Risk Areas/ Intervention Points/ Loss Events/Existing/ Prospective Risk Contributing Factors and Other Relevant Aspects.

- associate specific Operational Risk Contributing Factors, People, Process, System or External Events.

- determine Severity of Risk –High, Medium, Low

In view of the foregoing, we developed a questionnaire comprising of 45 multiple choice, 15 each from people risk, process risk and systems related risk. The questionnaire was designed to identify the most important risk factor among the subject three elements. Proportion of fifteen questions each from people risk, process risk and systems related risk was decided to have respondents' unbiased opinion on any of the risk element, people, process and systems. In the questionnaire, questions based on the demographic information such as number of years in treasury, qualifications, etc. were not included as it was designed only for the professionals working in treasury and investment business line. The questionnaire was devised on a five point standard Likert scale options--High Risk, Medium Risk, Moderate Risk, Slight Risk and Low Risk. Questions were prepared, checked, rechecked, edited, tested and pretested several times by the experts so as to get free and candid

responses from the professionals. The questionnaire evaluated and vetted, especially for its contents and sequences by the experts. It may be added that treasury and investment activities are sensitive business, particularly trading activities and no organisation likes to share its internal practices, systems, procedures, guidelines, as these are usually part of their confidential treasury manual. Hence it was ensured from the initial stage itself, that by all means, base for devising questions, establishing parameters for control factors, elaborating KRIs etc., all remain confined strictly to the various policy guidelines and directives issued by the statutory bodies like RBI, SEBI and available in public domain and under no circumstances, internal practices, systems, procedures or policy guidelines etc. of any bank/financial institution are touched upon. Later, the respondents were also assured that their personal and sensitive organisational information would not be disclosed under any circumstances in our study. This arrangement was followed in the data analysis by the researcher.

4.3- Data Collection:

In any empirical research study, data collection is the most important aspect in identifying the authenticity of the research proposal as well as the analysis of hypotheses. As such we collect primary data through questionnaire survey method. The respondents were identified from the following three categories of strata:

Table- 4.3.1- Respondents' Sample Description

Sl. No.	Units of sample population **strata**	Purpose for specifying the **strata**
1	Dealers/Traders, Fund Managers and Investment Managers	To collect and gather first-hand information and responses on trading and other front office activities.
2	Supervisors/ Senior Managers	For the reasons as detailed in above point 1 as well as to have their considered opinions and observations on various policy and procedures related issues from, inter-alia, the monitoring and controlling point of view.
3	System Managers	To collect and gather first-hand information and responses on technological and systems related activities and issues.

Based on the parameters in the above Table 4.3.1, the first important stage in the process, *sampling design* was undertaken:

4.3.1-Sampling Design

In the research study, sampling has been based on mixed of both probability and non-probability sample design where, ***population*** has been decided as of those scheduled commercial banks/FIs whose treasury and investment departments are situated at Mumbai. This has been finalised keeping in view the fact that Mumbai is the financial capital of India, where most of the treasury departments/ cells of various banks, financial institutions and other organizations are located. Out of this ***purposive universe population, sample*** was selected as of those scheduled commercial banks/ financial institutions who actively participate in the day-to-day market operations and have made their market presence felt among the fellow organizations. From this sample, ***unit of analysis*** was finalised to be an employee/ professional who is actively involved in treasury functions in his/her organisation.The major criteria that laid down for selection of sample and unit of analysis were finalized as under:

- Only *active and experienced treasury professionals* comprising of- Traders, Fund Managers, Investment Managers, Research Analysts, System Managers and Supervisors/ Senior Managers from various organisations, were selected for sending questions and receiving responses.

- It was also ensured that these professionals possess a strong understanding of various strategies and practices of treasury and investment management activities vis-à-vis operational risks.

- Selection was further fine-tuned on the following criterion:

  - Professionals/practicenors, who were associated with trading activities for at least one year and above

- Professionals/practicenors, who possessedspecialised training, certifications or academic qualifications for treasury functions, which are prerequisites for working on such desks.

- Professionals/practicenors, who perceived themselves satisfied from the current occupation and expect future career growth opportunities to make better use of their competencies.

Based on the above dimensions, this purposive sampling method was considered appropriate because those involved in activities represented a homogeneous population. These criteria and parameters were finalised by the researcher on the basis of industry information, available from the platforms/agencies like CCIL,RBI,SEBI,NSE etc., advices and consultancies from the treasury experts, experienced bankers and researcher's own experience and intuition. These modes and measures paved way in collecting and gathering data/ information for meeting research objectives and thus identifying the most important risk factor and devising a model framework.

4.4.2-Data Preparation

Based on the above dimensions, data were collected through questionnaires survey method. Questionnaires were sent to sample population of more than one hundred fifty professionals posted in a cross-section of twenty-seven institutions, comprising of thirteen public sector and two private sector banks, three mutual fund houses, four venture capital funds, two research houses and three brokerage houses.

The process of data collection was completed during the period from May 2007 to May 2010 when the researcher himself was posted in Mumbai in Treasury and Investment Department of a major Public Sector Bank. Questionnaires were sent to the professionals in January 2010 and thereafter they were contacted personally/ telephonically for providing any further insight on the subject vis-à-vis clarifying any doubts etc. Out of 150 questionnaires sent, written / emailed responses from one hundred sixteen professionals were received / collected during the period from February 2010 to April 2010 and data from the remaining 34 experts' responses, who

did not respond, was removed from analysis without any biasness. Despite this removal the data responses were found to be around 78% of the total sample size which was considered appropriate for arriving at authentic results.

4.4.3-Data Transformation

After collecting the data, it was classified and arranged in groups to make the data ready for analysis. As the most important operational risk element was to be decided by the participants on the basis of two major parameters- likelihood and impact, these aspects were given due weightage. Participants were expected to convey "likelihood" and "impact" aspects of risk/potential risk by putting values as High Risk, Medium Risk, Moderate Risk, Slight Risk, and Low Risk in the questionnaire. From their responses, "likelihood and impact" aspect was to be decided thorough "degree" of risk, "severity" of risk and "level" of risk. However, while analysing the questionnaires responses it was observed that there had been none or negligible response to many "Moderate Risk and Slight Risk" options. As such, these were removed from the data and out of the five Likert scale options, responses from only three risk factors, High, Medium and Low were considered for analysis. It may be added that wherever, "Moderate Risk and Slight Risk" options were chosen by the respondents these scores were included in "Low risk" segment of option. It was also ensured that while aggregating item scores, equal weight to the variables are not provided as simple addition of these would have been inaccurate (Alfares et al, 2008). As such, 3was allotted to High Risk, 2 to Medium Risk and 1 to Low Risk to all the 45 variables. This transformation changed the original data into a new scale given by the z-score $(x-\mu)/\sigma$, as different mean and standard deviations were converted to a same scale and thus all the results became comparable. As total of 16 responses contained one or more missing values, these were replaced with the mean score for that item, as recommended by Han and Kamber (2006).

4.5-Data Analysis

Given below are participation and responses related data in the following Table 4.5.1-

Table 4.5.1 -Description of participation in the questionnaire

	Public Sector Banks	Private Sector Banks	Mutual Fund Houses	Venture Capital Fund	Research Houses	Brokerage Houses	Total
Dealers/ Traders	35 (64%)	9 (16%)				11 (20%)	55 (100%)
Fund Managers			8 (100%)				8 (100%
Investment Managers			7 (100%)				7 (100%)
Supervisors Senior Managers	13 (45%)	2 (7%)	4 (14%)	5 (17%)	2 (7%)	3 (10%)	29 (100%)
System Managers	11 (65%)	2 (12%)	1 (6%)			3 (18%)	17 100%)
Total	59 (51%)	13 (11%)	20 (17%)	5 (4%)	2 (2%)	17 (15%)	116 (100%)

Questions were sent to 150 professionals out of which 116 responses were received. Out of these more than 50% were from PSBs, followed by brokerage houses. In both types of the organisations, major participation was made by the dealers/traders. This gave strength to our research base, which had foreseen the role of people factor in treasury operations to be comparatively at the higher level. It was also expected that a good number of responses were received from supervisors and senior managers level of respondents to get their opinion about the particular ORC. These responses were also satisfying. One of the major ORCs includes Systems related risk factors, hence it was essential to obtain responses of the persons working in this area. This goal was also achieved to a great extent. Responses from the homogenous group of professionals having multifarious skills, varied and in-depth exposure in treasury operations and positioned at different level of hierarchy provided authenticity to the data and this was considered appropriate for further analysis. We delineate hereunder in Figure-4.5.1 and Table-4.5.2, the details of such participation:

Figure 4.5.1 - Description of Participation- *Institutions Wise*
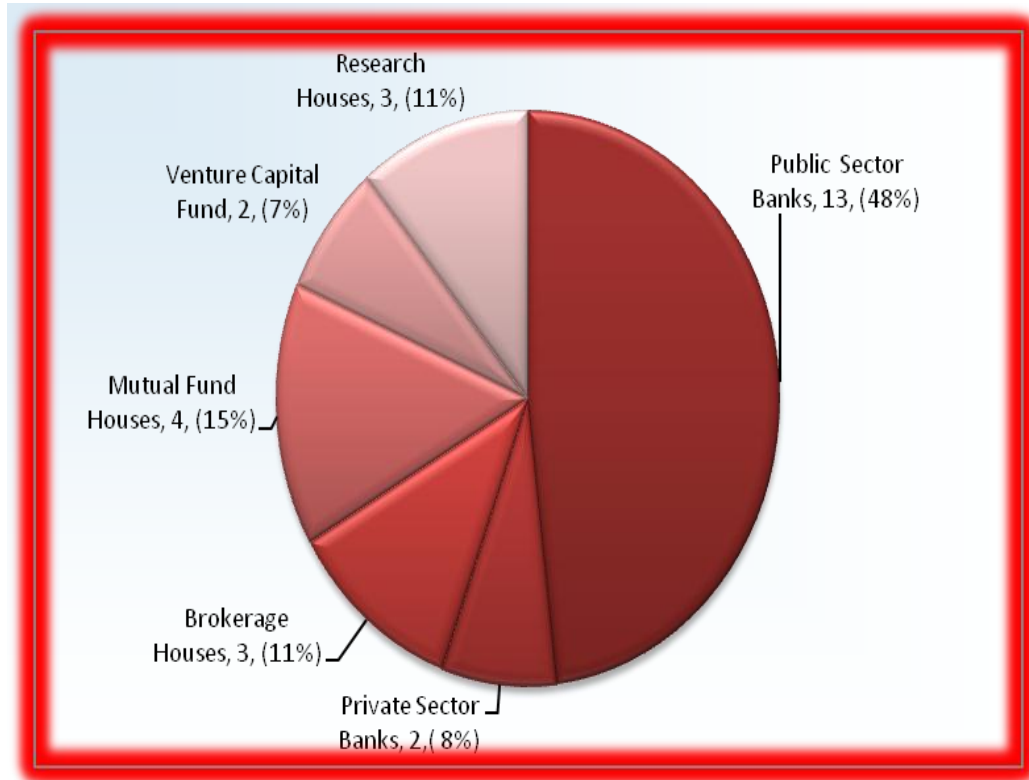
Table- 4.5.2 -Description of Participation - *Institutions Wise*

Institution- wise Participation	Numbers	In percentage terms
Public Sector Banks	13	48%
Private Sector Banks	2	8%
Brokerage Houses	3	11%
Mutual Fund Houses	4	15%
Venture Capital Fund	2	7%
Research Houses	3	11%
	27	100%

As may be observed from the above Table -4.5.2 and three graphic representations in Figure-4.5.1, out of total 27 institutions, 13 public sector banks constituted 48% of the sample size while 2 private sector banks represented 7% of the sample population size. The remaining sample size was represented by 3 mutual fund houses which contributed 11% in the sample whereas four venture capital funds represented 15%, two research houses 7% and three brokerage houses 11% in the sample. Such different institutions of similar fraternity provided basis in exploring relationship between the various strategies and practices of treasury and investment management activities vis-à-vis operational risk.

Figure 4.5.2 - Description of Participation - *Respondents Position Wise*
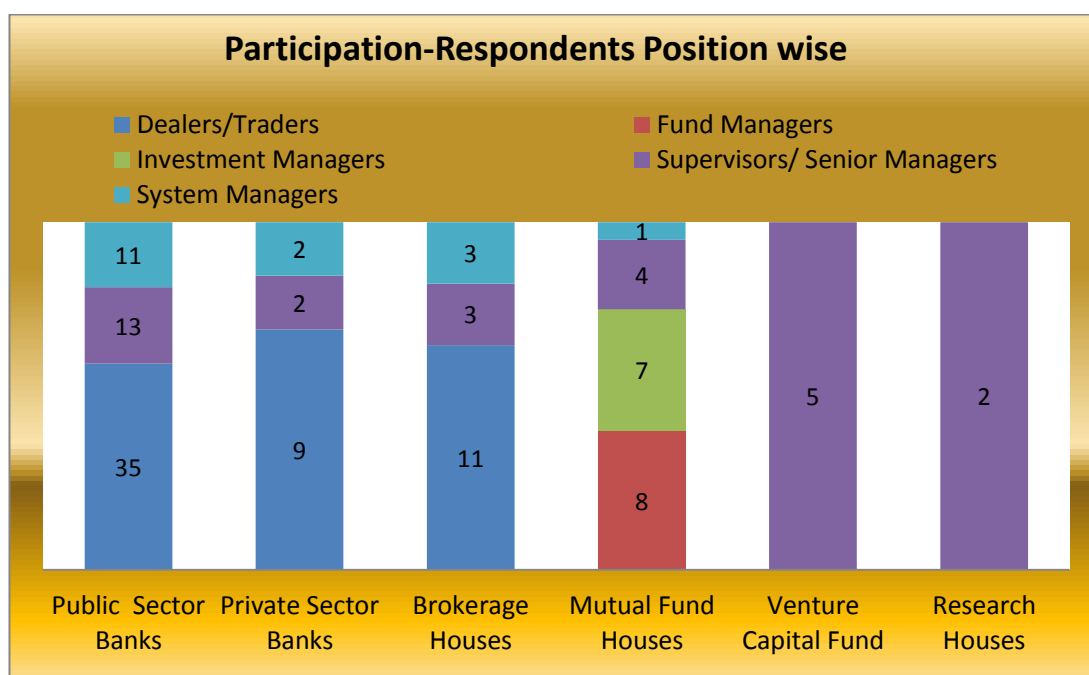
Table-4.5.3 - Description of Participation - *Respondents Position Wise*

	Dealers/ Traders	Fund Managers	Investment Managers	Supervisors/ Senior Managers	System Managers	Total
Public Sector Banks	35			13	11	59
Private Sector Banks	9			2	2	13
Brokerage Houses	11			3	3	17
Mutual Fund Houses		8	7	4	1	20
Venture Capital Fund				5		5
Research Houses				2		2
	55	8	7	29	17	116

As may be observed from the above Figure 4.5.2 and Table 4.5.3**,** out of the 116 sample from 27 institutions, 55 responses were from dealers/traders, 8 from fund managers, 7 from investment managers, 29 from supervisors/ senior managers and 17 were from system managers. These constituted 47%, 8%, 7%, 29%, and 17%

respectively of the total sample size. As the major responsibility of the treasury and investment activities rests with the persons attached directly with dealing room operations, it was ensured that major responses are obtained from such professionals/ practitioners. As such, out of 55 responses from dealers/traders 13 were from public sector banks, 2 from private sector banks and 3 from brokerage houses. Besides, since an important role is also played by the Fund Managers and Investment Managers their participation constituted 7% and 6% respectively in the total sample population. Supervisors and senior managers ensure execution of various internal guidelines, statutory directives etc, and their role is very important in identifying and preventing various risk contributing factors. Their responses were ensured at 29% of the sample population. From all the selected institutions, 13 were from Public Sector Banks, 2 from Private Sector Banks, 4 from Mutual Fund Houses, 5 from Venture Capital Funds, 2 from Research Houses and 3 from Brokerage Houses. Keeping in view the prominent and vital role of systems managers in maintaining security and continuity of various computer and networking related processes, these were accorded due weightage in the data collection. With 17 responses their contribution was 15% of the total sample size. It was 11 from Public Sector Banks, 2 from Private Sector Banks, 1 from Mutual Fund House and 3 from Brokerage Houses. All these represented satisfactory level of participation and adequate number of samples for hypothesis analysis.

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Chapter5- Analysis of Empirical Data

In this chapter we have results of hypotheses testing. Based on the literature survey made, and its output used as a tool for empirical research, we cover in this chapter, research tools, hypotheses data analyses which include normality test, descriptive statistics description, and non-parametric test - t test. We also cover relevancy ranking of professional responses to arrive at the major operational risk contributor.

5.1 Background

The purpose of the study was to understand various dimensions of ORM, particularly the role and importance of major operational risk contributing factors namely people, process and systems, in treasury and investment business line of a bank/ financial institution so as to develop an appropriate framework for assessment and management of various operational risks. Accordingly, this research was undertaken and data was collected from professionals and analysed. From the data analysis it was observed that experts have rated people as the major risk contributor in comparison with the remaining two - process and systems. The severity levels of remaining ORCs and other important parameters were also observed and identified.

The major findings of the research as well as the details of various tools applied in conducting it and analysing data are delineated in the following paras:

5.1.1- Analysis of Data Related to Responses

As stated earlier a questionnaire containing 45 questions, relating to Process Risk, Systems Risk and People Risk was sent to 150 experts out of which 116 responded. We delineate hereunder the summarised version of the data collected from the respondents.

Figure 5.1.1- Overall Observations of the Respondents
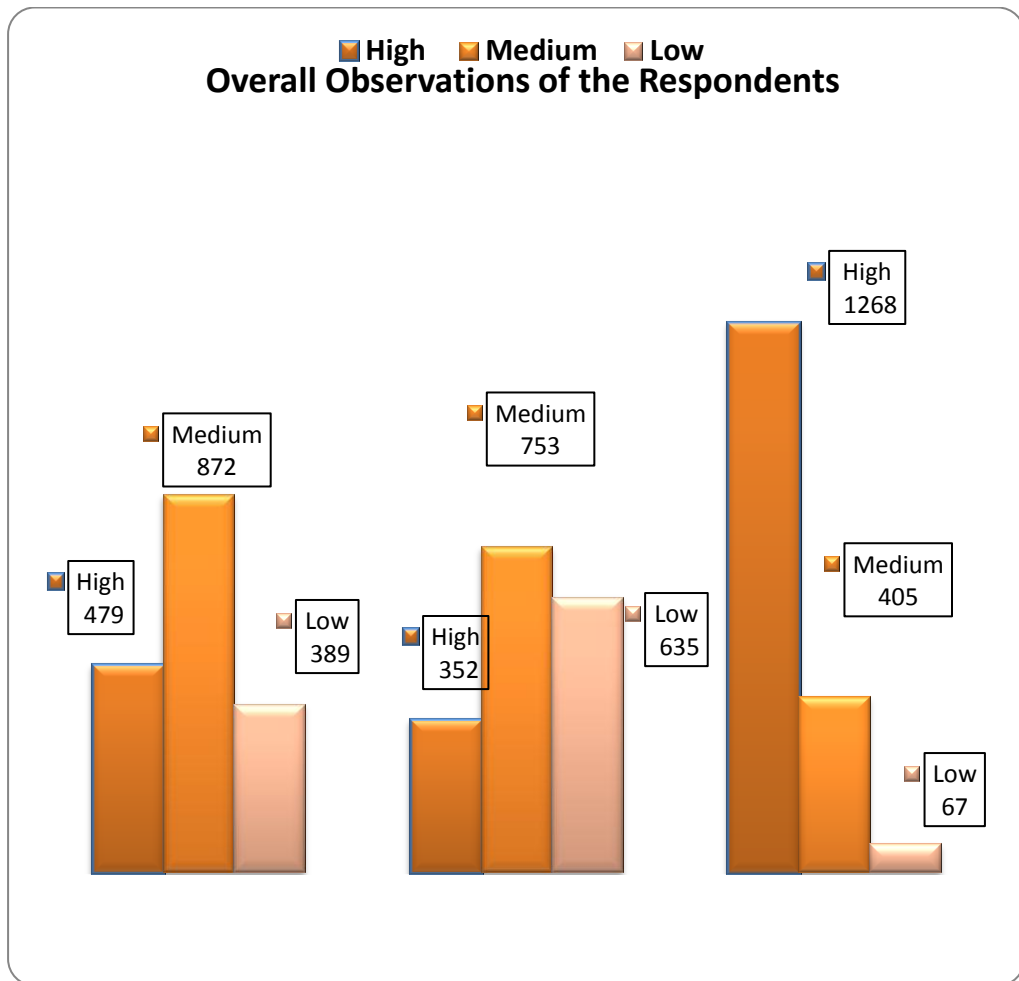
Table-5.1.1- Overall Observations of the Respondents

	High	**Medium**	**Low**	**Total Observations of the Respondents**
Process	479 (9%)	872 (17%)	389 (7%)	1740
System	352 (7%)	753 (14%)	635 (12%)	1740
People	1268 (24%)	405 (8%)	67 (1%)	1740
	2099 (40%)	2030 (39%)	1091 (21%)	5220 (100%)

Out of the total responses of 5220, experts observed that most of the high risk areas in the treasury operations are influenced by People related control factors. This is followed by Process related control factors which entail Medium Risk. They observe that systems related control factors generate less risk in comparison to the other two control factors.

Figure 5.1.2- Overall Responses of the Participants- *Institution* **Wise**

Overall Reponses of Participants-Institution wise

PSBs	Public Sector Banks
PvtSBs	Private Sector Banks
BH	Brokerage Houses
MFs	Mutual Fund Houses
VCFs	Venture Capital Fund
RH	Research Houses
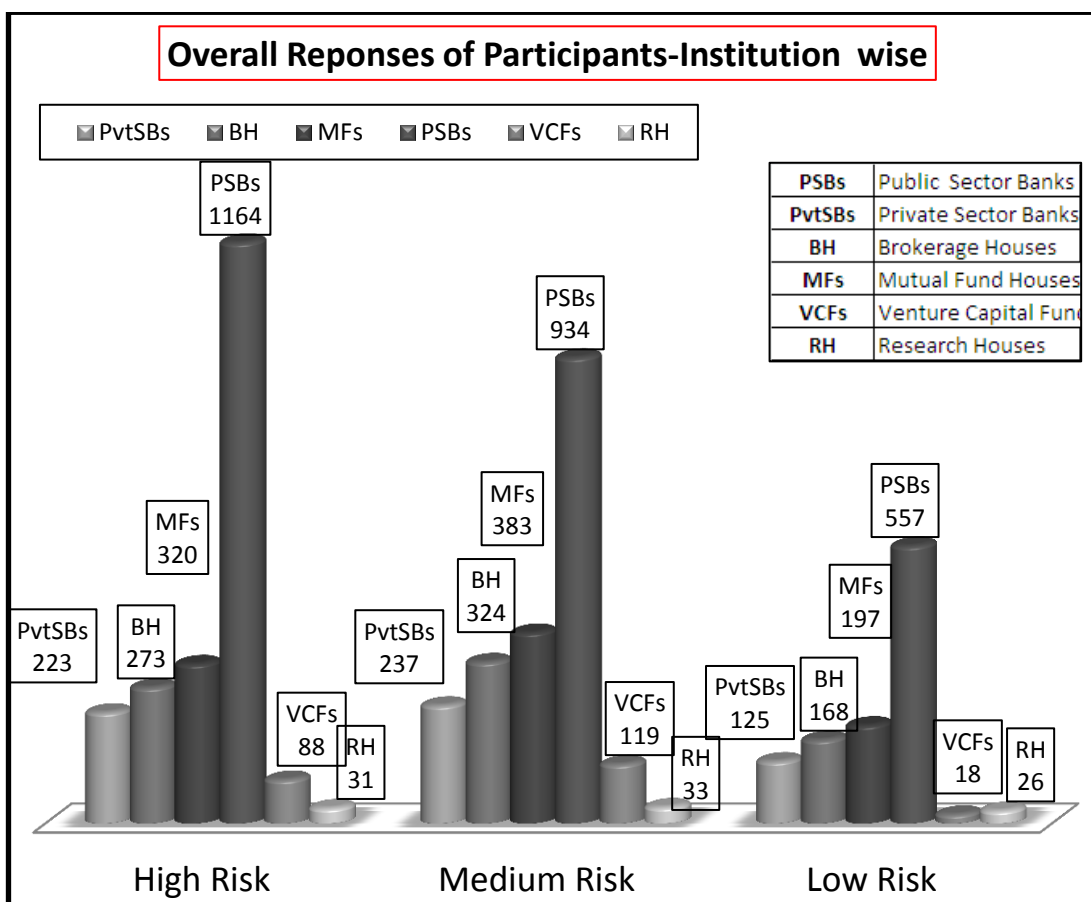
Table- 5.1.2- Overall Responses of the Participants- *Institution* **Wise**

	High Risk	Medium Risk	Low Risk	Total
Public Sector Banks (PSBs)	1164	934	557	2655
Private Sector Banks (PvtSBs)	223	237	125	585
Brokerage Houses (BH)	273	324	168	765
Mutual Fund Houses (MFs)	320	383	197	900
Venture Capital Fund (VCFs)	88	119	18	225
Research Houses (RH)	31	33	26	90
	2099	2030	1091	5220

Out of the total responses of 5220, experts rated High Risk factors at 2099, Medium Risk at 2030 and Low Risk factors at 1091. These high risk factors were mostly identified by the participants from PSBs and by experts from Mutual Fund Houses.

Figure5.1.3- Respondents' Observations - Risk *Classification-Category wise*

Risk Classifcation - Category wise
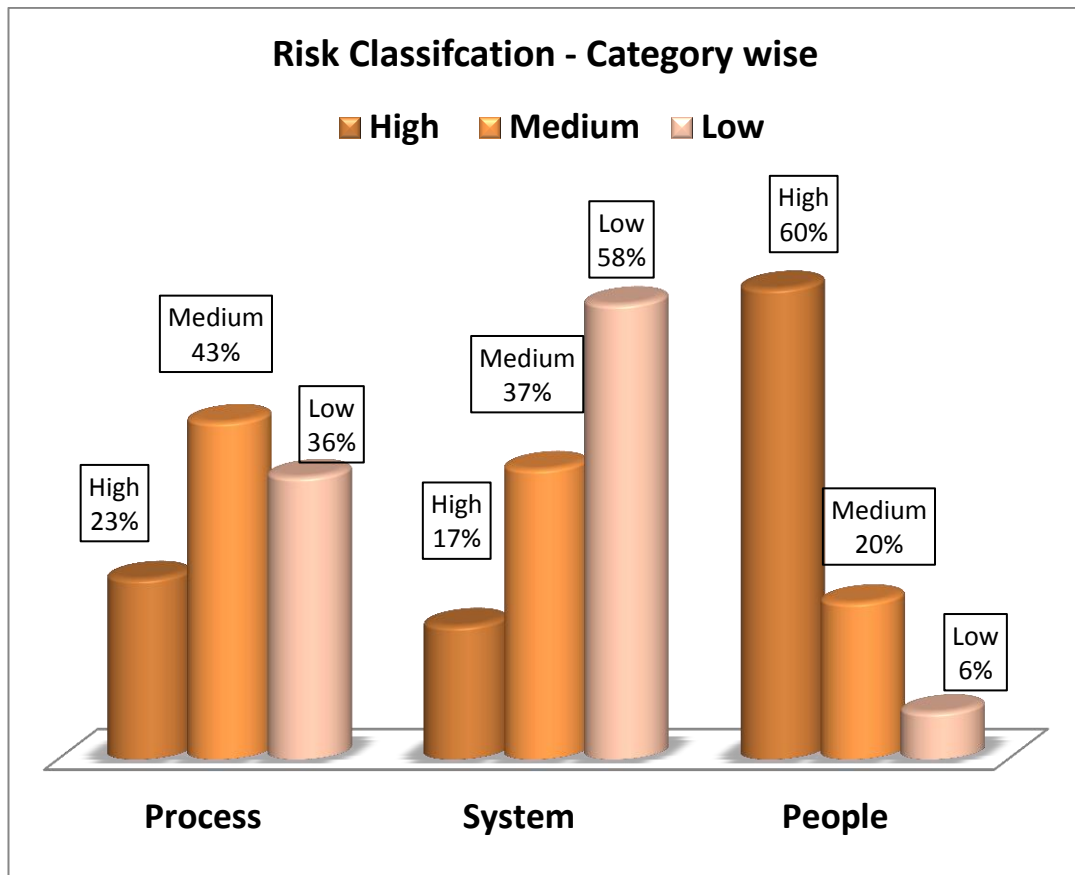
Table- 5.1.3- Respondents' Observations - Risk *Classification-Category wise*

	High	Medium	Low	Total Observations of the Respondents
Process	479 (23%)	872 (43%)	389 (36%)	1740
System	352 (17%)	753 (37%)	635 (58%)	1740
People	1268 (60%)	405 (20%)	67 (6%)	1740
	2099 (100%)	2030 (100%)	1091 (100%)	5220 (100%)

Out of the total responses of 5220 by 116 experts, people related risks observed for 1268 observations were identified as High Risk category constituting 60% of total number of 1740 responses. This was followed by Processes related risk attracting 872 responses as Medium category risk constituting 43% of total responses and Systems related risk drew 635 observations under low risk category constituting 58% of responses.

Figure 5.1.4- Respondents Observations-Risk Classification- *Contributing Factors wise*

Risk Classification- Contributing Factors wise
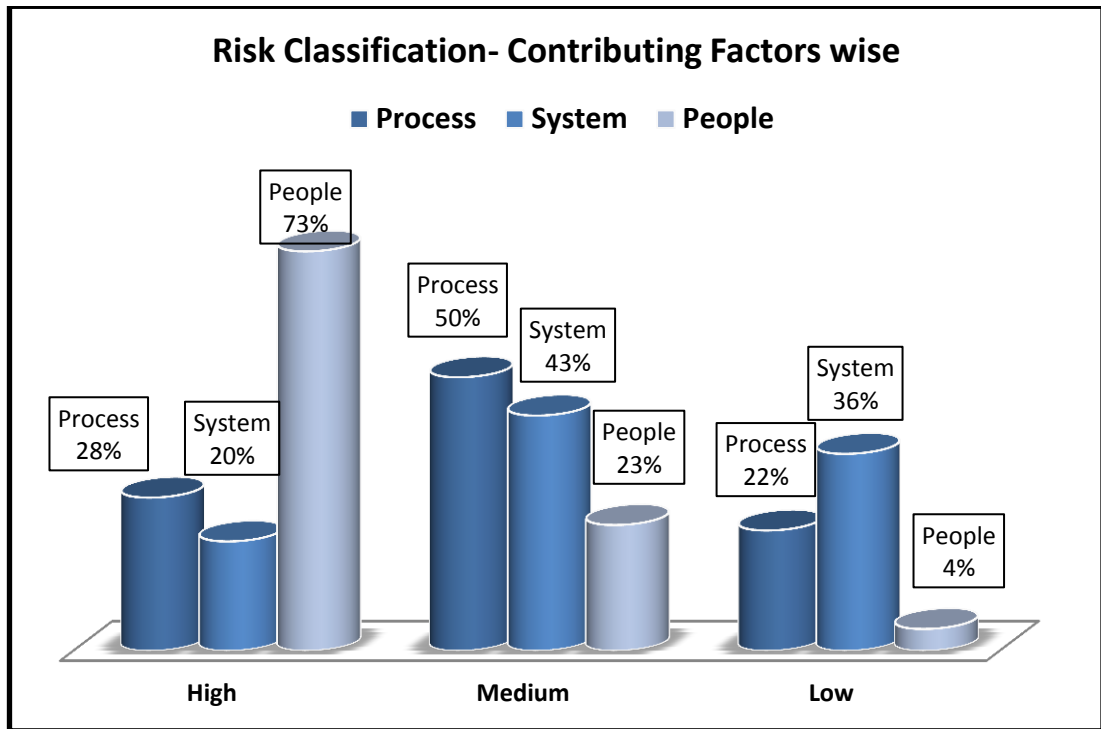
Table- 5.1.4- Respondents Observations-Risk Classification- *Contributing Factors wise*

	High	**Medium**	**Low**	**Total Observations of the Respondents**
Process	479 (28%)	872 (50%)	389 (22%)	1740 (100%)
System	352 (20%)	753 (43%)	635 (37%)	1740 (100%)
People	1268 (73%)	405 (23%)	67 (4%)	1740 (100%)
	2099	2030	1091	5220

As may be observed from the Table-5.1.4 and graphic presentation figure 5.1.4, experts observed that most of the high risk areas in the treasury operations are influenced by People related control factors. This is followed by Process related control factors which entail Medium Risk. They observe that systems related control factors generate less risk in comparison with to other two control factors. This entailed analysis of factors under each category and their relevance to operational risk management and testing specific hypothesis that can help in building a

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framework for risk management in banks. In the following paras we discuss the results of hypotheses data analysis to understand status of various risks related features viz degree, level severity so as to come out with a framework for operational risk management in banks and financial institutions.

5.2-Hypotheses Analysis

Hypotheses were formulated to identify major operational risk contributor. On the basis of data collected through questionnaire purposive sampling technique as described earlier and the research objectives devised(chapter-3.2), hypotheses were tested to identify significant variables which affect operational risk management. The major findings of the hypotheses analysis are summarised hereunder -

5.2.1. Hypotheses Analysis for Degree of Risk (High or Medium)

To understand and decide the *Degree of Risk- High or Medium,* attached to various functions, related to pre-investment, investment capturing and post- investment activities as well as to analyse its implications, a due analysis of the professional responses, tabulated hereunder, was undertaken.

Table 5.1.5- Details of Professionals' Responses

Participants	High	Medium	Low	Total
Public Sector Banks	1164	934	557	2655
Private Sector Banks	223	237	125	585
Brokerage Houses	273	324	168	765
Mutual Fund Houses	320	383	197	900
Venture Capital Fund	88	119	18	225
Research Houses	31	33	26	90
Total Number of Observations	2099	2030	1091	5220

Based on the overall dimensions, earlier following hypothesis was formulated:

Hypothesis 1-
Ho. Most of the functions related to pre- investment, investment capturing and post-investment activities entail high risk as against medium risk
Ha. Most of the functions related to pre- investment, investment capturing and post-investment activities entail medium risk as against high risk.

5.2.1.1- Results of Hypothesis Analysis
We summarize hereunder the respective results of data:

(a) Pie Chart-

Figure 5.1.5- Pie chart
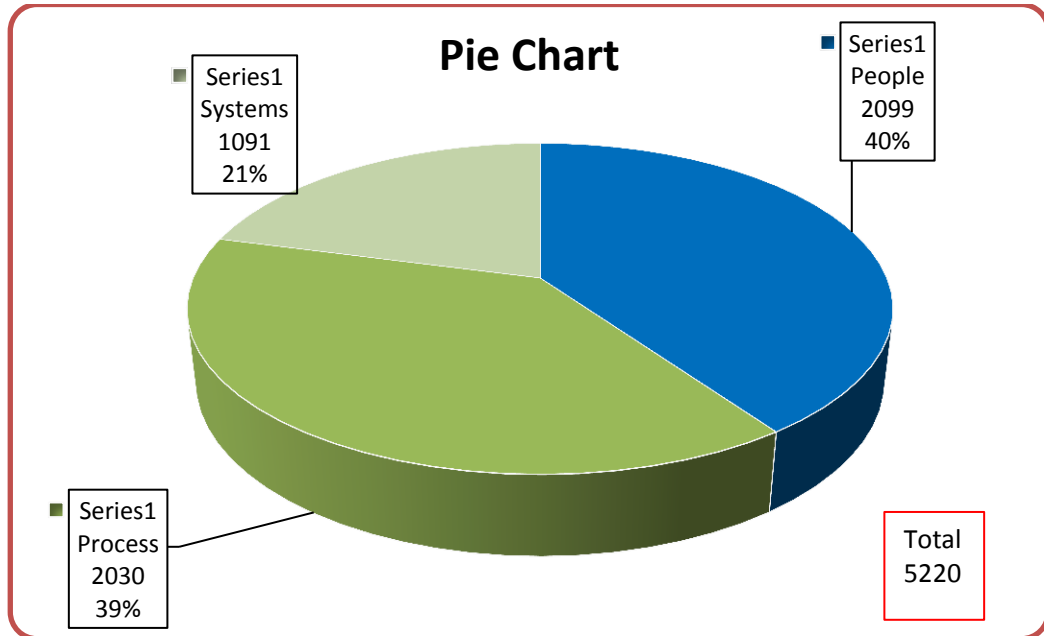
As may be observed from the side by Figure 5.1.5, 40% respondents have rated various pre-investments, investment capturing and post-investment activities under high risk category, then 39% under medium risk and 21% have voted for low risk category. Most of the professionals also view treasury operations as very risky business as reflected from the minor difference between the high and medium risk categories of observations, highlighting that most of the treasury operations carry high or medium level risk.

(b) Normality Test-
Table 5.1.6- Description of Normalcy Test Data

Shapiro-Wilk Test	
High Risk	0.892
W Medium Risk	0.924
p-value	< 0.0001
alpha	0.05

For testing normalcy of collected data Shapiro-Wilk Test was applied, where the null hypothesis was that the data is normally distributed and at the significance level

Alpha=0.05,the decision was to reject the null hypothesis if the computed p-value is lower than the significance level. Since the computed p-value arrived at was <0.0001, as detailed in above Table – 5.1.6, it was construed that the mean difference between the samples is significant. W statistic for High Risk scores at 0.892 and for Medium Risk at 0.924 also conveyed a similar message. Accordingly, based on these results, we reject the null hypothesis and conclude that the mean for Medium Risk scores is not equal to that of High Risk scores.

(c) T Test Results & Interpretation

Table- 5.1.7- Descriptive Analysis

High Risk Mean	18.095
High Risk Std. deviation	7.218
Medium Risk Mean	17.500
Medium Risk Std. deviation	3.981
Difference between mean	0.595
t (Observed value)	0.762
t (Critical value)	1.981
DF	115
p-value (Two-tailed)	0.447
Alpha	0.05

After conducting normalcy test of data, a paired-samples t-test was conducted to decide the *Degree of Risk (High or Medium)* and above results detailed in Table-5.1.7 were obtained. Here the null hypothesis was formulated that difference between the means of *High Risk and Medium Risk* data is almost equal to zero and at significance level of Alpha=0.05, therefore the decision was to reject the null hypothesis which will indicate that the samples are not normal. In other words, the difference between the samples is significant. From the results obtained it was observed that the scores for *High Risk* and *Medium Risk* were *2099* and *2030* respectively and apparently that the *difference* between these two risk scores was ***not significant***. Similarly, the mean goodness score, on a scale of 1 to 3, for high risk

samples was 18.095 whereas for Medium Risk samples at 17.50. Results were also witnessed for other scores of these two samples e.g. standard deviation of high risk at 7.218 and medium risk at 3.918.The t (observed value) was at 0.762 which is less than the t (critical value) of 1.981. Likewise, computed p-value at 0.447 is greater than the significance level, alpha=0.05. All these results suggested ***non-rejection of null hypothesis in favour of alternative hypothesis*** and we concluded that the mean for High Risk scores is more or less equal to the mean for Medium Risk scores. It was therefore inferred that most of the functions related to pre- investment, investment capturing and post- investment activities entail ***High Risk*** as against Medium Risk and thus our objective is proved.

5.3.2 – Hypothesis Analysis for Degree of Risk (High or Low)

For deciding ***Degree of Risk- High or Low,*** attached with various treasury functions, related to pre- investment, investment capturing and post- investment activities following hypothesis was formulated –

Hypothesis 2-
Ho. Most of the functions related to pre- investment, investment capturing and post- investment activities entail low risk as against high risk.
Ha. Most of the functions related to pre- investment, investment capturing and post- investment activities entail high risk as against low risk

Professional responses collected and analysed are tabulated below in Table 5.1.8:

Table 5.1.8- Details of Professionals' Responses

Participants	High	Medium	Low	Total
Public Sector Banks	1164	934	557	2655
Private Sector Banks	223	237	125	585
Brokerage Houses	273	324	168	765
Mutual Fund Houses	320	383	197	900
Venture Capital Fund	88	119	18	225
Research Houses	31	33	26	90
Total Number of Observations	2099	2030	1091	5220

5.3.2.1- Results of Hypothesis Analysis

Based on the above data vis-à-vis hypothesis formulated, following results , detailed in figure-5.1.6, were obtained:

(a) Pie Chart-
Figure 5.1.6- Pie chart
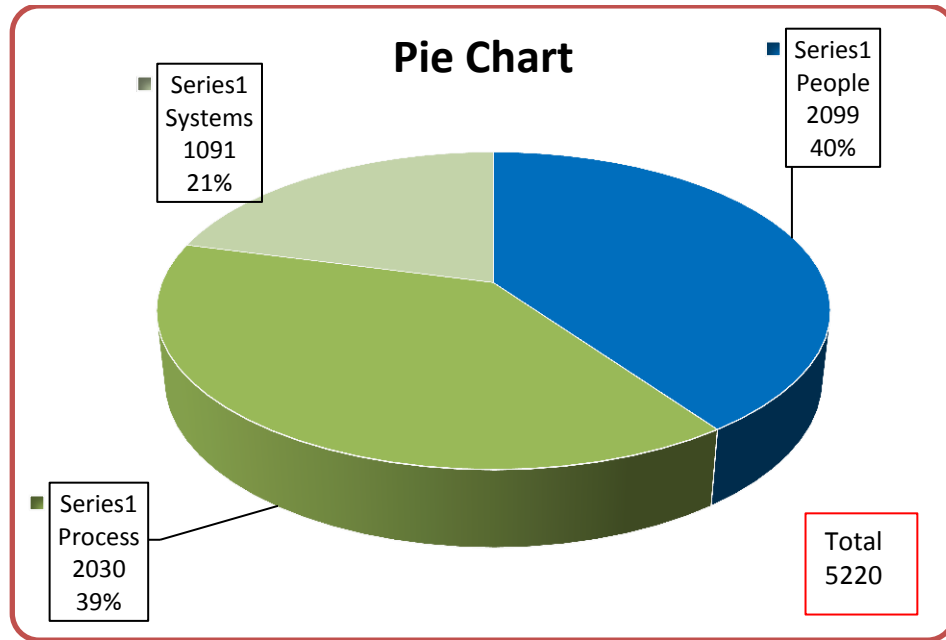
The abovePie chart graphical presentation as Figure 5.1.6 describes that while 40% observations have been specified by the professionals under high risk category, only 21% scores have been assessed by them for low risk category. This difference between the high and low degree of risk category of observations conveys that various treasury activities contain mainly high risks.

(b) Normality Test-
Table-5.1.9- Description of Normalcy Test

Shapiro-Wilk Test	
W High Risk	0.892
W Low Risk	0.881
p-value	< 0.0001
alpha	0.05

In tandem with the previous hypothesis data analysis, Shapiro-Wilk Test was applied to test normalcy of data for this hypothesis also where the null hypothesis was that the data are normally distributed. The results arrived are shown in Table – 5.1.9. At the level of significance Alpha=0.05 the decision was to reject the null hypothesis that the samples are not different. In other words, the difference between the samples

is significant. Shapiro-Wilk Test showed, W statistic for High Risk scores at 0.892 and for Low Risk at 0.881. Following these results and the computed p-value being <0.0001 being lower than the alpha, we rejected the null hypothesis and concluded that the mean for Low Risk scores is not equal to the mean for High Risk scores.

(c) T Test Results & Interpretation

After normalcy test, a paired-samples t-test was conducted to decide the *Degree of Risk (High or Low)* and the following results were obtained:

Table- 5.1.10- Descriptive Analysis

High Risk Mean	18.095
High Risk Std. deviation	7.218
Low Risk Mean	9.405
Low Risk Std. deviation	8.081
Difference between mean	8.081
t (Observed value)	6.325
t (Critical value)	1.981
DF	115
p-value (Two-tailed)	<0.0001
Alpha	0.05

Null hypothesis for the hypothesis was formulated that difference between the means of *High Risk* and *Low Risk data* is equal to zero and at the significance level of 0.05 the decision is to reject the null hypothesis, as the samples are not normal. In other words, the difference between the samples is significant. From the results obtained and detailed in above Table- 5.1.10, it was observed that the scores for *High Risk* and *Low Risk* were *2099* and *1091* respectively and apparently that there was significant difference between these two risk scores. Similarly, the mean goodness score, on a scale of 1 to 3, for high risk samples was observed at 18.095 and for Low Risk samples at 9.405. A noticeable difference was also observed between the standard deviation of High risk at 7.218 and Medium Risk at 8.081. The results of other scores for these two samples were also more or less similar. The t (observed value) at 6.325 being greater than the t (critical value) of 1.981 and computed p-

value at <0.0001being less than alpha, implied rejection of null hypothesis. As all these results suggested rejection of **null hypothesis** and it was concluded that the mean for High Risk scores is significantly different to the mean for Low Risk scores. Hence it is proved that most of the functions related to pre-investment, investment capturing and post- investment activities entail **High Risk** as against Low risk.

Thus, this analysis shows that functions related to pre- investment, investment capturing and post- investment activities play a very critical role in operational risk management and entail a high degree of risk. Therefore, these functions need to be performed in a much-organised way by the professionals, so as to avoid any mis-happening at any stage of investment and treasury operations. Proper systems need to be put in place to ensure that appropriate checks and balances capture any deviations in time before adverse implications of decisions.

As pre- investment, investment capturing and post- investment activities entail a high risk, banks need to have practices and guidelines in place to avoid occurrence of errors or mistakes at these stages of investments. There is a utmost need for undertaking a high level of pre-investment due diligence on each manager, key personnel, established risk profiles, risk management and compliance performance, investment performance and liquidity/redemption practices through a full business cycle, and above all having transparency and timely disclosure to investors of material financial results. Key personnel to be identified for investment activities need to have due expertise and human talent coupled with uprightness and integrity above board. Organisations need to identify the key personnel for these functions by title, function, experience, reporting line, levels of responsibility and stature within the organization. Investment functions need to clearly earmark risk profile of the organization working out management's compatibility with risk appetite and investment goals of the organization. Business structure for effective and efficient decision making need to be put in place by proper assessment of fund manager's ownership structure, voting rights, and rigor of committees/decision-making processes, and appropriateness of decision making authority. Further risk management system at all these three stages coupled with effective compliance structure need to be put in place, so that control mechanism works objectively, independently to identify timely deviations, if any. Investment performance needs to

be evaluated through a full business cycle and performance on a risk-rated basis. Integrity of the people needs to be ensured strict compliance to the manager's stated operational risk and investment strategy. Transparency to the higher ups in the organization need to be ensured, this should ensure availability and accessibility of necessary information of so in a format that facilitates investor assessment of performance and risk. There is a need to inbuilt an appropriate separation of duties among front, middle and back office personnel; if the model validation function is independent of the model development function; and if internal audit is independent of the business line and reports directly to senior management and the board.

Figure 5.1.7- ORM- Steps in Pre, During and Post- investment
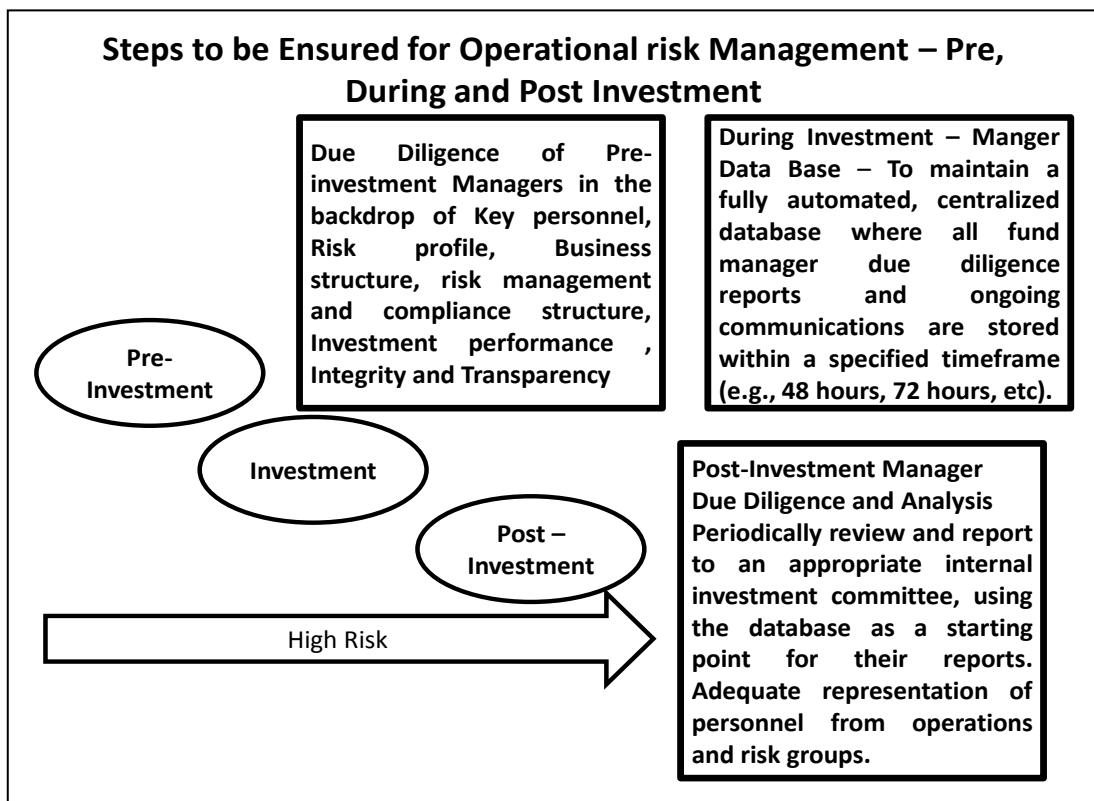
During the investment stage activity, it is necessary to have a uniform source of information readily available and accessible to the concerned personnel in the organization which need to be continuously updated. In the present context of technology era, a fully automated, centralized database---should contain relevant history and commentary regarding the investments. Exception reports, such as reports about non-receipt of key manager information, should be generated from the

database. Information received in the database should be archived to be utilized as and when required.

Post- investment stage activities should include periodic review and report to an appropriate internal investment committee, using the database as a starting point for their reports. The frequency of reporting should be linked to quantum and severity of the investment and associated operational risks. Personnel from operation and risk groups should have adequate representation on the committee to ensure that their concerns are adequately addressed.

5.3.4- Hypotheses on *Severity of Risk* (Low) associated with Processes, Systems and People

To understand and decide Severity of Risk (Low) arising from Process, Systems and People related risk contributing factors following responses as given in Table 5.1.11 were analysed. Data was scrutinised to examine and identify the ORC, which contributes the Lowest level of Risks out of the following three ORCs-

Table 5.1.11- Details of Operational Risk Contributors (ORCs)

Operational Risk Contributors (ORCs)	High	Medium	Low	Total
Processes	479	872	**389**	1740
Systems	352	753	**635**	1740
People	1268	405	**67**	1740
Total	2099	2030	**1091**	5220

Based on the overall dimensions, in chapter 3, three relevant hypotheses were formulated:

Hypothesis 3-	
Ho. Most of the Low Risks arise from People instead of Processes	
Ha. Most of the Low Risks arise from Processes instead of People.	
Hypothesis 4-	
Ho. Most of the Low Risks arise from Processes instead of Systems.	
Ha. Most of the Low Risks arise from Systems instead of Processes.	
Hypothesis 5-	
Ho. Most of the Low Risks arise from People instead of Systems.	
Ha. Most of the Low Risks arise from Systems instead of People.	

5.3.4.1-Resluts of Hypothesis Analysis

(a) Pie Chart

Figure 5.1.8- Pie chart
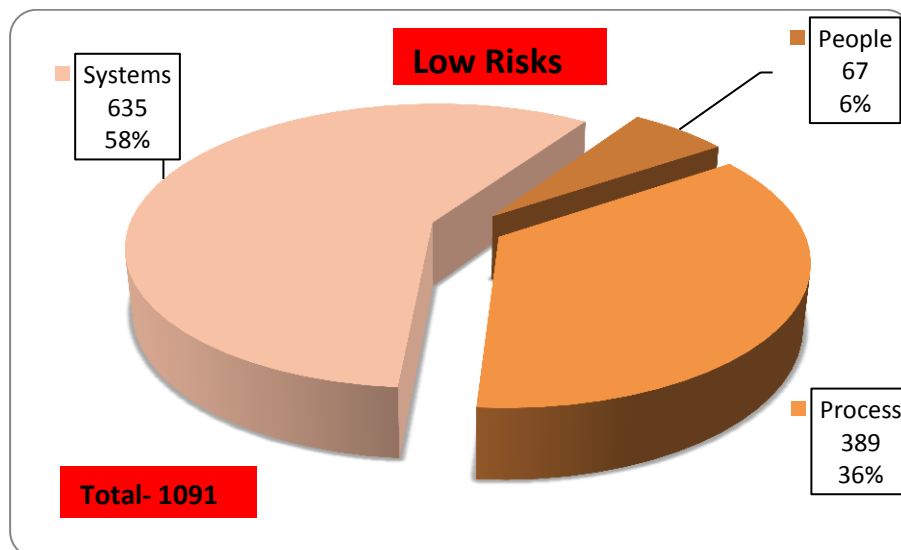
Description in Figure 5.1.8 through Pie chart clearly shows that out of the total Low Risks scores of 1091, respondents have rated Systems related risk as the most *low risk*s emanating category of risk contributing factors. This also indicates that systems related risks are critical independent variables affecting operational risk and need to be given a special importance while developing a framework for operational risk management.

(b) Normality Test-

Table- 5.1.12- Description of Normalcy Test

Shapiro-Wilk Test	
W Systems	0.849
W Processes	0.840
W People	0.593
p-value	< 0.0001
alpha	0.05

To test normalcy of data, Shapiro-Wilk Test was applied and null hypothesis was finalised that the data are normally distributed. At the Alpha0.05 the decision was to reject the null hypothesis as the difference between the samples is significant. Test results denoted W statistic for Systems related Risk at 0.849, for Process related Risk at 0.840 and People related Risk at 0.593. The computed p-value arrived at <0.0001 is lower than alpha0.05 for all the three hypotheses. Based on these results, the null hypothesis was rejected and it was concluded that the mean scores for all the operational risk contributors, People, Process and Systems Risk scores are different.

(c) T Test Results & Interpretation

After testing normalcy of data, a paired-samples t-test was conducted to decide Severity of Risk (Low) associated with Processes, Systems and People related risk contributing factors and following results were obtained:

Table- 5.1.13- Descriptive Analysis

Overall Observations	Processes Related Low Risk	389
	Systems related Low Risk	635
	People Related Low Risk	67
Mean	Processes Related Low Risk	3.353
	Systems related Low Risk	5.471
	People Related Low Risk	0.578
Standard Deviation	Processes Related Low Risk	3.025
	Systems related Low Risk	5.012
	People Related Low Risk	1.031
Difference between Mean	Processes & Systems Related Low Risk	2.121
	Systems & People Related Low Risk	4.897
	People & Processes Related Low Risk	2.776
p-value (two tailed)	Processes Related Low Risk	<0.0001
	Systems Related Low Risk	<0.0001
	People Related Low Risk	<0.0001
t (Observed value)	Processes &Systems	7.105
	Processes & People	10.869
	Systems & People	11.043
t (Critical value)		1.981
DF		115
Alpha		0.05

Earlier, null hypotheses was formulated that difference among the means of Processes, Systems and People scores is equal to zero. From the data analysed, depicted in the above Table-5.1.13, it was observed that there are significant differences among the scores of *Processes, Systems* and *People Risk* contributing factors. The mean goodness score, on a scale of 1 to 3, standard deviation and difference among the means of all three contributing factors also showed noticeable difference among the scores of all the three low risk contributing factors, thus indicating rejection of null hypotheses. Similarly, the t (observed value) conveying relationship between processes and systems at 7.105, processes and people at 10.869 and systems and people at 11.043 indicated rejection of null hypothesis as in all these the observed values were found greater than the critical value of 1.981. The computed *p-value at - < 0.0001*was also less than the significance level. All these results suggested **rejection of *null hypothesis*** and it was concluded that most of the *Low Risk* contributing factors arise from Systems related risks in connection with pre- investment, investment capturing and post -investment activities and thus our objective was proved*.*

Putting proper systems in place and an auditing mechanism goes a long way in effectively managing systems related risks. It can be minimized by carrying out having satisfactory audits commensurate with the nature and scope of project activities; by coming out with quality and timely audit reports; and proper follow up of audit observations to keep improving the systems. This would require having satisfactory quality auditors, use of appropriate auditing standards, and satisfactory audit scope and terms of reference.

Although systems related factors low risk as regards operational risk management in banks is concerned but it is important to realize that complex or poorly designed systems can result in causing operational losses, either because they are unfit for purpose, or because they malfunction. This may result in bank experiencing a wide range of problems, including settlement-processing errors, fraud and information security failures. In addition, the increasing automation of systems and over reliance on IT has the potential to transform risks from minor manual processing errors to major systematic failures. Therefore a due care need to be given to systems related factors which can be managed with greater certainty by putting right systems with appropriate checks and balances in place.

5.3.4- Hypothesis Analysis for deciding *Severity of Risk* (Medium) associated with Processes, Systems and People

To understand and decide ***Medium Level of Risk Severity attached to Process, Systems and People related risk-contributing factors*** professional responses were analysed as tabulated in Table 5.1.14. Data was scrutinised to identify and decide the most of the critical of *Medium Risks* generating ORC, among the above three ORCs.

Table 5.1.14- Details of Operational Risk Contributors (ORCs)

Operational Risk Contributors (ORCs)	High	Medium	Low	Total
Processes	479	**872**	389	1740
Systems	352	**753**	635	1740
People	1268	**405**	67	1740
Total	2099	**2030**	1091	5220

Earlier, following three related hypotheses were formulated –

Hypothesis 6-	
Ho. Most of the Medium Risks arise from People instead of Systems.	
Ha. Most of the Medium Risks arise from Systems instead of People.	
Hypothesis 7-	
Ho. Most of the Medium Risks arise from Systems instead of Processes.	
Ha. Most of the Medium Risks arise from Processes instead of Systems.	
Hypothesis 8-	
Ho. Most of the Medium Risks arise from People instead of Processes.	
Ha. Most of the Medium Risks arise from Processes instead of People.	

5.3.4.1- Results of Hypothesis Analysis
(a) Pie Chart-

Figure- 5.1.9- Pie chart
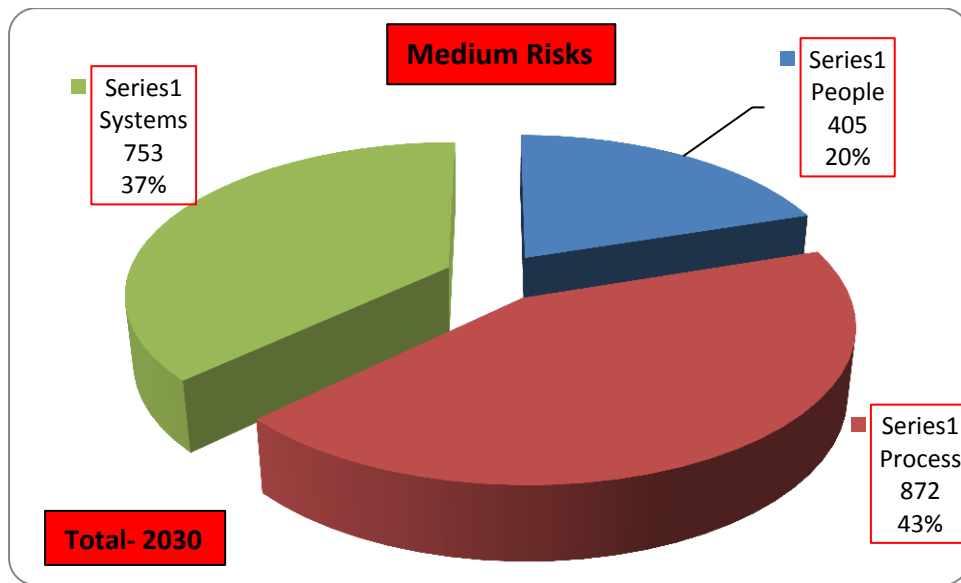
Graphical description as presented in Figure 5.1.9 by way of Pie chart clearly depicts that out of the total Medium Risks scores of 2030, Processes related activities generate most *Medium level risks*. This has been followed by Systems related medium risks. Professionals view process related risks as a very critical independent variable affecting operational risks management and opine that given the stringent systems and procedures necessitated and enforced by the regularity bodies viz RBI, SEBI etc. these risk can be managed with a greater degree of certainty

(b) Normality Test-

Table- 5.1.15- Description of Normalcy Test

Shapiro-Wilk Test	
W Processes	0.810
W Systems	0. 951
W People	0.781
p-value	< 0.0001
alpha	0.05

To test normalcy of data, null hypothesis was devised that the data were normally distributed and at significance level of Alpha=0.05 the decision was to reject the null hypothesis to conclude that the difference between the samples is significant. Results of the test were analysed and it was observed that W statistic for Process related Risk was 0.810, for Systems related Risk, 0.951, and for People related Risk it was 0.781. The computed p-value was <0.0001 for all the three hypotheses test data i.e. lower than the significance level alpha=0.05. Based on these results, null hypothesis was rejected and it was concluded that the mean for all the *Medium Risk* contributors, People, Process and Systems activities was different.

(c) T Test Results & Interpretation

Table-5.1.16- Descriptive Analysis

Overall Observations	Processes Related Medium Risk	872
	Systems related Medium Risk	753
	People Related Medium Risk	405
Mean	Processes Related Medium Risk	7.517
	Systems related Medium Risk	6.491
	People Related Medium Risk	3.491
Standard Deviation	Processes Related Medium Risk	2.711
	Systems related Medium Risk	3.550
	People Related Medium Risk	3.729
Difference between Mean	Processes & Systems Related Medium Risk	1.026
	Systems & People Related Medium Risk	3.000
	People & Processes Related Medium Risk	4.026
p-value (two tailed)	Processes Related Medium Risk	<0.0001
	Systems Related Medium Risk	<0.0001
	People Related Medium Risk	<0.0001
t (Observed value)	Processes &Systems	3.875
	Processes & People	8.028
	Systems & People	4.644
t (Critical value)		1.981
DF		115
Alpha		0.05

After normalcy test, a paired-samples t-test was conducted to decide Medium level Severity of Risk associated with Processes, Systems and People related risk contributing factors, arising from pre- investment activities, investment capturing activities and post- investment activities. Null hypotheses was formulated as difference among the means of Processes related medium risk scores, Systems related medium risk scores and People related medium risk scores factors was equal to zero. From the data analysed, depicted hereby in the Table-5.1.16, it was observed that there are significant differences among the scores of these ORCs and mean goodness score. On a scale of 1 to 3, it was, 7.517 for Processes related medium level risks score of 872, 6.491 for Systems related medium level risks score of 753 and 3.491 for People related medium level risks score of 405. Results also showed that there was significant difference in standard deviation and other scores of three samples, and computed p-value at < 0.0001 was also less than alpha. All these results suggested **rejection of null hypothesis in favour of alternative hypothesis** and the results proved that most of the risk contributing factors generating Medium level risks arise from Processes related factors instead of People or Systems and thus **our objective was proved** that processes related risks contribute medium risk for operational risk management in bank's operations.

Inbuilt and strong internal controls are a must and these reduce the possibility of significant human errors and irregularities in internal processes. These also help in timely detection of irregularities as and when they occur. The processes need to be well laid down with due support of the top management to ensure their effective implementation. The processes need to be well integrated with systems and culture of the organization, so that meaningful purpose gets fulfilled to achieve risk management goals.

5.3.5- Hypotheses Analysis for deciding *Severity of Risk* (High) associated with Processes, Systems and People

To understand and decide *High Level of Severity* of Risk arising from *Process, Systems and People related risk-contributing factors* as well as to analyse its implications, a due analysis of the professional responses received was undertaken. Data tabulated hereunder were scrutinised to identify and decide the ORC attracting highest level of severity of risks.

Table 5.1.17- Details of Operational Risk Contributors (ORCs)

Operational Risk Contributors (ORCs)	High	Medium	Low	Total
Processes	**479**	872	389	1740
Systems	**352**	753	635	1740
People	**1268**	405	67	1740
Total	**2099**	2030	1091	5220

Keeping in view the above, following hypotheses were formulated –

Hypothesis 9-
Ho. Most of the High Risks arise from Systems instead of Processes.
Ha. Most of the High Risks arise from Processes instead of Systems.
Hypothesis 10-
Ho. Most of the High Risks arise from Processes instead of People.
Ha. Most of the High Risks arise from People instead of Processes.
Hypothesis 11-
Ho. Most of the High Risks arise from Systems instead of People.
Ha. Most of the High Risks arise from People instead of Systems.

5.3.5.1- Hypothesis Analysis

 (a) Pie Chart

Figure 5.1.10- Pie chart
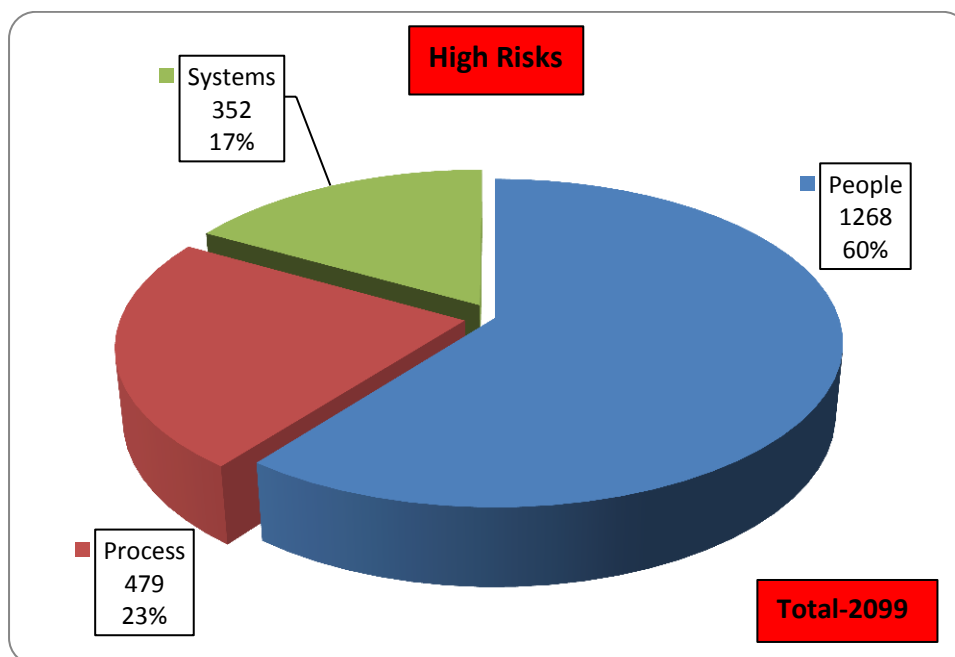
Graphical description of the above figure 5.1.10 as Pie chart clearly depicts that out of the total High level Risks scores of 2099, People related activities generate highest level of risks and process and systems related activities follow suit. Data analysis specify that People related risks are critical independent variable affecting operational risk and need to be given a special importance while developing a framework for operational risk management.

(b) Normality Test-

Table- 5.1.18- Description of Normalcy Test

Shapiro-Wilk Test	
W Processes	0.929
W Systems	0.868
W People	0.754
p-value	< 0.0001
alpha	0.05

To test normalcy of data, null hypothesis was devised to prove that the data are normally distributed. At the level of significance Alpha=0.05 the decision was to reject the null hypothesis that the difference between the samples is significant. Results of the test were analysed and it was observed that denoted W statistic for Process related Risk was at 0.929, for Systems related Risk, at 0.868, and for People related Risk it was at 0.754. The computed p-value at <0.0001 for all the three hypotheses test data was lower than the significance level alpha=0.05. Based on these results, null hypothesis was rejected and it was concluded that the mean for all the *High level Risk* contributors, People, Process and Systems activities is different.

(c) T Test Results & Interpretation

From the data collected, a paired-samples t-test was conducted to decide the Severity of Risk (High) associated with Processes, Systems and People related risk contributing factors and following results, detailed in Table -5.1.19, were obtained:

Table-5.1.19- Descriptive Analysis

Overall Observations	Processes Related High Risk	479
	Systems related High Risk	352
	People Related High Risk	1268
Mean	Processes Related High Risk	4.129
	Systems related High Risk	3.034
	People Related High Risk	10.931
Standard Deviation	Processes Related High Risk	2.521
	Systems related High Risk	2.550
	People Related High Risk	4.265
Difference between Mean	Processes & Systems Related High Risk	1.095
	Systems & People Related High Risk	7.897
	People & Processes Related High Risk	6.802
p-value (two tailed)	Processes Related High Risk	<0.0001
	Systems Related High Risk	<0.0001
	People Related High Risk	<0.0001
t (Observed value)	Processes &Systems	4.539
	Processes & People	18.332
	Systems & People	19.870
t (Critical value)		1.981
DF		115
Alpha		0.05

Initially, null hypotheses was formulated that difference between the means of Processes, Systems and People related high level risk scores is equal to zero. But from the data analysed, depicted in the Table- 5.1.19, it was observed that there are significant differences among the scores of all the three –Process, Systems and People related high level risk contributing factors. The mean goodness score, on a scale of 1 to 3, for *Process related High Risk* contributing factors of 479 with a mean score of 4.129, *Systems related High Risk* contributing factors of 352 with a mean score of 3.034 and People *related High Risk* contributing factors of 1268 with a mean score of 10.931 was observed, which indicated rejection of null hypotheses. Similarly, the t (observed value) conveying relationship between processes and systems related high risks at 1.095, systems and people related high risks at 7.897 and processes and people related high risks at 6.802 clearly indicated rejection of null hypothesis as all these observed values were greater than the critical value of 1.981. The computed p-value at - < 0.0001 being less than the significance level alpha=0.05 was also observed. All these results suggested rejection **of *null hypothesis*** i.e. the results proved that most of the risk contributing factors generating

highest level risk severity arise from People related factors instead of Processes or Systems and thus our objective is proved.

One of the severe risks to quantify and manage in banks relates to people related factors. People related risks are several and of multi-faceted nature. Even after having best of policies, procedures and systems in place, risk management may not deliver results, if not backed up by superior talent in terms of competence and integrity. Personnel involved in investment activities need to have clear understanding of the banks' policies and procedures and they must ensure an effective implementation of those policies in their units' activities. The awareness of the risks in general and operational risk in particular, must characterize each member of the staff. The implementation of the operational risk framework within each line of business should reflect the scope of that business and its inherent operational complexity and operational risk profile.

5.3.6- Hypotheses on deciding *Overall Level of Risk* associated with Processes, Systems and People

Lastly we analyse and decide the ***Overall Level of Risk* associated with various operational risk contributors,** on the basis of professionals' responses, tabulated as below:

Table 5.1.20- Details of Operational Risk Contributors (ORCs)

Operational Risk Contributors (ORCs)	High	Medium	Low	Total
Processes	479	872	389	1740
Systems	352	753	635	1740
People	1268	405	67	1740
Total	2099	2030	1091	5220

As stated earlier a questionnaire, devised on Likert scale method, containing 45 questions, 15 each from Process Risk, Systems Risk and People Risk were sent to 150 experts, out of 116responded. It was explicit that values for all the five variables- High Risk, Medium Risk, Moderate Risk, Slight Risk, Low Risk were to be assigned on the basis of score of the item associated with each variable. However, as simple addition of the responses by providing equal weight to all the variables, would have been inaccurate (Alfareset al 2008), appropriate values to all the 45

variables were assigned. Hence, during data analysis, High Risk responses were assigned 3, Medium Risk were allotted 2 and responses for Moderate Risk, Slight Risk and Low Risk were allotted 1. It may be recalled that as discussed in chapter-4, para 4.4.3, since responses to "Moderate Risk and Slight Risk" segment of answers were none or negligible, these were removed from the data and out of the five Likert scale intervals, responses from only three risk factors, High, Medium and Low were taken for analysis. This transformation changed the original data, as tabulated hereunder, into a new scale given by the z-score $(x-\mu)/\sigma$ and different mean and standard deviations were converted to be same scale so that all the results become comparable.

Table 5.1.21- Professional Responses- Contributing Factors wise

Total Number of Observations (after conversion of Likert Scale data)	6228
Out of which	
Processes	1830
Systems	1457
People	2941

Based on the overall dimensions, earlier three relevant hypotheses were formulated:

Hypothesis 12-
Ho. Most of the risk contributing factors arise from Systems instead of Processes.
Ha. Most of the risk contributing factors arise from Processes instead of Systems.
Hypothesis 13-
Ho. Most of the risk contributing factors arise from Processes instead of People.
Ha. Most of the risk contributing factors arise from People instead of Processes.
Hypothesis 14-
Ho. Most of the risk contributing factors arise from Systems instead of People.
Ha. Most of the risk contributing factors arise from People instead of Systems.

5.3.6.1-Results of Hypotheses Analysis
(a) Pie Chart-

Figure- 5.1.11- Pie chart
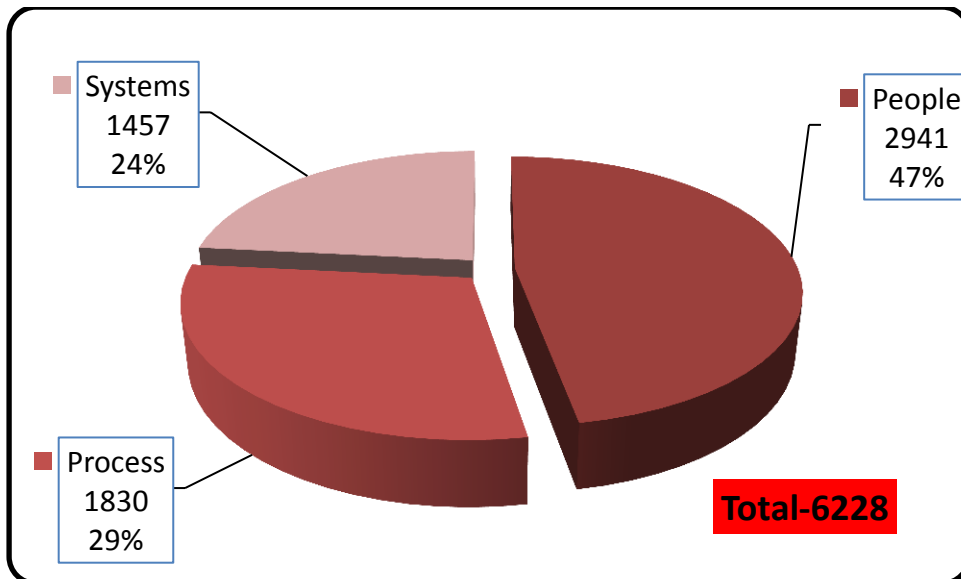
As may be observed from the side by Pie chart graphical description in Figure 5.1.11 that majority of respondents, 47%, have rated people related risk contributors under high risk category of ORCs. This has been followed by process related risks-29% and then Systems risks at 24%.This difference between the top two risk category observations at 18% and between the top most and lowermost at 23% unequivocally elucidate people related risks as the most prominent risk contributor in various treasury activities.

(b) Normality Test-
Table- 5.1.20-Description of Normalcy Test

Shapiro–Wilk Test	
W People	0.798
W Processes	0.920
W Systems	0.909
p-value	< 0.0001
alpha	0.05

Shapiro-Wilk Test was applied to test the normalcy of data where the null hypothesis was devised so that the data are normally distributed. At the significance level of

0.05 the decision was to reject the null hypothesis that the samples are not different. In other words, the difference between the samples is significant. Test results denoted W statistic for People related Risk at 0.798, for Process related Risk at 0.920 and Systems related Risk at 0.909. The computed p-value arrived at<0.0001 in all the three hypotheses test data analysis which was lower than alpha. Based on these results, we rejected the null hypothesis and concluded that the mean scores for all the three operational risk contributors, People, Process and Systems, is different.

(c) T Test Results & Interpretation

From the collected data, a paired-samples t-test was also conducted to decide the Overall Level of Risk associated with various ORCs and following results were obtained:

Table- 5.1.21- Descriptive Analysis

Overall Observations	Processes Risk	1830
	Systems Risk	1457
	People Risk	2941
Mean	Processes Risk	15.776
	Systems Risk	12.560
	People Risk	25.353
Standard Deviation	Processes Risk	4.865
	Systems Risk	7.117
	People Risk	4.959
Difference between Mean	Processes & Systems Risk	0.595
	Systems & People Risk	8.690
	People & Processes Risk	9.575
p-value (two tailed)	Processes Risk	<0.0001
	Systems Risk	<0.0001
	People Risk	<0.0001
t (Observed value)	Processes &Systems	6.788
	Processes & People	24.383
	Systems & People	24.682
t (Critical value)		1.981
DF		115
Alpha		0.05

Null hypothesis was formulated that difference among the means of Processes risk contributing factors, Systems risk contributing factors and People risk contributing factors was equal to zero and at the significance level of Alpha=0.05 the conclusion

was to reject the null hypothesis that the samples are not normal. From the results it was observed that there is significant difference among all the 3 ORCs- People(2941), Process(1830) and Systems(1457). Similarly, the mean goodness score, on a scale of 1 to 3, for Process risk samples at 15.776, for Systems Risk samples at 12.560 and for People risk samples at 25.353 showed significant difference. Similarly difference among the standard deviation of all these three risk samples was also observed. Likewise, the t (observed value) for the relationship between processes and systems at 6.788, processes and people at 24.383 and systems and people at 24.682 clearly indicated rejection of null hypothesis as for all these the observed values are greater than the critical value of 1.981. P-value computed at <0.0001 for all the three cases being less than the significance level alpha=0.05 conveyed similar outcomes. All these results suggested rejection of null hypothesis for all the three hypotheses and it was concluded that mean for all these risk contributing factors is significantly different from each other and most of the risks contributing factors arise from People related risks instead of Processes or Systems related risks in connection with pre- investment, investment capturing and post-investment activities and thus **our objective is proved**. A brief summary of all these theses are detailed in the following Table- 5.1.22:

Table-5.1.22-Summary of Hypothesis Test Results

Hypotheses	Results	Objective
Hypothesis 1 Most of the functions related to pre- investment, investment capturing and post- investment activities entail high risk as against medium risk.	Not Rejected – Not Supported by data	Proved
Hypothesis 2 Most of the functions related to pre- investment, investment capturing and post- investment activities entail low risk as against high risk.	Rejected – Not Supported by data	Proved
Hypothesis 3 Most of the Low risks arise from People instead of Processes.	Rejected – Not Supported by data	Proved
Hypothesis 4 Most of the Low risks arise from Processes instead of Systems.	Rejected – Not Supported by data	Proved
Hypothesis 5 Most of the Low risks arise from People instead of Systems.	Rejected – Not Supported by data	Proved
Hypothesis 6 Most of the Medium risks arise from People instead of Systems.	Rejected – Not Supported by data	Proved
Hypothesis 7 Most of the Medium risks arise from Systems instead of Processes.	Rejected – Not Supported by data	Proved
Hypothesis 8 Most of the Medium risks arise from People instead of Processes.	Rejected – Not Supported by data	Proved
Hypothesis 9 Most of the High risks arise from Systems instead of Processes.	Rejected – Not Supported by data	Proved
Hypothesis 10 Most of the High risks arise from Processes instead of People.	Rejected – Not Supported by data	Proved
Hypothesis 11 Most of the High risks arise from Systems instead of People.	Rejected – Not Supported by data	Proved
Hypothesis 12 Most of the risk contributing factors arise from Systems instead of Processes.	Rejected – Not Supported by data	Proved
Hypothesis 13 Most of the risk contributing factors arise from Processes instead of People.	Rejected – Not Supported by data	Proved
Hypothesis 14 Most of the risk contributing factors arise from Systems instead of People.	Rejected – Not Supported by data	Proved

5.4- Relevancy Ranking of Professional Responses-

Analysis of data collected from experts and testing of different hypotheses revealed that *People* related risk-contributing factors generate *High Risk*, and *Processes* related risk contributing factors *Medium Risk* and *Systems* related risk contributing factors generate *Low Risk* severity factors. Hence it was clear that paramount risk continues to be on account of people which needs to be assessed and ascertained well to take appropriate steps to manage it. People related factors play most important role in operational risk management in financial institutions. Nonetheless, it was also thought fit to itemise the major events/intervention points, which are prominent but vulnerable and demand continuous, focussed and preferred attention. As such, relevancy ranking of responses was conducted for classifying prime areas and intervention points which needed preferred attention from the higher management of banks and financial institutions.

We append hereunder results of this relevancy ranking according to the severity level envisaged and decided by the professionals for People, Processes and Systems in Table-5.1.23 Table – 5.1.24 and Table – 5.1.25 respectively. Based on their responses, we index hereunder the most answered question under a '*specific risk*' category at first rank, followed by the second most, then third and so on and so forth. For example if a particular question has been responded by more than 98% respondents, under "High Risk" category of responses, it has been ranked and weighed accordingly.

5.4.1-Relevancy Ranking forHigh Risk Severity Factor–*People*

Table-5.1.23- Relevancy Ranking for High Risk Severity Factor–
***People* – Descending Order**

	People Related Risk Factors	Rank	% of Professionals rated in High Risk
1	Non-evaluation of performance and control mechanisms. Slips in getting feedback on dealers'/investment managers' performance and thus unable to determine whether the performance has been due to luck or skill or favourable circumstances.	1	100
2	A trader's belief that in this era of internet and online 24X7 business activities, the old concept of undertaking dealing activities during predetermined business hours and at a designated place- 'dealing room' only should be dispensed with.	2	99
3	Disregard for conventional training at an academic institution /training centre and heavy dependency on various websites, blogs, books, magazines, newspapers	3	98
4	A trader's/investment manager's goal being first generating steady and big profits and then considering safety and survival.	4	94
5	Blindly following advices/trading tips of senior traders/market pundits and acting accordingly.	4	94
6	Considering trading as an individual's performance instead of teamwork.	5	70
7	Failure in maintenance of strict confidence by the staff involved in the processes related to investment, especially trading activities. Belief that discussing open positions with peer group dealers/ friends helps in making objective decisions.	6	66
8	Paper trading makes a trader afraid of actual trading, particularly if (s)he has experienced losing money therein. It also makes a trader less emotional while making actual trading.	6	66
9	Failure in developing a written trading plan and act accordingly and frequently adopting the tactics of getting in or getting out from the market.	7	64
10	Poorly designed performance incentive schemes for		

	treasury personnel. Different schemes for front and back office personnel.	7	64
11	Showing scant regard for fundamental and technical analysis and firmly believing in the saying-"Trading is a "on-the-spot-decision-making"–game.	8	61
12	Trading Discipline - In a trading room, a trader's unwillingness to refer his/her trading dairy/spread sheet frequently for analysing price levels, entry/exit	8	61
13	points. Losing trades disturb everyone. Risks attached with a trader's/investment manager's inability in shaking off the setbacks and accepting these as a cost of doing business in the market.	8	61
14	Risks attached to improper alignment of trader's strengths, his/her style of functioning vis-à-vis unavailability of resources, information, market favourability etc.	9	51
15	A trader's/investment manager's reluctance in reviewing past performances, especially poor or bad performances. Believing that these carry, among other things, emotional setbacks which hamper decision making process.	10	45

It is evident from the above that first five factors play most critical role and need to be focused upon most. These factors are-

- Evaluation of performance and control mechanisms. Slips in getting feedback on dealers'/investment managers' performance and thus unable to determine whether the performance has been due to luck or skill or favourable circumstances.

- A trader's belief that -in this era of internet and online 24X7 business activities, the old concept of undertaking dealing activities during predetermined business hours and at a designated place-'dealing room 'only should be dispensed with.

- Disregard for conventional training at an academic institution /training centre and heavy dependency on various websites, blogs, books, magazines, newspapers.

- A trader's/investment manager's goal being first generating steady and big profits and then considering safety and survival.

- Blindly following advices/trading tips of senior traders/market pundits and act accordingly.

More than 94 per cent of professionals have rated these five as highest risk carrier under people risk category. Thus a due emphasis on developing proper evaluation mechanisms, strictly adhering to them coupled with emphasis on training and having rational goals to achieve profits through trading goes a long in avoiding risks and in managing people related risk factors. Second group of factors that matter the most having high risk between 60 per cent to 70 per cent as highlighted by professionals include team effort, maintaining strict confidence by the staff, having a written trading plan and following the same, putting well defined reward mechanism, doing scientifically fundamental and technical analysis, following trading discipline and professional competence to reshuffle the portfolio on time goes a long way in managing people related risk. Above all, what matters the most is right placement of traders having required skills and continuous review of performance.

5.4.2-Relevancy Ranking for Medium Risk Severity Factor–*Process*

Table-5.1.24- Relevancy Ranking for Medium Risk Severity Factors –
Processes **– Descending Order**

	Processes Related Risk Factors	Rank	% of Professionals rated in Medium and High Risk
1	Slippages in ensuring that deals undertaken are in line with the market practices and policy guidelines/ rules from RBI, SEBI, ISDA, Fixed Income Money Market and Derivatives Association (FIMMDA), FEDAI, Clearing Corporation of India Ltd etc.	1	98
2	Poor or wrong identification of prospective security and adopting wrong approach for conducting investment analysis.	2	98
3	Inadequately and poorly defined administrative/financial powers, feeble demarcation of responsibilities/duties of various treasury functionaries in their decisions making process.	2	98
4	Issues related to deal execution, accounting entries, exposure limits, cut loss limits etc.	3	97
5	Lack of timely review of portfolio.	4	96
6	Slippage in adhering to various norms related to investment categorization, shifting, valuation, income recognition and classification	5	82
7	Non- adherence of Dealing room code of conduct – installation of voice recorders, no use of mobile phones in dealing etc.	6	78
8	Not adhering to various guidelines/norms related to volume, maturity, holding period, duration/modified duration, stop loss, defeasance period etc. for trading book and HTM portfolio of securities.	7	71
9	Issues related to inadequate/non-compliance of various act, rules and regulations, notifications, guidelines, instructions from RBI, SEBI, Government of India, Board of Directors of the bank/FI or any other regulatory, quasi or semi quasi body.	8	68
10	Issues related to approvals/sanctions from the appropriate authorities for all investments/trading activities.	8	68

11	Issues related to deals validation. Invalid/incomplete/late receipt of deal confirmation and their half-hearted verification for accuracy and genuineness. Improper monitoring of pending deals with little attention for generating timely and meticulous reports.	9	66
12	Irregular and infrequent review of counterparties and brokers' list, completing various "KYC" norms, Failure to ensure adherence to a code of conduct by the approved/empanelled brokers and getting it renewed by them periodically.	9	66
13	Not adhering to Code of Conduct specified by FEDAI/FIMMDA for respecting internal guidelines, various parameters of model code of conduct such as no use of mobile phones in dealing room, compulsory availment of two weeks' leave during a year etc.	10	65
14	Delayed and improper updation of various policies, instructions and guidelines in line with the relevant Regulatory /Statutory requirements and RBI directives.	11	60
15	Delayed/partial and or irregular generation of various daily and periodical reports for any breach out in limit / violation made or the limits which are about to breach such as Stop Loss etc. and their reporting to authorities, timely and as per laid down norms.	12	50

Professionals forewarn processes related risk in investments as medium risk and suggest that compared to the top people related risk these can be managed with a greater degree of certainty. Processes related risks are mainly associated with the problems of accurately processing, settling, taking or making deliveries of trades in time and as per norms etc. Process risks also arise from factors such as complying with various regulations, financial powers to dealing officers, timely review of portfolio, compliance of rules and regulations, adherence to code of conduct etc. Amongst the most crucial process related risk factors, which professionals put forward from medium to high category in the range of 96 per cent and above are-

- slippages in ensuring that deals undertaken are in line with market and policy guidelines, poor or wrong identification of prospective security,
- inadequately defined administrative and financial powers,
- issues related to deal execution, accounting entries, exposure limits etc. , and
- timely review of portfolio.

In the second group of factors under processes related risks to which professionals have given high weightage in the range of 71 to 82 percent are slippages in adhering to various norms, dealing room code of conduct, ensuring that processes adhere to various guidelines/norms related to volume, maturity, holding period etc. Third category of processes related factors to which professionals in the range of 50 to 68 per cent have given medium or high risk are non-compliance of various acts, rules and regulations, issues related to approvals and sanctions from appropriate authorities, issues related to deal validation, irregular and infrequent review of counterparties and brokers' list, adherence to code of conduct by FEDAI/FIMMDA, delayed and improper updation of various policies, instructions and guidelines, and delayed /partial and or irregular generation of various daily and periodical reports for any breach. Thus by putting right processes in place, banks can minimise their risks. What it requires is to streamline systems and procedures, so that unnecessary mishappenings are avoided.

5.4.3-Relevancy Ranking for Low Risk Severity Factor–*Systems*

Table-5.1.25- Relevancy Ranking for Low Risk Severity Factor –
Systems **– Descending Order**

	Systems Related Risk Factors	Rank	% of Professionals rated in Medium and Low Risk
1	Inefficient monitoring of the hardware and software changes made in the system during the year. Casual approach in demanding timely, safe and efficient services from the vendors.	1	98
2	Making inefficient review of various market changes and their impacts. Failure in observing the degree to which the conducted trades/deals are in line with market conditions and initiating effective steps accordingly.		
3	Irregular and infrequent backup of data ,its storage and other system related security controls issues	2	97
4	Inadequate training and user documentation for the system related activities.	3	96
5	Failure in identifying system related natural and man-made threats, affecting availability, confidentiality and integrity of information/data.	4	94
6	Deficiencies in creation of Master Instruments/ Securities List. Wrong or faulty assignment of security codes, wherever applicable.	5	93
7	Inconsistency and inadequacy of the system in meeting various regulatory requirements/ directives related with reporting, privacy and other compliances.	6	91
8	Improper or little attention to the various system related risks identified by an auditor.	6	91
9	Incomplete, insufficient and undue delay in updation of data related to brokers/ counterparties. Missing check signal for breach out of limit of brokers' and counter parties. Half-heartedly efforts in ensuring correctness and completeness of execution and settlement of various investments/ trading transactions.	7	88
10	Irregular review and testing of DRP and BCP. Issues	8	85

	related to its implementation etc., staff awareness about their respective role in the DRP/BCP		
11	Slippages in ensuring that the business lines, performing various regulatory business activities, are complete and without overlap (e.g. collection, updation and monitoring of data for calculation and maintenance of CRR are separate yet interlinked).	9	61
12	Role of "inbuilt "systems check points. Monitoring control exceptions detected/ not detected by the systems controls/ check points.	10	59
13	Failure in ensuring that various rules/guidelines/instructions laid down in different policies for cut loss limits are adhered to.	11	58
14	Password control- weighed in balance but always found wanting.	12	53
15	Failure in ensuring that all trades are concluded over recorded lines and recordings of telephonic conversations are maintained for each deal undertaken for determining, inter-alia respective trading position and also fol1owing regulators/internal guidelines.	13	36

Professionals' responses suggest that systems related risk factors contribute comparatively low risk in operational risks associated with managing investments. More than 91 per cent of professionals postulate seven factors out of the total fifteen, mainly accountable for creating higher degree of risk within the low risk profile. They suggest that these seven factors need to be given greater importance to streamline investment decisions and associated risk management. These seven factors are-

- inefficient monitoring of the hardware and software changes made in the system during the year,
- making inefficient review of various market changes and their impacts,
- irregular and infrequent backup of data, its storage and other system related controls issues,
- inadequate training and user documentation for the system related activities,
- failure in identifying system related natural and man-made threats, effecting availability, confidentiality,

- deficiencies in creation of master instruments/securities list,
- inconsistency and inadequacy of the system in meeting various regulatory requirements/directives and improper or little attention to the various system related risks identified by an auditor.

Other two systems related risk factors were given relatively lower importance, as number of professionals who indicated these being in medium and low risk ranged between 85 to 88 per cent each. The two factors that were identified under this category are - Incomplete, insufficient and undue delay in updation of data related to brokers/counterparties and irregular review and testing of Disaster Recovery Plan (DRP) and Business Continuity Plan (BCP) and issues related to their implementation etc.

Remaining five factors were rated by 36 to 61 per cent of professionals as carrying medium to low risk. However within systems related factors, some of the most critical factors that have been given a high risk by the experts are as under:

- failure to ensure that all trades are concluded over recorded lines and recordings of telephonic conversations are maintained for each deal undertaken for determining, inter-alia respective trading position and also fol1owing regulators/internal guidelines.
- Password control- weighed in balance but always found wanting.
- Role of "in built "system check points. Monitoring control exceptions detected/ not detected by the systems controls/check points.

Professionals suggest that though systems related factors contribute lesser risk compared to other two namely people and processes, nevertheless special care should be given to these factors while developing systems and ensuring their execution.

5.5 - People, Processes and Systems – Correlation Tests /Association Tests

It is important to understand the relationship between different factors contributing to risk in investment activities of banks i.e. between various risk intervention points,

factors related to systems and process, systems and people, process and people. Correlation determination would be helpful to identify risk perspectives in terms interrelationships and in turn for devising future strategy. As they say, "higher the correlation coefficient, better the formulation of predictions to reduce potential errors". Correlation analysis also helps in measuring closeness of the linear relationship between the defined variables e.g. how significant or how strong is the association between two variables. For example, if people related risk contributing factors increase, do these affect the other two relating risk factors?

Though in our research, empirical observations and data analysis of professional responses, pie chart depiction, hypothesis analysis and the *intuition* as well, all indicate that all the subject variables, people, process and systems are linearly related, but what is unclear is the *degree or strength* attached to these relationships.

As such, we attempt a statistical correlation analysis to determine the strength of association between the various risk contributing factors in the following analysis-

5.5.1- Measuring Association- Correlation coefficient

Correlation coefficient is an abstract measure and suggests that the higher the absolute value, stronger the relationship. It measures the proportion of the total variation in the dependent (response) variable that is explained by the least-squares regression line. It also indicates how closely the data fit a linear pattern.

There are a few famous approaches for correlation analysis- Pearson product moment correlation, Spearman's rank-order correlation and Kendall's tau correlation. Pearson correlation coefficient benchmarks linear relationship and measures the strength of linear relationship between X and Y. It is considered effective in analysing continuous data. Whereas, Spearman's rank-order correlation coefficient benchmarks nonlinear, but monotonic relationship and is considered better for ordinal data analysis. Kendall's Tau measures correlation between two ordinal-level variables and is considered most appropriate for square tables. (Nian, 2010)

Nian (2010) says that although Kendall's Tau and Spearman's Rho, both are suited for ordinal data analysis, they imply different interpretations. Spearman's Rho is considered as the regular Pearson's correlation coefficient in terms of the proportion of variability accounted for, whereas Kendall's Tau represents a probability, i.e., the difference between the probability that the observed data are in the same order versus the probability that the observed data are not in the same order.

In our research, we have collected data from professionals to identify major ORC and assess risk severity attached to these. The participants were requested to rate their observations on a Likert rating scale of high, medium, moderate, slight and low. A rating of high was to be reckoned with more risk severity than a rating of medium, moderate, slight and low.

This data collected is statically termed as "ordinal data". Ordinal data is a set of data where the values / observations belonging to it can be ranked (put in order) or have a rating scale attached. Such data can be counted and ordered, *but not measured*. Whereas, a continuous set of data, values / observations take on any value within a finite or infinite interval i.e. in simple terms, one can count, order and *measure* continuous data. Example of such data are height, weight, temperature, time etc. Pearson product moment correlation coefficient is appropriate for such type of continuous and interval data analysis whereas the Spearman's and Kendall's correlation coefficients are better suited for both ordinal and interval data. However, between the Spearman and Kendall, we have chosen Spearman's rank-order correlation coefficient for analysis, because our data is ordinal and for Kendall's Tau analysis data should fit for square table.

5.5.2- Spearman's Correlation

Spearman's rank correlation coefficient is calculated by applying the Pearson correlation formula to the ranks of the data rather than to the actual data values themselves. In doing so, many of the distortions plagued with the Pearson correlation viz, undue influences of outliers, unequal variances, non-normality, and nonlinearity are reduced considerably. Spearman's rank correlation coefficient, Rho, is computed by the following formula:

$$Rho = \frac{\left[1 - 6\sum (d_i)^2\right]}{\left[n(n^2 - 1)\right]}$$

where

di is the difference between the ranks of Xi and Yi.

rs = +1, if there is a perfect agreement between the two sets of ranks.

rs = - 1, if there is a complete disagreement between the two sets of ranks.

Spearman's correlation coefficient varies from -1 to +1 and the absolute value of ρs (rho) describes the strength of the monotonic relationship. The following Table-5.1.26 describes the monotonic relationship between the risk variables, people, process and systems-

Table-5.1.26- Correlation matrix (Spearman)-

Variables	People	Process	Systems
People	1	-0.388	-0.085
Process	-0.388	1	-0.013
Systems	-0.085	-0.013	1

As may be observed, correlation among all the factors is negative. A negative correlation indicates an inverse relationship whereas one variable increases the second variable decreases. The correlation between people and process at -0.388 suggests that, just as we predicted, as people related risk factors increase, process related risk factors decrease. Similar is the relationship between people and systems and process and systems. The negative relationship suggests that when one risk factor increase other decrease simultaneously. This supplements our data and hypothesis analysis results that people are most risk contributing factor as these risk intervention points, parameters also affect process and systems severally.

Table-5.1.27- Coefficients of determination (R^2)

Variables	People	Process	Systems
People	1	0.150	0.007
Process	0.150	1	0.000
Systems	0.007	0.000	1

Although the correlation coefficient is the best known and subject to statistical testing, perhaps the coefficient of determination is more meaningful (Richard, 1990). The coefficient of determination (r^2), obtained by simply squaring the correlation coefficient r, is defined as the percent of the variation in the values of the dependent variable (y) that can be "explained" by variations in the value of the independent variable (X). This technique results in a percent value which makes it easier to interpret more precisely. Thus, in the above Table-5.1.27 the relationship between People and Process at 0.15 suggests that only 15% of the process related risk factors can be explained or accounted for variation in variable x i.e. people related risk factors. Similarly, the correlation between people and systems at 0.007 that if people related risks factors increase, only 7% of the systems related risk factors can be held responsible for variation in people related risk factors. Data further suggest that there is not strong relationship process and systems i.e. change in one variable does not affect much the other variable.

Figure 5.1.12- Scatter Diagrams Showing Varying Degree of Relationship between people and process; people and systems; and systems and process.
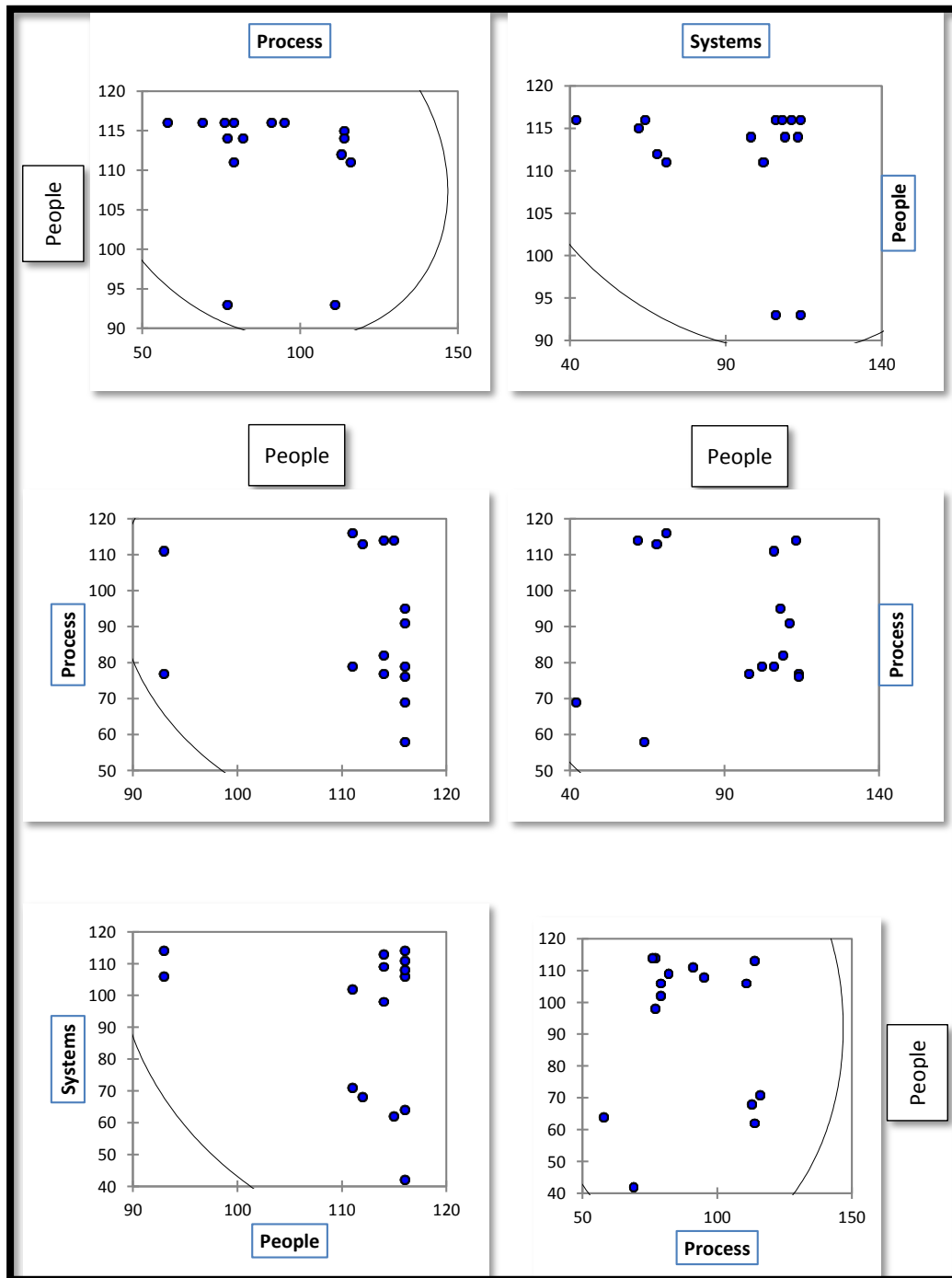
The above graphical representation of quantile-quantile (q-q) plot in Figure 5.1.12, illustrate the status of correlation coefficient, r,   between the variables people, process and systems to visualize relationship. It can be observed from the graphical presentation that in almost all the figures, there is no positive relationship between the variables and the r is negative in all cases. A negative correlation means that the cloud slopes down, as one variable increases, the other decreases. Data points on the corresponding graphs are randomly scattered and approximate a circle. In few relationships the data points are tightly clustered along a line or like a cloud which show strong relationship, though inverse.

Figure-ature*people and process*- scattered data, clustered circle-like cloud; zero and negative relationship - r = -0.388

Figure-atter*people and systems*- scattered data clustered circle-like cloud - zero and negative relationship- r = -0.085

Figure-atter*process and people* - scattered data weakly clustered around a line; zero and negative relationship - r = -0.388

Figure-atter*process and systems*- scattered data- zero and negative relationship- r = -0.013

Figure-atter*systems and people* - scattered data with no linear correlation - zero and negative relationship - r = 0.085

Figure-atter*systems and process* - scattered data clustered weakly along a line ;linear correlation and negative relationship r = -0.013

All these figures depicting negative correlation indicate that as the variable x, say people, increases, variable y, say process, decreases. An example of a such correlation may be people related ORC factor "evaluation of performance and control mechanisms" relative to the process related risk factor of "timely review of portfolio" where when the process related ORC percentage increases, a decrease in the people related ORC factor is observed. Similar is the situation of people and systems related data where there is negative relationship between the variables and data points on the corresponding graph are randomly scattered and approximate a circle .

The above tables and graphical presentation describe status of correlation to which these variables are inter related. The negative values of correlation coefficients, r, indicate that the variables, people, process and systems variables have inverse relationship i.e. when one variable increases the other variable decreases. This shows the nature of association among people, process and systems and strengthens our prediction that most of ORCs entail high risks and need to be attended accordingly. Out of which the relationship among people related risks with other ORCs be given preferred attention.

This analysis also clearly reveals that risk management in investment and treasury operations of bank requires strong people, processes and systems related framework and an integrated perspective of the three can help in dramatically minimising the overall risk as these factors are negatively related. Looking at the magnitude of negative relationship being relatively more stronger between people and processes as compared to people and systems; greater benefit can be derived in minimising the risk by putting proper people and processes related factors in place.

People related risks are the most important drivers of operational risks in treasury and investment activities and are often difficult to spot, detect and identify. These risks involve a lot of conjecture and consideration of probabilities. Risk factors in the dealing rooms arise in wake of inappropriate financial training, lack of risk culture and incentive structures on trading floors. Across the globe, trading activities of dealers, fund managers, financial professionals, corporate insiders etc., christened as "rouge trading", "insider trading" unfold same mechanism- undetected fictitious trades covering undetected unauthorised open positions. People related risks in trading activities or rouge trading have always been part and partial of the financial industry, given access to substantial money combined with loose controls and procedures and, of course, temptation. Normally related banks/FIs nor corporates do not share such incidents/ losses among the mass, hence the data is not easily available. However, regulatory and enforcement agencies keep on spotting and punishing such perpetrators and also share their modus operandi with the society. A brief detail of a few such cases, highlighting the importance of people risk management are given hereunder in Table 5.1.28:

Table-5.1.28- Examples of People Risks in Treasury & Investment Activities

Sl. no.	Important Incidents of People Risks in Treasury & Investment Activities	Operational Risk Classification
1.	In early 1990's, Harshad Shantilal Mehta siphoned off funds from inter-bank transactions and bought shares heavily at a premium across many segments, triggering a rise in the Sensex. he managed to get issued fake Banks Receipts and passed these on to other banks and the banks in turn gave money to Mehta, assuming that they were lending against government securities. This money was used to drive up the prices of stocks in the stock market. When time came to return the money, the shares were sold for a profit and the BR was retired. When the scheme was exposed, banks started demanding their money back, causing the collapse of Sensex. People got bankrupt, a few committed suicide.	People, Process, Systems
2.	In the early 2000s, Ketan Parekh, ramped up shares of selected firms in collusion with promoters and inflated their prices in the market. Ketan formed a network of brokers from smaller exchanges like the Allahabad Stock Exchange and the Calcutta Stock Exchange, and purchased shares of these companies through benami identities or in the name of poor people living in the shanty towns of Mumbai. Systems collapsed, companies and people got bankrupt and lost billions.	People, Process, Systems
3.	In 1995s, Nick Leeson a derivatives trader in Barings Bank at its Singapore branch engaged in unauthorized speculative trading, resulting in the collapse of Barings Bank, the United Kingdom's oldest investment bank.. The $1.3 billion dollars of liabilities he had run up was more than the entire capital and reserves of the bank. The fraud prompted banks worldwide to tighten internal checks.	People, Process, Systems
4.	In 1990s, Toshihide Iguchi, a New York bond trader for Japan's Daiwa Bank, charged with hiding $1.1 billion in trading losses he accumulated over 12 years. The bank later pleaded guilty to failing to notify U.S. authorities sooner. It was hit with $340 million in fines and shut its	People, Process, Systems

	U.S. operations. Iguchi was sentenced to four years in prison and fined.	
5.	In 2012, the USA, regulatory authority, SEC charged 29 defendants for widespread and repeated insider trading in the securities of 15 companies generating illicit profits totalling nearly $90 million. The illegal conduct involved Raj Rajaratnam and his New York-based hedge fund Galleon Management making cash payments in exchange for material non-public information. The case eventually ensnared corporate executives, consultants, rating agency personnel, proprietary traders, hedge fund executives, and public relations personnel.	People, Process
	On September 15, 2011, the Investment banking arm of UBS announced a loss of $2.3 billion following unauthorized trading activities, less than four years after the disclosure by the Société Générale, on January 24, 2008 of the largest rogue trading loss on record of €4.9 billion. Both frauds have been perpetrated by traders of the same age and profile, coming from back office functions, working on the same type of products, synthetic funds tracking European indexes (ETFs) – an activity that was "supposed to be a low-risk area". Indeed, when fully hedged. Except it was not. At UBS, Adoboli has covered his open positions using fictitious trades according to the same mechanism as Kerviel - forward-settling cash ETF transactions that would not require immediate confirmation or settlement. He was charged for fraudulent activities dating back 2008.Adoboli worked on the Swiss bank's Delta One desk — which typically handles relatively low-risk trades — but that didn't stop him from reportedly speculating on the EuroStoxx, DAX and S&P 500 indexes over the course of three years, and then hiding his losses with falsified accounting records. Adoboli, who pled not guilty to all charges, is presently under trial.	People, Process, Systems
6.	In 2010, information technology major Wipro detected a fraud committed by one of its employees, who siphoned off around $4 million from company's funds by getting	People, Process, Systems

	access to a colleague's password. The money was diverted from one of Wipro's bank accounts over the last couple of years and came to light when it showed an overdraft transaction despite the company having sufficient balance. The company confirmed that only one person was involved in the act, who was responsible for maintaining its financial books and had powers to authorise payments whenever needed. The fraud did not show up in the company's routine accounts reconciliation as it involved small amounts over a long period. Reportedly, the employee siphoned off company's money to his personal accounts in multiple transactions of between Rs 1 lakh to Rs 1.2 crore.	
7.	In 2006, Rajiv Gandhi, former company secretary and CFO of Wockhardt, along with his immediate family members, was alleged to have traded in the pharma company's shares on the basis of unpublished price-sensitive information (Wockhardt's financial results). SEBI imposed a monetary penalty of Rs 5 lakh on Gandhi.	People, Process
8.	In 2006, SEBI held DilipPendse, former MD of Tata Finance, guilty of insider trading. Pendse was alleged to have helped J Talaulicar, former director of Nishkalp Investment and Trading, a subsidiary of Tata Finance, to offload a large chunk of the NBFC's shares at a premium, prior to the public announcement of Nishkalp's huge loss. SEBI imposed a monetary penalty on Pendse, besides debarring him from dealing in the securities market for 2 years.	People, Process
9.	In 2004, Samir Arora, former Asia-Pacific head of Alliance Capital Mutual Fund, was charged with indulging in unfair trade practices for disposing off a considerable quantity of shares held by the fund under his management, which resulted in a sharp decline in the valuation of Alliance. The incident came into light when the US-based fund decided to sell its indian interests. SEBI banned Arora from dealing in securities in any manner for a period of five years.	People, Process

10.	In 1998, SEBI pulls up Hindustan Lever (now Hindustan Unilever) and its then five directors SM Datta, KB Dadiseth, R Gopalakrishnan, A Lahiri and MK Sharma for alleged misconducts. The case involved HLL purchasing a sizeable chunk of Brooke Bond Lipton shares from UTI, prior to its public announcement related to the merger of the two outfits, which, according to SEBI, was price sensitive information. Both HLL and Brooke Bond were subsidiaries of the same parent — Unilever. SEBI passed an order and directed HLL to compensate UTI to the extent of Rs 3.04 crore. HLL then approached the finance ministry, which was then the appellate authority on SEBI orders. MoF ruled in favour of HLL. Following this, SEBI filed an appeal in the Bombay HC. Status: The outcome about final verdict is not available.	People, Process

All these incidents clearly indicate that right placement of professionals having requisite skills and continuous review of their performance is the most important factor in managing operational risks which has also been proved in our above various hypotheses and relevancy analysis.

5.6- To Sum Up- Lesson from the losses[24]

As may be observed from the above incidences, more than the similarities of traders or products, the way extreme rogue trading losses emerge is strikingly similar in every case: a trader books a loss on unauthorised trading positions that are not detected soon enough. He hides his positions and losses using fictitious profitable opposite trades, compensating both the losses and the directional bets. He doubles up in a recovery attempt and eventually either turns himself in, like Harshad Mehta, or is finally uncovered like Ketan Parakh, or flies and blows up the bank, like Nick Leeson at Barings.

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[24] Excerpts from the article "Lessons Not Learned: The Role of Operational Risk in Rogue Trading", by Amy Poster and Elizabeth Southworth in Risk Professional, June 2012, available from www.garp.org

5.6.1-The wrong signals

Trading is a highly transactional business involving high money flows, an operational risk nightmare. Something can go wrong at every transaction and, given the amounts at stake, each error can cost millions. Therefore, trading activities are immersed in controls, market risk positions, P&L results, risk limits per trader or per desk in the front office, trade checks and validation in middle office, trade confirmations, monitoring, payment and settlement in back office, each handled by different teams. All parties use daily, weekly reporting and more such as, activity per trader, P&L, unusual transaction compared to standards, deferred start dates, pending confirmations, unsettled deals, unmatched deals, etc. Still things go wrong. But, why do they?

Again, a poor risk-aware culture in the front office and a lack of financial training in back and middle offices expose banks/FIs to extreme rogue trading events. Too often trading limits are exceeded in dealing rooms with few or no consequences for the trader, especially when the trading result is a gain. This sends mixed signals to traders, the younger ones in particular, that it is consented to exceed the trading limits as long as you book a profit. Despite, knowing well across the group that, it is against the systems and procedures of every bank/ FI and yet leniency remains in this area.

Trading limits increase with experience, but also with past profits. A young trader can be lucky for one or two years in a row and end up managing a book far larger for his competence and experience. If he fails or breaks under pressure, it will result in a loss of "only" a few million, stopped after a day or two in a good control environment. No one will hear about it in the press. However, in a failing control environment, this can turn into catastrophic losses, like in case of Harshad Mehata or Ketan Parakh.

The difference between a good and a failing environment is the performance of the support functions, mid office, back office and the risk management department. Even though the risks are generated in the front office, there have been incidences where some banks put all the control pressure on the support functions, thus de facto

absolving front office for all the risks they generate. This action again sends the wrong signals. Banks need traders who are risk takers with a personality fit to work well under pressure in a high speed, high adrenaline environment. However, with strong characters comes the need for strong leadership. It is the responsibility of the management of the trading room to send clear signals on what is allowed and what is not allowed on the floor. Each trader exceeding his limit should be charged with internal fraud and his bonus should be lost, regardless of whether his position turned into a profit or a loss. It may be added that breaching market risk limits fall indeed in the category of internal fraud since in that case the trader is taking unauthorised risk on someone else's resources, i.e. the capital of the bank.

5.6.2- ORM Challenges – People Risks- Slipping through the nets

When a rogue trader gambles willingly on the bank's resources, he uses fictitious transactions to cover his steps and fake profits to cover his losses. Such actions generate high transaction modifications and cancellation rates, unusual transactions with delayed start dates, off-market price deals and, most importantly, absence of third party confirmations – the first characteristic of false trades. All of these elements surface in every control and risk report. Pending confirmations will show in end of day reports, unusual market transactions will be part of daily exception reports. And each of these alerts, if followed up and investigated fully, could lead to the detection of the fraud.

Still, alerts are ignored, or unnoticed. Not voluntarily, but due to inattention, lost in the pages of reports, supervisors or the concerned managerial authorities receive every day. But at times, these are also overlooked due to ignorance of what constitute a suspicious transaction, an abnormal price or an unusual practice. Missing confirmations are neglected or overlooked. Margin calls – sometimes far too high compared to the trader's limits or products – are paid without further questioning.

Staff profiles in support functions vastly differ from the traders they are asked to control. Some are there for a first experience in banking before moving on to another job, the front office perhaps. Others take it as an administrative job after a degree in an entirely different field, such as English Literature or History. In the first group,

turnover will be high. In the second group, the lack of financial background will be blatant. For all, there is no prerequisite or training in risk and risk management before starting the job.

Relying, for highly technical controls, on people who know very little about the features, the processes and the order of magnitude of the products and activities they are asked to monitor, is optimistic at best. Even if many banks – some being pushed by their regulator – have undertaken training programmes for their back and middle office staff, the needs are still immense. A few days' session on the market environment, the features of the financial products and the type of amounts and prices that are expected per activity, as well as the common mechanisms of frauds, will do wonders in increasing the efficiency of controls and the investigation of alerts.

Besides technical training, empowerment of the support functions vis-à-vis the front office is a necessity. Segregations of duties – the corner stone of fraud prevention – require that front office and back office functions operate under separate authorities: people booking transactions are not the ones validating them, confirming them and settling them. Duties are segregated in every bank/ FI in the organisation charts but in reality this is less distinct. It is common for controllers, pushed back by assertive traders, to be too intimated to ask for further explanations about a transaction they do not understand. This is not effective risk management. Appropriate training together with a clear corporate message that control is a priority, not a ticked box for the regulator, will lead to proper empowerment and effective control of trading activities.

More controls or more regulation are not the answers to rogue trading. Rogue trading cannot be stopped by more regulation or greater levels of controls. Banks control their trading activities by controlling their traders at the source, in the front office, acting on every breach of limit. Banks control their back office activities by training and empowering staff, which will turn existing controls into effective ones. People risk management "always mange more".   In Annexure-4 we also detail similar incidences which took placed across the globe and brought to justice by the enforcement agencies.

5.7-Summary

In tandem with the objectives framed (chapter3.2), all these 14 hypotheses were devised to identify major operational risk contributor. The fourteen hypotheses were manifested to estimate the overall level, degree and severity of risks attached with these ORCs. Analysis of first two hypotheses proved that most of the functions related to pre- investment, investment capturing and post- investment activities entail high degree of risk. The next three hypotheses proved that amongst the three ORCs, Systems generated risks encompass Low level of Risk Severity. Hypotheses listed at 6, 7 and 8 helped in confirming the assumption that Processes generated ORCs result in Medium level of Risk Severity and the hypotheses serialed at 9, 10 and11 confirmed justification in adjudging   people as the Highest Risk severe ORC. This was supplemented by the hypotheses numbered at 12,13 and 14 which concluded that people are the most sensitive factor and carry highest degree of risk in treasury and investment business line.

Risk management is a process and consistent and continuous evaluation of risk contributing factors is necessary. We extend our analysis by undertaking relevancy ranking of the professional responses. We itemise major events/intervention points among the identified ORCs, which are prominent, vulnerable and demand undiverted, focussed and preferred attention consistently and continuously. Relevancy ranking convincingly proved that People related risk-contributing factors carry High Risk, Processes related risk contributing factors, Medium Risk and Systems related risk-contributing factors generate Low Risk severity factors.

Hypotheses analysis and relevancy ranking of the responses prove that all the three ORCs are interdependent, however, it was also considered fit, appropriate and important to understand the relationship between different risk contributing factors i.e. between systems and process, systems and people, process and people. As such, correlation analysis was undertaken which determined the significance and strength of relationship between the defined variables- people, process and systems. Correlation and association results showed that all the three factors are negatively related and need to be attended accordingly. The results also showed that the

relationship among people related risks with other ORCs is highly inverse, hence should be accorded preferred attention. This analysis also revealed that risk management in investment and treasury operations of a bank/ FI requires strong people, processes and systems related framework and an integrated perspective of the three can help in dramatically minimising the overall risk as these factors are negatively related. Looking at the magnitude of negative relationship being relatively more stronger between people and processes as compared to people and systems; greater benefit can be derived in minimising the risk by putting proper people and processes related factors in place. All the above observations cum stipulations necessitate use of those assessment approaches, which include both the quantitative and qualitative aspects in the analysis. This was the major reason for our selection of KRIs/RCSA based approach.

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Chapter 6-Conclusions,
Specific Contributions,
Limitations and
Scope for Future Research

"Bankers who hire money hungry geniuses should not always express surprise and amazement when some of them turn around with brilliant, creative, and illegal means of making money." Linda Davies–A Financial Thriller Writer[25]

Having presented the findings of the study in the preceding chapters, we summarize here our concluding observations, emerged from the study, alongwith representation of a model framework, its implementation approach, specific contributions made through the research by devising a people concentrated model framework, limitations of the research and some recommendations for future scope of research in this area of treasury and investment business line.

6.1 Conclusion

For the past 2-3 decades, Operational Risks have increasingly been considered as one of the major and important financial risks and gained importance similar and to some extent, more than market risk and credit risk. Operational Risk Management (ORM) is acquiring new credibility as a roadmap to add value to the banking business. Day by day, it is attracting more and more attention from regulators, financial institutions and other stakeholders. Operational risk is embedded everywhere and its assessment, at most of the occasions, is subjective. The major reason is, operational risks are entrenched "work in progress" and difficult to quantify. Addressing operational risks in an effective manner is important for business continuity and sustainability of an organisation, as experts believe, these have final impact on the market value of a firm.

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[25] The quotation is from her speech on the Psychology of Risk, Speculation and Fraud, at a conference on EMU in Amsterdam, accessed from,
http://www.moneyscience.com/pg/bookmarks/Admin/read/44990/classic-financial-and-corporate-scandals

Though Basel Accord has specified norms for assessment and measurement of operational risks, but these are mainly confined to the calculation of economic and regulatory capital, primarily to meet statutory norms. Besides, these specified assessment and measurement approaches are also based heavily on quantitative and statistical aspects, which require specialised skills and knowledge of statistical tools. Against this backdrop there has been observed a felt need for developing an efficient and effective assessment tool, which has sustainable operational risk management initiatives aligned to institutional strategy.

Adhering to these notions, our present research work tries to pin pointedly give a direction for developing an integrated operational risk management framework in the wake of empirical work done for strengthening ORM in banks and financial institutions, for which regulatory as well as individual institutions are required to devise their own mechanisms under Advanced Measurement Approach (AMA), for meeting Basel norms. We attempt in this thesis analysis of quantitative and qualitative aspects of operational risks and propose a model framework for their assessment and measurement, keeping in view the practical problems faced by a banker, inter-alia, in the analysis of data through statistical and quantitative methods. We start our research by reviewing present state of practices, systems, procedures and various other activities followed in treasury and investment department/cell of a Bank/ Indian financial institution and compare these with the best global practices. We identify various risk factors enduring in different Indian financial institutions viz. Public Sector Banks, Private Sector Banks, Mutual Fund Houses, Venture Capital Funds, Research Houses and Brokerage Houses in the light of various regulatory/statutory/legal/internal policy guidelines/parameters, global practices etc. and identify various steps of investment making process. We segregate these steps into three stages- pre-investment activities, investment-capturing activities and post-investment activities and then identify operational risk-contributing factors - people, processes, systems and external events attached to these. We study major features and characteristics of these ORCs and try to ascertain their role and contribution from interplay and interactions among themselves as well as with the other risk contributing factors. We subsequently assess the role and responsibilities of dealers, traders, investment managers, systems managers, supervisors in generating operational risks and their effective management. After identifying risk contributing

factors, we get these vetted by treasury professionals/experts on the essence of, inter-alia, degree of risk, level of risk and severity of risk attached to them. Based on these vetted ORCs we formulate hypotheses and devise questionnaires to collect opinions from treasury professionals for identifying the major ORC. We send questionnaires to professionals working in treasury and investment business line for their opinion, meanwhile review assessment and measurement approaches in the context of Advanced Measurement Approach (AMA) under Basel guidelines, and zeroed ourselves on of KRI and RCSA approach for our model framework.

We collect professional responses and analyse data to test hypotheses. Our results show that out of the four major operational risk factors - people, process, systems and external events, experts have rated people as the most risk-contributing factor. Results also highlight that people behind investment and trading desks play the most important role in creating and mitigating operational risks. Experts also endorse that people are the decisive factors in the process and own the powers to jeopardize the effectiveness of systems and procedures by indulging themselves into the undesirable acts. Their actions can expose a bank or financial institution to horrible ramifications and, at times, to the extent of closure of an organisation (e.g. Barings Bank).

Analysis of professional responses and testing of different hypotheses further reveal that though People related risk-contributing factors are most important, which generate High Risk, Processes and Systems, the other two risk-contributing factors, are also important as these invoke Medium and Low level Risk severity factors. Hence, these need to be assessed and ascertained well for initiating appropriate steps in time.

Risk management is a process and consistent and continuous evaluation of risk contributing factors is necessary. Since all these ORCs were considered important by the experts, we extend our analysis by undertaking relevancy ranking of the professional responses. We itemise major events/intervention points among the identified ORCs, which are prominent, vulnerable and demand undiverted, focussed and preferred attention consistently and continuously. Relevancy ranking convincingly proved that People related risk-contributing factors carry High Risk,

Processes related risk contributing factors, Medium Risk and Systems related risk-contributing factors generate Low Risk severity factors.

Hypotheses analysis and relevancy ranking of the responses prove that all the three ORCs are interdependent, however, we also consider it fit, appropriate and important to understand the relationship between different risk contributing factors i.e. between systems and process, systems and people, process and people. As such, we undertake correlation analysis to determine the significance and strength of relationship between the defined variables- people, process and systems. Our correlation and association results show that all the three factors are negatively related, hence, need to be attended accordingly. Results also show that the relationship among people related risks with other ORCs is highly inverse, as such these should be accorded preferred attention. Our analysis also reveal that risk management in investment and treasury operations of a bank/ FI requires strong people, processes and systems related framework and an integrated perspective of the three can help in dramatically minimising the overall risk as these factors are negatively related. Looking at the magnitude of negative relationship being relatively more stronger between people and processes as compared to people and systems, it was construed that greater benefit can be derived in minimising the risk by putting proper people and processes related risk mitigation factors in place.

Analysis of professional responses and other analysis postulate that with proper identification of various control risk factors, a well-defined framework/model can be developed easily and which can significantly address quantification of various operational risk factors. As such, keeping in view the data results and the constraints faced by a banker in applying statistical and quantitative tools for data analysis, we adopt experts' opinion based KRI/RCSA approach for our model framework. KRI based approach is primarily qualitative and entails less quantitative and statistical requirements. We also select KRI based approach because of its bottom down approach characteristics where the participants get involved in the process and offer suggestions/ ideas for improvement. We develop our model framework for assessment of operational risks, in four stages. We start with a *process flow chart*(Chapter-3, Figure 3.4.1)detailing sequence of actions and an overview of the model framework at a glance. We show in this process flow chart key steps for

identification and specification of important treasury activities, sub activities, decisions making points etc. Then we develop *a basic framework for identifying Key Risk Indicators (KRIs),* depicted in the following Figure-6.1.1, with respect to risk sensitivity and severity and thus prioritizing resources accordingly.

Figure-6.1.1- Identification of KRIs - A Basic Framework
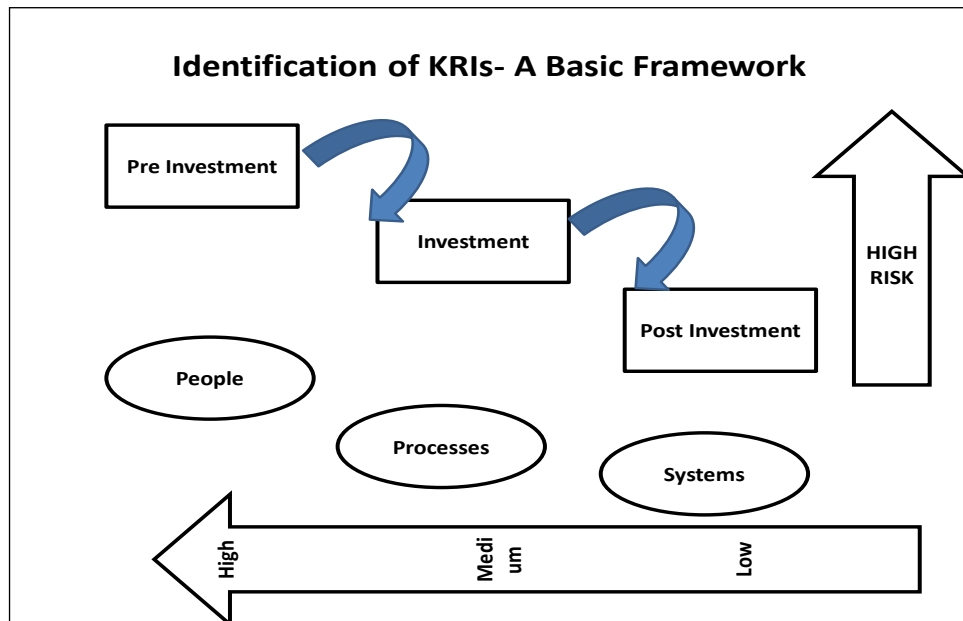
With this model framework, risk sources and KRIs can be clearly identified in a treasury and investment business line of a Bank/FI and then mitigation efforts can be evaluated. It may be added that monitoring of operational risk resources, especially related to procedures, controls, systems, technology etc. and identification of KRIs is foremost and most import step in formation of a model framework for any business line of a bank/FI.

After this KRI framework, in the third step of the model, delineated in Figure- 6.1.2, we propose a comprehensive *framework* showing relationship among various operational risk contributing factors- people, process, systems and external events, their strategy, structure and execution for controls, checks and balances, internal and external changes.

Figure 6.1.2- Model Framework for Operational Risk Management

Since our research results show people as the most important risk-contributing factor, we develop, in the fourth and final step of the model a *framework*(Figure 6.1.3) for identifying and mitigating people related operational risk factor. Thus, we complete our model framework in four stages.

Our proposed model framework is based on KRIs/RCSA approach, which provides a methodological advantage over the traditional statistical techniques, since in our framework, the qualitative aspects of ORCs viz importance of risk severity, their frequency and relationship among various operational risk contributing factors-people, process, systems and external events can be reviewed frequently and consistently. With this cyclical and concurrent review of all the four stages of our model framework, our framework may help in understanding the existing risks, known risks, unknown risk, misses, near misses, present threats and future risks and the like and based on these review, risk mitigation techniques can be implemented in time.

Our proposed model framework does not necessitate acquaintance with and proficiency in various processes of treasury and investment activities and/or extensive knowledge of human psychology, since it has drawn from KRIs/RCSA initiatives, which are usually defined in detail in the process manuals /job cards for working professionals/employees available in every financial institution.

In addition, we have explicated our framework on the essence of audit formats because across the globe, every financial institution is covered under various types of audits viz, internal, concurrent, credit, systems, human resources, statutory etc. and professional are exposed to these regularly and frequently. Acquaintance with the process, format and framework makes a risk assessor at home. Finally, our framework is an elixir distillation from KRIs/RCSA based risk assessment approaches, which are literally akin to Risk Based Internal Audit (RBIA) or Risk Focused Internal Audit (RFIA). In India, banking regulator, RBI devise directives and monitor guidelines in this regard. As such, we hope that our model will be accepted by the users easily. Our model framework can also be modified and used as a reference for constructing models for assessing and managing operational risks in other business lines of a bank/ FI. it can also be tailored to meet the Basel norms under Advanced Measurement Approach (AMA), subject to invariable vetting of parameters/control factors by the experts.

In the light of the above a pertinent question arises-" When financial institutions/ banks are grappled with so many and different types of audits, which are more or less based on KRI/RCSA based approach, what is the need and necessity for such risk assessment framework models? The explanation is- *audits are conducted, more often, as a part of MIS to conform to the prescribed systems and procedures, whereas risk assessment is made to identify various existing and potential risks with a view to mitigate those on time by implementing appropriate systems and controls*.

Hence, we have conducted this study and devised the subject model framework. Our proposed model can be used as a tool under Advanced Measurement Approach (AMA) of Basle Accord, which allows expert based assessment of operational risks. It can also be tailored to suit the requirements of an organization provided the changed parameters/control factors are invariably vetted by experts. We expect that

the proposed model framework will be used as a reference for constructing operational risk models for various business lines in a bank/ financial institution.

6.2- Specific Contributions- Devising a People Concentrated Model Framework

The above model presented as Figure 6.1.2 is meant for overall assessment of ORCs. However, based on the present empirical research conclusions, where the people have been rated as the major operational risk contributor, it was also felt essential and tactical to offer a cogent and effective integrated framework which may capture people related dimensions crucially and critically in the area of treasury and investment business line. A framework capturing people related risk dimensions and working out a mechanism to manage them is shown in the following Figure 6.1.3:

Figure 6.1.3- A Model Framework for People Centric Risk Dimensions
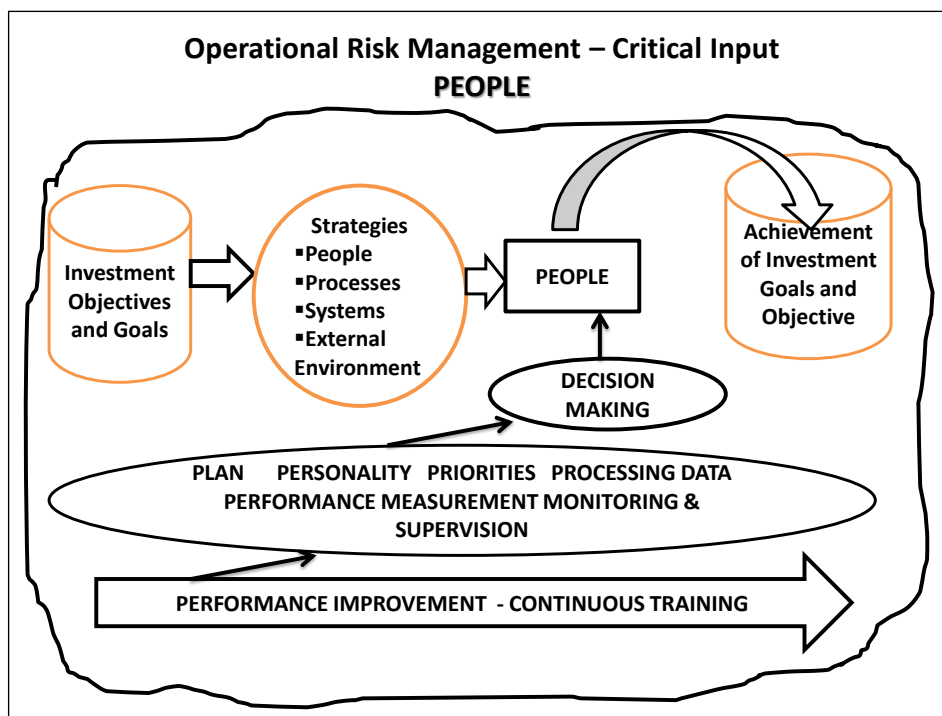
The key aspects that need to be incorporated under plan, personality, priorities, processing data, performance measurement, monitoring and supervision, performance improvement and decision making to take care of people related operational risk dimensions are as under:

PLAN

- Preparing and adhering to "Daily Plan"
- Well prepared "Action Plan"
- Trading Discipline
- Pre and Post trade Dimension and Preparation
- Pre -trade and Post- trade dimensions – Entry and Exit Points
- Pre- trade and Post -trade dimensions – Money Management Rules
- Intra Day-Trading Strategies
- Intra-Day-Trading Challenge
- Intra Day Trading Challenges- Liquidity and Volatility

PERSONALITY

- Trading Attitude and well prepared "Decision Strategy
- Personality and Strategic Decision
- Personality and Trading Psychology
- Learning to Trade
- Trading Psychology
- Trading Attitude and Alignment
- Market Behaviour and Traders' Psychology
- Trading Career

PRIORITIES

- Market Intelligence and Trading Priorities
- Trading Choices

PROCESSING DATA

- Recognition and Interpretation of "Charts and Chart patterns"
- Information -based Trading
- Market Information
- Trends and Chart Patterns
- Fundamental/ Technical Analysis

PERFORMANCE MEASUREMENT MONITORING AND SUPERVISION

- Performance Measurement
- Performance Monitoring and Supervision
- Cost of Trading
- Disclosing Trades
- Trading Diary
- Trading Records

PERFORMANCE IMPROVEMENT (TRAINING)

- Training for Trading Success

DECISIONS

- Trading Decisions
- Trading Tips
- Trading Dimensions and Decision Making Strategies
- Chaos and Trading Decisions
- Trading and Market Activities
- Trading and Market Intelligence
- Trading Alignment
- Price Information and Discovery
- Trading Dimensions
- Paper Trading

In nutshell, people behind investment desks play the most crucial part in ORM. They are decisive factors and own the powers to jeopardize the effectiveness of processes and systems by indulging themselves into acts which can expose a bank to outcomes that may be quite costly and horrible. The need is to get right professionals who should be continuously trained to be ahead of times to effectively manage investment and treasury functions to optimize returns.

6.3- Limitations

Although KRIs and RCSA (Risk Control &Self-Assessment) based methods are easier and widely used in banks and financial institutions but some bankers/ FIs prefer statistics and regression based quantitative methods compared to this primarily qualitative based method. These bankers/ professionals underestimate experts' views and hesitant in accepting their observations/ views, thus hampering smooth implementation of such knowledge based assessment methods (Mehra, 2010).In view of this, we fear that our model thoroughly based on KRIs and RCSA approach, may be shunned in the banks/FIs, because they will not welcome any new risk assessment approach framework to their familiar RFIA/RBIA based audit formats. But as submitted earlier in the above paras, audit and risk assessments both are different aspects for risk mitigation and one cannot replace the other. Both have their merits and demerits. However, such discussions are out of the purview of this research study. Limitations of this research also include targeted sample size alongwith inherent limits of the scales and instruments used in the research. To sum up following limitations have been visualized-

- Difficulty in identifying and defining the specific operational risk control factors.
- Measurement of operational risks is often subjective
- It is difficult to foresee unanticipated correlations between and among various operational risks control factors.
- Data is often unavailable and/or unreliable. It is impractical to expect any institution to share their entire operational loss data publicly, without intervention of the statutory or regulatory body. Normally to save brand image and reputation the institutions make public only those loss events, which are mandatory to be declared or under regulatory compulsion.
- Though from extrapolation of historical data, two normal means for benchmark and peer comparisons may be available for measurement of operational risk, these can be problematic and misleading as treasury and investment is a sensitive business and relevant activities may differ from bank to bank. Thus peer comparison may be faulty.

6.4- Future Scope of Research

The concept of Operational Risk lends itself to specialised research on possibilities of different measurement and assessment techniques. One of the interesting areas for future research can be comparative study of RFIA based audit and KRI based risk assessment approach in mitigating operational risk factors. Basel-III norms are slated for application across the Indian banking industry in the coming years. Another area of study can be implication of Basel –III changes in Indian banks in the area of operational and market risk. For the past 3-4 years data availability is growing within the banks, among the banks and across the banking industry. Many banks are pooling data for implementing LDA. Future research studies can also be considered to study how this data will help in deciding treasury related aspects through mathematical research tools. Operational risk related events are difficult to identify. It is not easy to identify and conclude when an operational risk becomes a market risk or credit risk or vice versa. These are a few areas where further research can be undertaken.

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Annexure-1

Rationales behind identifying people related risk factors
in the area of Treasury & Investment Activities

Following summarised version of the rationales, theories, principles, is a collection of numerous ideas, tips, observations, from dealers, practicenors, experts and the invaluable information available at internet from various sites, blogs, books etc.

1. Preparing and adhering to "Daily Plan" -

Writing plans for preparation in trading help tremendously in systematic thinking of a trader in making decisions when the real action starts. Writing descriptions also helps in understanding the facts before moving to their interpretations. Reading written instructions of the top management from a sheet in front help a trader in avoiding emotional mistakes, specifying trading size and reinforcing discipline.

2. Well prepared "Action Plan"-

Markets are full of bad advice, A trader need to be prudent enough to filter out the good from the bad or stand aside if (s)he is not sure. The key difference between a risk and a loss is the fact that risk is limited to a small percentage and loss can be unlimited. Both impact a trader's survival. A thoughtful trader limits his/her risk on the basis of learnings, acumen and understanding and thus promotes long-term survival and success.

3. Trading Discipline-

The secret of trading is that there is no secret except it requires discipline, hard work, flair, and attention to detail. Undivided attention, particularly while one is at the learning stage, is a must for successful trading. Trading rules are very attractive one may bet on a race after it starts and exit before it ends. But the battle for survival and profit is full of danger and its entertainment value distracts most people. Successful traders possess some edge in the market, which distinguishes them from market crowd. They stick to rules and systems (conscientious), would

not impulsively enter or exit trades on the whim of emotion (neuroticism) and will trade for profits and will not stimulate (low openness).

4. Pre and Post trade Dimension and Preparation -

Beginners are attracted by tales of huge profits while professionals primarily focus on safety and survival. Good trading depends on good planning and implementing money management rules, thus grinding out steady and high profits. After achieving stable and sustainable success, one can spend more time in looking for extraordinary opportunities. Then, if the analysis is right and the market cooperates, one can expect extraordinary returns, which is the overall goal of trading.

5. Trading Alignment-

All traders, especially beginners, having too much money and chasing too many stocks, lead to sloppy trading. The best trades often look iffy / doubtful at first and one takes up those only because rules force to do so. There is one rational reason to trade-to make money, or to be more exact, to beat riskless rate of return, such as treasury bills. Taking trading as a reckless adventure tends to be very expensive. Discipline and determination are more important than intelligence. As Churchill once said, "It is not the size of the dog in the fight, but the size of the fight in the dog."

6. Trading Attitude and Well prepared "Decision Strategy"-

Frequent in and out from the market is not a healthy sign of a rational trader. Good traders focus on a few scrips/securities and keep grading their performance. Disciplined approach to trading requires significant research and preparation time, along with an ability to stick to market movements along with one's game plan. Many successful traders started their careers by reviewing intensively their trades at the end of each session. They would study their trades, again and again and observe how the market moved and reviewed their trading decisions accordingly. Along the way they would make notes, highlight what they did right and what they did wrong. By and by, they developed specific things to do or not to do in their trading. Such reviews take hours.

7. Personality and Strategic Decision-

Emotional reactions to trading outcomes--positive or negative--are related to poor trading performance. A highly driven trader may generate more positive and negative emotional experiences in his/her approach interfering with clear, calm decisions under conditions of risk and uncertainty. The conundrum is that successful traders do tend to be aggressive and achievement oriented. However, upto a certain level, Type-A personality trait tendency (the degree to which individuals are driven to achieve) works for them, especially if they are able to combine self-monitoring and self-control with the desire to take risks. At very high levels of aggressiveness and need for achievement, however, the frustrations inherent in high uncertainty working may prove overwhelming. Highly achievement oriented traders also have a strong tendency toward negative emotional experience (guilt, anger, depression, anxiety) and experience the worst trading setbacks.

8. Personality and Trading Psychology-

All of us experience emotional stress. The challenge is not to reduce stress, as the demands one faces at work and home are part and parcel of what make life meaningful, but to ensure that stress does not generate distress. Our lives have a favourable balance between states of well-being and states of distress. What turns stress into distress is the perception that one is no longer able to control something that is important for his/her well-being. If one lacks control over marriage, health, or career, the first result will be anxiety and (s)he will become mired in doubt and uncertainty. If one continues to lack control over important aspects of his/her life, anxiety will turn to depression and the perception, "I don't think I can handle this" will become "I know I can't handle it."

9. Market Intelligence and Trading Priorities-

Elements of success come from the long hours of research and immersion in the markets till it become a full-time enterprise-even if one is not necessarily trading every minute of the day. Researching a stock's prospects and its industry group is a hallmark of a serious investor. In the market, the principle -survival of the fittest- works. A trader focuses on the response of prices to the fundamental data, including

mass hysteria and survives with his/her learning ability and ability to sustain states of his/her enhanced learning.

10. Trading Choices-

Anyone who works on the tips of some famous guru on TV is a gambler, because (s)he chases hot leads instead of thinking for his/herself

11. Recognition and Interpretation of "Charts and Chart Patterns"-

Traders' visual inspection of charts, pattern recognition and analyses of signals statistically are heart of the trading. Traders identify shifts in demand and supply in real time and respond to such patterns. Most of the different trading approaches through econometrics, market profile, technical and fundamental analysis, quantitative and historical analysis, cycles etc. conceptualise patterns at different time frames. Traders benefit mostly from those methods which fit well with their cognitive styles and strengths. While one trader with superior visual memory and adept at visual processing might benefit from the use of charts in framing patterns, the other with high analytical skills might benefit from statistical studies and mechanical signals.

12. Performance Measurement-

In trading there is the quick and the dead. Success in trading, like other performances, depends upon a developmental process in which intensive, structured practice and experience extended over time yields competence and expertise. Many trading problems arise because of making attempts before undergoing a learning process. Research suggests that professional traders account for well over three quarters of all share and futures contract volume. It is impossible for a person to sustain success against these professionals without honing his/her skills/ performance and making sure that (s)he doesn't lose capital in the learning process. Confidence in one's trading comes from the mastery conferred by learning and development and not from psychological exercises or insights.

13. Personality and Trading Psychology-

Success in trading is a function of talents and skills and is no different from chess, Olympic events, or acting. Inborn abilities (talents) and developed competencies

(skills) determine level of success. From rock bands to ballet dancers and golfers, only a small percentage of participants in performance activities earn a comfortable living and success from their performances. The key to success is to find a seamless fit between talents/skills and the specific opportunities available in a performance field. For a trader, this means finding a superior fit between his/her abilities and the specific market strategies (s)he will be adopting. Many unsatisfied trading results are suboptimal so as to fit between what the trader is good at and how the trader is trading.

14. Learning to Trade-

Trial and error or rather repeated type of learning is called implicit learning. Under this people are repeatedly exposed to complex patterns till they eventually internalize those, even though they cannot verbalize the rules underlying those patterns. This is how children learn language and grammar and this is how one learns to navigate his/her way through complex social interactions. Implicit learning manifests itself as a "feel" for a performance activity and facilitates a rapidity of pattern recognition which would not be possible through ordinary analysis. Research tells us that implicit learning occurs only after one has undergone thousands of learning trials. This is why trading competence--like competence at other performance activities such as piloting a fighter jet and chess--requires considerable practice and exposure to the realistic world.

15. Trading Psychology-

Once a performer has developed skills and moved along the path towards competence and expertise, psychology becomes important in sustaining consistency of performance. Many performance disruptions are caused when shifts in cognitive, emotional, and/or physical states obscure the felt tendencies and intuitions that lie at the heart of implicit learning. This most commonly occur as a result of performance anxiety--fear about the outcome of performance-which interferes with the access to the knowledge and skills needed to facilitate that performance. Such performance disruptions also commonly occur when traders trade positions that are too large for their accounts and/or do not maintain sound risk management with their positions. The large profit/loss swings cause shifts in emotional states that interfere with the (implicit) processing of market data. Cognitive, behavioural and

biofeedback methods can be very useful in teaching traders' skills for maintaining the "Yoga state" of calm and concentration.

16. Information based Trading-

An important dimension related to emotional and neuroticism (a tendency toward negative emotional experience, which shows up as anger, anxiety, or depression) is the type of cognitive style, which is just as important as personality style in trading. Some people process information intuitively, relying on gut cues and subtle, non-verbal information, while others process information explicitly, through reasoning and analysis. With both these styles traders can make money in the markets, but it is essential that one's style matches with one's trading methodology.

17. Market Information-

Information in the context is knowledge about prices, quotes, volumes, sources of order flow, identities of market participants. An active role is played by FIIs, DIIs and big market players in price setting of rapid turnover stock/scrip/share without accumulating significant position in it. Sometimes they also act as dealers and quote prices which induce mean reversion towards their targeted prices of a stock and as active investors they adjust their target level, periodically, towards which asset prices revert.

18. Training for Trading Success-

Gathering knowledge from several websites, improving information base by reading blogs, articles in magazines and books, all may be important, but this is not training. Training is a systematic work on oneself to build skills and hone performance. Training provides right kind of skills and learnings in the right prospective to channelise their specific adaptations in improving performance. Constant feedback about performance, what is working and what is not, requires a steady process of drilling skills until these become automatic. This cannot be substituted by any amount of gathering knowledge from several websites or reading books or discussing with a coach or a counsellor. Training to the extent of proficiency is the path to a positive psychology. For example, various performance activities such as professional dance, theatre, chess, athletics, elite police (National

Security Guard- NSGs) and military (Commandos) and the like have several common features in imparting their trainings:

- A high ratio of time is spent in practising rehearsing activities relative to actual performance.

- Teacher/coach/trainer who guides through practices / rehearsals create sufficient demands to challenge the performer but not so overwhelming as to create frustration and failure.

- Structured preparation for specific performances, including review of one's competitive strength, creation of a performance plan / active rehearsal of a plan is undertaken.

- Structured review of recently completed performances to guide learning and subsequent practice is conducted.

- Rapid and comprehensive feedback is given to performers to learn from their practice / rehearsal and incorporate changes in future performances.

- Superior performers and performance are recognised.

- Training improves traders in sustaining mental effort and enhances performance by inculcating discipline and pattern recognition for improving problem solving skills.

19. Pre trade and Post trade Dimensions – Entry and Exit Points-

Strategic decision on gut feelings is dangerous. If a trader sells on the gut today, (s)he will be tempted to buy on the gut tomorrow, and that's where the real trouble will start. A trader should plan entries and exits well in advance, especially exit, which is an art and requires a lot of skills, learnings, experience, discipline and maturity. Anyone can enter a trade (and often does) but it takes knowledge and experience to find good exit points. Usually ninety percent of the efforts by a trader are made to get into the trade-the entry-because the purpose of the trade is to be in the market and not to make a profit. The impulsive trader seeks action, not results. Since exits are associated with the cessation of action, traders get a short shrift. But a rational trader knows when to enter and when to exit. While a longer-term trader watches the EMA, the resistance, or the channel, a shorter-term trader focuses on the channel or the spikes in Index. There are many methods for exiting trades and a

trader may use any method which appeals to his/her. But (s)he should refrain from making his/her decisions "on the gut."

20. Pre trade and Post trade dimensions – Money Management Rules –

While analysing prices and indicators, the trader should not forget that money management is the essential element of trading and each trade has to be chosen in accordance with strict money management rules. Before entering into a trade, a rational trader estimates his/her profit as well as risk factors and compares them. Thereafter, (s)he makes his/her go-no-go decision. (S)he tries to select trades in which (s)he stands to win more than (s)he risks-the higher the ratio, the better. (s)he might be aware that when the exit target is at a channel line, that target will move with the passage of time. So it is important for his/her to have a general idea before (s)he takes entry.

21. Trends and Chart Patterns-

Traders are fond of charts. Charts help them in making decisions in several timeframes, moving down from the longest to the shortest. Weekly charts help them in making bullish or bearish decisions, daily and finding entry and exit points, they love intraday charts. Charts help trader/dealer /investment manager to focus on specific signals that may lead to a trading decision. Writing down chart descriptions also helps in explaining what factors led to a trading decision. Live charts often seduce traders joining into emotional crowd. Short-term charts helps in getting closer to the market and long-term charts in making a strategic decision. One can filter these leading only the best signals.

22. Intraday-Trading Strategies-

Intraday trading demands much higher degree of concentration than position trading. In Intra-day -trading, expenses are higher because frequent trading and profits are smaller due to shorter swings. Losing trades need to be closed out by the end of the day. It is an expensive proposition which generates high commissions and leads to purchases of software, data, and other tools. These are the major reasons brokers and vendors love it.

23. Intraday-Trading Challenge –

Intraday trading does not leave any time to think and impulsivity is deadly in intraday trading because a trader has no time to correct his/her mistakes. To succeed, a trader must face his/her impulsivity and work to reduce it. (S)he should ride on the strength or weakness in the market once it has been manifested. A written trading plan is a useful step in that direction.

24. Trading Decisions –

Trading in a room full of people is likely to lead to emotional decisions. Successful traders always sit at the edge of the trading room, isolating themselves from the masses.

25. Trading Tips –

There is no harm listening to tips/market grapevine, as long as one doesn't get overwhelmed.

26. Intraday Trading Challenges- Liquidity and Volatility-

Two essential criteria for choosing intraday trading stocks are liquidity and volatility. Penny stocks may be promising for investors but are not good for intraday traders because of narrow intraday range and low liquidity.

27. Trading Dimensions and Decision Making Strategies-

The best time for making strategic decisions is before the opening of the market. A professional trader makes his/her mind well in advance visualising if the stock moves this way, I will do this or that. If one keeps on reviewing his/her stocks throughout the day, one may act fast whenever the conditions are favourable.

28. Paper Trading-

Most people are more objective when they do not have money at risk. The main value of paper trading is to allow a trader to test his/her discipline and ability to do homework day after day, although most people simply escape from it after losing money. If done in the right spirit, paper trading takes just as much time as the real trading. The results of paper trading almost always look better because there is no emotional pressure for risking money.

29. Performance Monitoring and Supervision-

It is always comfortable and a better positive result show for an institutional trader when (s)he trades for his/her organisation. There is a boss whose main task is money management and discipline maintenance. People who trade well for the institutions rarely match their performances once they leave to trade for themselves, because they leave behind their manager/supervisor/mentor. A private trader has to be his/her own manager and in that situation it is very difficult to write down trading plans, adhering to those and rate performance.

30. Fundamental/ Technical Analysis-

Fundamental analysts study supply and demand, which drive prices in the long run while market technicians try to read the behaviour of the market crowd under technical analysis. Fundamentals are important for long-term investors and technicals for short-term traders. Though both are used for trading decisions but neither predicts future prices. Instead, they tell you what is happening in the markets and leave you to decide how to play the odds for the future.

31. Trading Diary-

Maintaining a trading diary /spreadsheet is a must for a trader which provides basic record of every trade including its performance grade. A trader maintains therein data / information relating to various trades viz. dates of entries and exits, entry and exit prices, commissions and fees, performance grades and entry and exit grades etc.. In addition, a more sophisticated trader uses his/her diary/ spreadsheet to calculate performance grade for every trade by analysing the quality of entries and exits-where she bought or sold - at closer to the top or at the bottom of the daily bar as well as entry and exit dates.

32. Trading Records-

A focused, disciplined trader keeps asking the questions - What did I do right? Have I made a mistake? What should I do differently next time? A trading diary helps in answering these questions and serves as a precise indicator of discipline in a trader. People, who have the discipline for keeping good record, win consistently. It may be impractical for an active trader to record every single trade but it is

important to write details on every second, third, or fifth trade, in strict order, rather than deciding to keep it for "interesting" trades and omitting it for "ordinary" trades.

33. Chaos and Trading Decisions-

Rapidly changing prices affect traders. Incidents such as noise, interruptions from phone calls, pressure of management expectations so on and so forth tempt traders to put in another quarter in the trading deal. When the markets are closed, dealers/traders possess the luxury of time for preparing strategy for buying, selling or standing aside the next day. At that time, there is no pressure from price movements and hullabaloo, which gives them enough time and opportunity to pause, think and for going back to research/ indicators/charts for another look and analysis.

34. Trading and Market Activities-

Boiling markets are less rational and create opportunities for making money. It is easier to make money in a volatile market and a less efficient market than in a calm and a normal market. Quiet markets are more efficient, making it more difficult to make money.

35. Trading Attitude and Alignment-

Serious trading begins with good records and maintaining them and it is one of the best indicators of the level of discipline in a trader. Good records lead to reduction in trading mistakes and a dealer/trader gets benefited from analysing his/her records. Keeping records up-to-date puts them a step ahead in the crowd. Good records also allow a trader to be more relaxed in setting money management rules, recording compliance and developing a decision-making tree.

36. Disclosing Trades-

Telling about open positions is a negative sign of a seasoned dealer. It might make a trader more popular and invite friendly advice on positions (s)he failed to consider but none of this is likely to lead to a successful outcome. A dealer needs to be strong enough to shoulder all the responsibility for a trade. (S)he should discuss with others only after closing it.

37. Trading and Market Intelligence-

Trading requires time just as much as it requires capital. The more time a dealer/trader puts into the market, the more profit (s)he is likely to make. A dealer/trader needs to review frequently all market activities, where (s)he is interested at least once in a week and usually on weekends. A trader should keep a timetable of all important news which may impact his/her market position. Based on these information/ analysis (s)he may consider holding/accumulating/ reducing or getting out of the position.

38. Price Information and Discovery-

Prices are not a mirror image of values and can swing considerably above and below value. Undecided traders with money watch the market and put pressure on buyers and sellers to act faster.

39. Cost of Trading-

Dripping water shapes mountains and commissions, slippage and expenses shape traders' accounts, affecting more in the long run than most trades. Commissions and slippage are what a trader has to pay for the privilege of entering into a trading arena. Slippage, the distance between the market order and the transaction price, is small in quiet markets, greater in boiling markets. And expenses, no expense is meaningless, raise barriers to trader's success. Their combination cannot be reduced below a certain level.

40. Market Behaviour and Traders' Psychology-

Market behaviour and traders' psychology both are strongly correlated. When market is volatile they get excited, when it is quiet they get disappointed for want of opportunities. However, a trader needs to be strong enough to tide over such situations that come from refusal to let fate have its way. The first step for achieving this is simply figuring the pattern out, learning everything about the problem to find the right kind of help and the right helpers. Even if the first step is nothing more than stopping what isn't working and focusing on what one is doing well, this will begin the process of putting a person in the psychological driver's seat. As one trader puts it when he began to regain his sense of control, "The

problem is my pattern of overtrading, and I've been telling myself that I'm the problem."

41. Trading Career-

Type A personalities tend to get more upset if their expectations are not met. They tend to focus on external results and fail to sense or feel their own psychic and physiological distress. They are more likely to "explode" or "go off the deep end" whereas type B personalities are more likely to "go with the flow." However, type A personalities can be trained to become Type B's.

42. Trading Dimensions-

Observing and interviewing successful traders, reading about rational traders, trying trading in a simulation mode, learning about those skills and developing a plan to hone when, all are characteristics of a successful trader.

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Annexure-2
Panel of Experts

Treasury and investment activities are sensitive business, particularly trading activities. No organisation likes to share its internal practices, systems, procedures, guidelines as these are, usually, part of their confidential treasury manuals. Hence while devising base for control risk factors, KRIs and questionnaires, we have ensured that these are derived from various guidelines and circular instructions issued by the statutory bodies like RBI, SEBI, and which are available in public domain. Further, we have also got these control risk factors, KRIs and the questionnaire analysed, assessed and vetted by following *fifteen* experts for their tactical, technical and procedural information as well as their adherence to the best global practices. We have tried our best to ensure that no sensitive and organisational specific information/ data are included therein. These experts included-

- *Five experts related* to front office, trading and investment activities, namely Shri Manoj Sharma, Chief Manager, Miss Mona Gupta, Manager, Shri Mukesh Kumar, Manager Shri Rajeev Faujdar, Manager and Shri Rajeev Ranjan Mishra, Manager.
- *Two experts* related to mid office activities –Shri Abhinva Bajpai, Manager and Shri Dixant Juneja, Manager
- *Three experts* from back office - Shri C P Joshi, Assistant General Manager and Shri Sushil Kumar,Manager and K.K Saini, Dy.Manager
- *Two* experts from systems related activities- Shri Vikas Gupta, Chief Manager and Shri Rajesh Uttarwar, Chief Manager
- *Two* experts for providing information on regulatory guidelines issued by RBI and SEBI – Shri R.L.Dingli, Assistant General Manager and Miss SmitaGupta, Manager

The whole contents were revised, rerevised and finally brought to the present shape by respected Sir K.S.Subbaraman, General Manager.

All these experts are working with major public sector banks and a top-notch globally acclaimed constancy firm.

Annexure-3

Questionnaires[26] and Detail of Responses

Sl No	Loss Events / Existing /Prospective Risk Contributing Factors/Aspects	High Risk	Medium Risk	Low Risk
1	Poor or wrong identification of prospective security and adopting wrong approach for conducting investment analysis	26(22%)	31(27%)	2(2%)
		5(4%)	8(7%)	0(0%)
		6(5%)	11(9%)	0(0%)
		7(6%)	13(11%)	0(0%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		51(44%)	63(54%)	2(2%)
2	Issues related to inadequate/non-compliance of various act, rules and regulations, notifications, guidelines, instructions from RBI, SEBI, Government of India, Board of Directors of the bank/ FI or any other regulatory, quasi or semi quasi body	High Risk	Medium Risk	Low Risk
		9(8%)	31(27%)	19(16%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		16(14%)	63(54%)	37(32%)
3	Slippage in adhering to various norms related to investment categorization, shifting, valuation, income recognition and classification	High Risk	Medium Risk	Low Risk
		35(3%)	16(14%)	8(7%)
		5(4%)	5(4%)	3(3%)
		6(5%)	6(5%)	5(4%)
		7(6%)	8(7%)	5(4%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		53(46%)	42(36%)	21(18%)
4	Inadequately and poorly defined administrative/ financial powers, feeble demarcation of responsibilities/duties of various treasury functionaries in their decisions making process	High Risk	Medium Risk	Low Risk
		31(27%)	26(22%)	2(2%)
		5(4%)	8(7%)	0(0%)
		6(5%)	11(9%)	0(0%)
		7(6%)	13(11%)	0(0%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		49(42%)	65(56%)	2(2%)
5	Issues related to approvals/sanctions from the appropriate authorities for all investments/ trading activities	High Risk	Medium Risk	Low Risk
		12(1%)	30(26%)	17(15%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		0(0%)	5(4%)	0(0%)
		0(0%)	0(0%)	2(2%)
		12(1%)	67(58%)	37(32%)
6	Slippages in ensuring that deals undertaken are in line with the	High Risk	Medium Risk	Low Risk
		45(39%)	14(12%)	0(0%)

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[26] Questionnaires based on best global practices, regulatory and statutory guidelines, RBI circulars, working papers, audit checklists, experts opinions articles, blogs etc.

	market practices and policy guidelines/ rules from RBI, SEBI, ISDA, Fixed Income Money Market and Derivatives Association (FIMMDA), FEDAI, Clearing Corporation of India Ltd etc.	8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		1(1%)	1(1%)	0(0%)
		78(67%)	38(33%)	0(0%)
7	Issues related to deal execution, accounting entries, exposure limits, cut loss limits etc.	High Risk	Medium Risk	Low Risk
		31(27%)	28(24%)	0(0%)
		3(3%)	7(6%)	3(3%)
		6(5%)	11(9%)	0(0%)
		7(6%)	13(11%)	0(0%)
		0(0%)	5(4%)	0(0%)
		1(1%)	1(1%)	0(0%)
		48(41%)	65(56%)	3(3%)
8	Issues related to deals validation. Invalid / incomplete/late receipt of deal confirmation and their half-hearted verification for accuracy and genuineness. Improper monitoring of pending deals with little attention for generating timely and meticulous reports.	High Risk	Medium Risk	Low Risk
		9(8%)	31(27%)	19(16%)
		3(3%)	5(4%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		0(0%)	5(4%)	0(0%)
		0(0%)	0(0%)	2(2%)
		12(1%)	65(56%)	39(34%)
9	Not adhering to various guidelines/ norms related to volume, maturity, holding period, duration/modified duration, stop loss, defeasance period etc. for trading book and HTM portfolio of securities.	High Risk	Medium Risk	Low Risk
		12(10%)	31(27%)	16(14%)
		3(3%)	5(4%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		15(13%)	67(58%)	34(29%)
10	Delayed/ partial and or irregular generation of various daily and periodical reports for any breach out in limit / violation made or the limits which are about to breach such as Stop Loss etc. and their reporting to 3er authorities, timely and as per laid down norms.	High Risk	Medium Risk	Low Risk
		7(6%)	23(2%)	29(25%)
		3(3%)	5(4%)	5(4%)
		0(0%)	6(5%)	11(9%)
		0(0%)	7(6%)	13(11%)
		5(4%)	0(0%)	0(0%)
		0(0%)	2(2%)	0(0%)
		15(13%)	43(37%)	58(5%)
11	Lack of timely review of portfolio	High Risk	Medium Risk	Low Risk
		42(36%)	17(15%)	0(0%)
		3(3%)	7(6%)	3(3%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		0(0%)	0(0%)	2(2%)
		69(59%)	42(36%)	5(4%)
12	Irregular and infrequent review of counterparties and brokers' list, completing various "KYC" norms, Failure to ensure adherence to a code	High Risk	Medium Risk	Low Risk
		4(3%)	35(3%)	20(17%)
		3(3%)	6(5%)	4(3%)
		0(0%)	11(9%)	6(5%)

	of conduct by the approved/empanelled brokers and getting it renewed by them periodically.	0(0%)	13(11%)	7(6%)
		0(0%)	5(4%)	0(0%)
		0(0%)	0(0%)	2(2%)
		7(6%)	70(6%)	39(34%)
13	Adhering to Code of conduct specified by FEDAI/ FIMMDA for respecting internal guidelines, various parameters of model code of conduct such as no use of mobile phones in dealing room, compulsory availment of two weeks' leave during a year etc.	High Risk	Medium Risk	Low Risk
		2(2%)	35(3%)	22(19%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		0(0%)	5(4%)	0(0%)
		2(2%)	0(0%)	0(0%)
		4(3%)	72(62%)	40(34%)
14	Non-adherence to Dealing room code of conduct- installation of voice recorders, no use of mobile phones in dealing room etc,	High Risk	Medium Risk	Low Risk
		29(25%)	19(16%)	11(9%)
		5(4%)	5(4%)	3(3%)
		7(6%)	5(4%)	5(4%)
		7(6%)	7(6%)	6(5%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		48(41%)	43(37%)	25(22%)
15	Delayed and improper updation of various policies, instructions and guidelines in line with the relevant Regulatory /Statutory requirements and RBI directives.	High Risk	Medium Risk	Low Risk
		2(2%)	35(3%)	22(19%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		0(0%)	0(0%)	5(4%)
		0(0%)	0(0%)	2(2%)
		2(2%)	67(58%)	47(41%)
16	Password control- weighed in balance but always found wanting.	High Risk	Medium Risk	Low Risk
		29(25%)	16(14%)	14(12%)
		5(4%)	5(4%)	3(3%)
		6(5%)	6(5%)	5(4%)
		7(6%)	7(6%)	6(5%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		54(47%)	34(29%)	28(24%)
17	Inconsistency and inadequacy of the system in meeting various regulatory requirements/ directives related with reporting, privacy and other compliances.	High Risk	Medium Risk	Low Risk
		5(4%)	36(31%)	18(16%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		5(4%)	0(0%)	0(0%)
		0(0%)	0(0%)	2(2%)
		10(9%)	68(59%)	38(33%)
18	Deficiencies in creation of Master Instruments/ Securities List. Wrong or faulty assignment of security codes, wherever applicable.	High Risk	Medium Risk	Low Risk
		3(3%)	30(26%)	26(22%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		5(4%)	0(0%)	0(0%)

		0(0%)	0(0%)	2(2%)
		8(7%)	62(53%)	46(4%)
19	Irregular and infrequent backup of data ,its storage and other system related security control issues	High Risk	Medium Risk	Low Risk
		3(3%)	30(26%)	26(22%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		0(0%)	5(4%)	0(0%)
		0(0%)	1(1%)	1(1%)
		3(3%)	68(59%)	45(39%)
20	Incomplete, insufficient and undue delay in updation of data related to brokers/ counterparties. Missing check signal for breach out of limit of brokers' and counter parties. Half-heartedly efforts in ensuring correctness and completeness of execution and settlement of various investments/ trading transactions.	High Risk	Medium Risk	Low Risk
		3(3%)	30(26%)	26(22%)
		4(3%)	4(3%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		14(12%)	58(5%)	44(38%)
21	Slippages in ensuring that the business lines, performing various regulatory business activities, are complete and without overlap (e.g collection, updation and monitoring of data for calculation and maintenance of CRR are separate yet interlinked).	High Risk	Medium Risk	Low Risk
		27(23%)	16(14%)	16(14%)
		5(4%)	5(4%)	3(3%)
		6(5%)	6(5%)	5(4%)
		7(6%)	7(6%)	6(5%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		45(39%)	41(35%)	30(26%)
22	Failure in ensuring that various rules/guidelines/instructions laid down in different policies for cut loss limits are adhered to.	High Risk	Medium Risk	Low Risk
		25(22%)	27(23%)	7(6%)
		8(7%)	5(4%)	0(0%)
		6(5%)	11(9%)	0(0%)
		7(6%)	13(11%)	0(0%)
		0(0%)	5(4%)	0(0%)
		2(2%)	0(0%)	0(0%)
		48(41%)	61(53%)	7(6%)
23	Irregular review and testing of DRP and BCP. Issues related to its implementation etc., staff awareness about their respective role in the DRP/BCP	High Risk	Medium Risk	Low Risk
		8(7%)	19(16%)	32(28%)
		3(3%)	5(4%)	5(4%)
		0(0%)	6(5%)	11(9%)
		0(0%)	7(6%)	13(11%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		18(16%)	37(32%)	61(53%)
24	Failure in identifying system related natural and man-made threats, affecting availability, confidentiality and integrity of information/data.	High Risk	Medium Risk	Low Risk
		2(2%)	28(24%)	29(25%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		5(4%)	0(0%)	0(0%)
		0(0%)	2(2%)	0(0%)
		7(6%)	62(53%)	47(41%)

25	Role of "inbuilt "system check points .Monitoring control exceptions detected/ not detected by the systems controls/check points.	High Risk	Medium Risk	Low Risk
		27(23%)	16(14%)	16(14%)
		5(4%)	5(4%)	3(3%)
		6(5%)	6(5%)	5(4%)
		7(6%)	7(6%)	6(5%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		52(45%)	34(29%)	30(26%)
26	Improper or little attention to the various system related risks identified by an auditor.	High Risk	Medium Risk	Low Risk
		5(4%)	20(17%)	34(29%)
		0(0%)	5(4%)	8(7%)
		0(0%)	6(5%)	11(9%)
		0(0%)	7(6%)	13(11%)
		5(4%)	0(0%)	0(0%)
		0(0%)	2(2%)	0(0%)
		10(9%)	40(34%)	66(57%)
27	Inefficient monitoring of the hardware and software changes made in the system during the year. Casual approach in demanding timely, safe and efficient services from the vendors	High Risk	Medium Risk	Low Risk
		2(2%)	20(17%)	37(32%)
		0(0%)	5(4%)	8(7%)
		0(0%)	6(5%)	11(9%)
		0(0%)	7(6%)	13(11%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		2(2%)	45(39%)	69(59%)
28	Making inefficient review of various market changes and their impacts. Failure in observing the degree to which the conducted trades/deals are in line with market conditions and initiating effective steps accordingly.	High Risk	Medium Risk	Low Risk
		0(0%)	20(17%)	39(34%)
		0(0%)	5(4%)	8(7%)
		0(0%)	6(5%)	11(9%)
		0(0%)	7(6%)	13(11%)
		0(0%)	5(4%)	0(0%)
		2(2%)	0(0%)	0(0%)
		2(2%)	43(37%)	71(61%)
29	Inadequate training and user documentation for the system related activities.	High Risk	Medium Risk	Low Risk
		0(0%)	27(23%)	32(28%)
		0(0%)	8(7%)	5(4%)
		0(0%)	11(9%)	6(5%)
		0(0%)	13(11%)	7(6%)
		5(4%)	0(0%)	0(0%)
		0(0%)	1(1%)	1(1%)
		5(4%)	60(52%)	51(44%)
30	Failure in ensuring that all trades are concluded over recorded lines and recordings of telephonic conversations are maintained for each deal undertaken for determining, inter-alia respective trading position and also fol1owing regulators/internal guidelines.	High Risk	Medium Risk	Low Risk
		39(34%)	20(17%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		3(3%)	1(1%)	1(1%)
		0(0%)	1(1%)	1(1%)
		74(64%)	40(34%)	2(2%)
31	A trader's belief that -in this era of internet and online 24X7 business	High Risk	Medium Risk	Low Risk
		59(51%)	0(0%)	0(0%)

	activities, the old concept of undertaking dealing activities during predetermined business hours and at a designated place-'dealing room 'only should be dispensed with.	13(11%)	0(0%)	0(0%)
		17(15%)	0(0%)	0(0%)
		20(17%)	0(0%)	0(0%)
		5(4%)	0(0%)	0(0%)
		1(1%)	0(0%)	1(1%)
		115(99%)	0(0%)	1(1%)
32	Failure in maintenance of strict confidence by the staff involved in the processes related to investment, especially trading activities. Belief that discussing open positions with peer group dealers/ friends helps in making objective decisions.	High Risk	Medium Risk	Low Risk
		42(36%)	17(15%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		2(2%)	0(0%)	0(0%)
		76(66%)	40(34%)	0(0%)
33	Paper trading makes a trader afraid of actual trading, particularly if (s)he has experienced losing money therein. It also makes a trader less emotional while making actual trading.	High Risk	Medium Risk	Low Risk
		42(36%)	17(15%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		2(2%)	0(0%)	0(0%)
		76(66%)	40(34%)	0(0%)
34	Failure in developing a written trading plan and act accordingly and frequently adopting the tactics of getting in or getting out from the market.	High Risk	Medium Risk	Low Risk
		42(36%)	17(15%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		0(0%)	0(0%)	2(2%)
		74(64%)	40(34%)	2(2%)
35	A trader's/investment manager's goal being first generating steady and big profits and then considering safety and survival.	High Risk	Medium Risk	Low Risk
		59(51%)	0(0%)	0(0%)
		13(11%)	0(0%)	0(0%)
		17(15%)	0(0%)	0(0%)
		20(17%)	0(0%)	0(0%)
		0(0%)	0(0%)	5(4%)
		0(0%)	2(2%)	0(0%)
		109(94%)	2(2%)	5(4%)
36	Losing trades disturb everyone. Risks attached with a trader's/investment manager's inability in shaking off the setbacks and accepting these as a cost of doing business in the market.	High Risk	Medium Risk	Low Risk
		39(34%)	20(17%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	0(0%)	5(4%)
		0(0%)	2(2%)	0(0%)
		71(61%)	40(34%)	5(4%)
37	Blindly following advices/trading tips of senior traders/market pundits and act accordingly.	High Risk	Medium Risk	Low Risk
		59(51%)	0(0%)	0(0%)
		13(11%)	0(0%)	0(0%)
		17(15%)	0(0%)	0(0%)

		20(17%)	0(0%)	0(0%)
		0(0%)	3(3%)	2(2%)
		0(0%)	0(0%)	2(2%)
		109(94%)	3(3%)	4(3%)
38	Disregard for conventional training at a academic institution /training centre and heavy dependency on various websites, blogs, books, magazines, newspapers	High Risk	Medium Risk	Low Risk
		59(51%)	0(0%)	0(0%)
		13(11%)	0(0%)	0(0%)
		17(15%)	0(0%)	0(0%)
		20(17%)	0(0%)	0(0%)
		5(4%)	0(0%)	0(0%)
		0(0%)	0(0%)	2(2%)
		114(98%)	0(0%)	2(2%)
39	Showing scant regard for fundamental and technical analysis and firmly believing in the saying- "Trading is a "on-the-spot-decision-making"–game.	High Risk	Medium Risk	Low Risk
		39(34%)	20(17%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		0(0%)	0(0%)	2(2%)
		71(61%)	43(37%)	2(2%)
40	Trading Discipline - In a trading room, a trader's unwillingness to refer his/her trading dairy/spread sheet frequently for analysing price levels, entry/exit points.	High Risk	Medium Risk	Low Risk
		39(34%)	20(17%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		71(61%)	45(39%)	0(0%)
41	Risks attached to the improper alignment of trader's strengths, his/her style of functioning vis-à-vis unavailability of resources, information, market favourability etc.	High Risk	Medium Risk	Low Risk
		34(29%)	16(14%)	9(8%)
		5(4%)	5(4%)	3(3%)
		6(5%)	6(5%)	5(4%)
		7(6%)	7(6%)	6(5%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		59(51%)	34(29%)	23(2%)
42	A trader's/investment manager's reluctance in reviewing past performances, especially poor or bad performances. Believing that these carry, among other things, emotional setbacks which hamper decision making process.	High Risk	Medium Risk	Low Risk
		34(29%)	16(14%)	9(8%)
		5(4%)	5(4%)	3(3%)
		6(5%)	6(5%)	5(4%)
		7(6%)	7(6%)	6(5%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		52(45%)	41(35%)	23(2%)
43	Non-evaluation of performance and control mechanisms. Slips in getting feedback on dealers'/investment managers' performance and thus unable to determine whether the performance has been due to luck or	High Risk	Medium Risk	Low Risk
		59(51%)	0(0%)	0(0%)
		13(11%)	0(0%)	0(0%)
		17(15%)	0(0%)	0(0%)
		20(17%)	0(0%)	0(0%)
		5(4%)	0(0%)	0(0%)

	skill or favourable circumstances.	2(2%)	0(0%)	0(0%)
		116(1%)	0(0%)	0(0%)
44	Poorly designed performance incentive schemes for treasury personnel. Different schemes for front and back office personnel.	High Risk	Medium Risk	Low Risk
		42(36%)	17(15%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		0(0%)	5(4%)	0(0%)
		0(0%)	2(2%)	0(0%)
		74(64%)	42(36%)	0(0%)
45	Considering trading is an individual's performance instead of teamwork.	High Risk	Medium Risk	Low Risk
		42(36%)	17(15%)	0(0%)
		8(7%)	5(4%)	0(0%)
		11(9%)	6(5%)	0(0%)
		13(11%)	7(6%)	0(0%)
		5(4%)	0(0%)	0(0%)
		2(2%)	0(0%)	0(0%)
		81(7%)	35(3%)	0(0%)

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Annexure-4

Examples of People Risks in Trading Activities-

"Behind every great fortune there is a crime." - Honore de Balzac

Financial scams and frauds are alarmingly confidence shaking and send a very wrong signal to the investors or the associate companies, with a corresponding drop in accountability. Business executives who swear by high ethical and moral standards and harmonise others to abide by them, filling their websites and annual reports with pages upon pages lauding corporate social responsibility and ideal corporate governance remorselessly befool investors, employees and government authorities. A few of such worthies are listed below-

Year	Company	Trader	Auditor	Years to Discovery	Source of Loss Problem	Problem Type	Risk Classification	Trading Losses ($B)	Final Result
1994	Kidder Peabody	Joseph Jett	KPMG	2	False profits on US Treasury forward trades.	Flaw in Kidder Peabody's computer systems. System incorrectly valued forward traded trades as immediately settled.	Operational/ IT Systems	0.35	Kidder Peabody Bankruptcy.
1995	Barings Bank	Nick Leeson	Deloitte and Touche	3	Unauthorized speculative position on futures linked to Nikkei 225 and Japanese government bonds and Options on Nikkei index.	A) Trader was allowed to execute AND settle his own trades; B) Unchecked error account. Error accounts used to correct mistakes in trading.	Operational	1.4	Collapse of Barings Bank. Deloitte and Touche found guilty of negligence in its audit by UK court. Red flag that Barings posted more margin to Singapore futures exchange than it had received from customer accounts.

1995	Daiwa Bank	Toshihide Iguchi	Showa Ota (part of Ernst and Young)	11	Unauthorized US Treasury bond trading	Falsifying subcustody account statements held at Bankers Trust. (Note: Iguchi's did not relinquish back-office responsibilities with his promotion to trader.)	Operational	1.1	• Daiwa end of US Operationsands\$340mm fine; • 16 counts of Federal felonies; • counts of conspiracy to defraud US and Federal Reserve bank; • 1 count misprision of a felony; • 10 counts of falsifying bank records; • 2 counts of wire fraud and • 1 count of obstructing a bank examination.
1996	Morgan Grenfell Asset Management	Peter Young	KPMG	1	Shares-investments in unlisted companies	A) Shell companies in Luxembourg to hide dealings in unlisted companies, mainly in Scandinavia; B) breach of rules in investing more than 10% in unlisted stocks.	Operational/ Legal and Compliance — Lack of oversight on cross border transactions/ legal entities.	0.66	Eventual sale to Deutsche Bank.
1997	UBS	Ramy Goldstein	Ernst and Young	6	Inadequately hedged equity derivative trades.	A) Independence from the bankor company risk control process; B) conflicts of interest and overlapping of responsibilities in UBS' risk management efforts.	Operational/ Legal and Compliance	0.68	Merger with Swiss Bank Corporation (SBC).

2002	Allfirst Financial/ Allied Irish Bank	John Rusnak	Ernst and Young	2	FX Options and bets on Japanese yen.	A) Booking bogus trades with Asian counterparties; B) forged trade confirmations.	Operational	0.75	Allfirst Financial sold to M&T Bank.
2008	SocieteGenerale	Jerome Kerviel	Ernst and Young	3	European Index Futures.	Unhedged futures contracts covered with bogus forward trades.	Operational	7.22	Net loss reported for one quarter.
2008	AIGFP	Joseph Cassano	Price Waterhouse Coopers (PwC)	Data not available	Credit Default Swaps (CDS).	Unhedged CDS.	Adverse external events- subprime mortgage crisis/credit ratings downgrade.	85.5	AIG Bankruptcy, US Treasury/NY Fed bailout; continuing majority ownership by US Government.
2011	UBS	KwekuAdoboli	Ernst and Young	3	Delta 1 and Equities ETF.	Unmonitored "failed to deliver trades."	Operational	2.3	UBS CEO resignation and management shakeup.

Sources: Baltimore Sun, Bilanz, New York Times, The Independent, Wall Street Journal, Wall Street & Technology

Adapted from the article by, Amy Poster and Elizabeth Southworth , "Lessons Not Learned: The Role of Operational Risk in Rogue Trading", in Risk Professional, June 2012, available from www.garp.org.

Top Global Finance Scandals[27]

Bernard Madoff- Former NASDAQ chairman who initiated a Ponzi scheme confessed to his crime in 2008. On June 29, 2009, he was sentenced to 150 years in prison with restitution of $170 billion. Prosecutors estimated the size of the fraud to be $64.8 billion.

The Enron Scandal- Enron, awarded as the most innovative company by Fortune, showed its smartness in manipulating accounts. Its chairman Kenneth Lay and the CEO Jeffrey Skilling were convicted alongwith other accomplices for hiding billions of dollars in debt from failed deals and projects. The auditing failure revealed in 2001 resulted in the birth of Sarbanes Oxley Act of 2002 in USA and the dissolution of Arthur Anderson, one of the big five auditing forms in the world at that time.

Worldcom: This US telecom major went bankrupt in 2002 after revealing that it had incorrectly accounted for $3.8 billion in operating expenses. Arthur Anderson was again found involved in the coverup.

UN's Oil for Food Program: Originally conceived as a means of providing humanitarian aid to the Iraqi people. It was subverted by Saddam Hussein's regime who siphoned off an estimated $10 billion through oil smuggling and systematic thievery, by demanding illegal payments from companies buying Iraqi oil, and through kickbacks from those selling goods to Iraq, all under the noses of U.N. bureaucrats. Known as the biggest scandal in U.N. history.

Vatican Bank: The Vatican Bank was involved in a major political and financial scandal worth US $3.5 billion in 1980s, resulted in the collapse of Banco Ambrosiano of which it was a major share-holder. The head of the Vatican Bank from 1971 to 1989, Paul Marcinkus, was indicted in 1982 in Italy. the incidence inspired the plot of the movie," The Godfather Part- III".

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[27]http://money.butjazz.com/top-finance-scandals/

<h2 style="text-align:center">Top Ten Indian Financial Scandals[28]</h2>

Insurance Scam – This scam had happened in the period immediately following Independence in 1947. At that time, the insurance sector was not nationalized, and a handful of private companies dominated it. These companies were biased in providing benefits to select industrialists, thereby ignored the interests of the common man. The government responded by nationalizing the insurance sector, and the LIC was formed under a Special Act of the Parliament. This scam laid the foundation of the nationalization culture in India.

Harshad Mehta Scam– This is perhaps the most well-known of all financial scams – probably because it happened in a highly visible period – just soon after the start of the economic reforms in 1991. Harshad Mehta was quick to understand the weaknesses of the banking system, and exploited these weaknesses to the hilt. He managed to procure huge amounts of money using the so- called Ready Forward Deals, and used this money to purchase large amounts of shares at hugely inflated prices. He was also called as the Big Bull of the stock market. Later, the banks got a clue of his shady deals, and demanded their money back.

CR Bhansali Scam – This scam took place during the years 1992-1996, the period immediately following the Harshad Mehta fallout. This makes the scam even all the more daring and surprising. CR Bhansali, the perpetrator of this scam, floated more than 100 companies, such as CRB Mutual Funds and CRB Capital Markets. The primary purpose of these companies was to attract huge funds from the public by promising high rates of interest. This interest was later paid from further borrowings, and so on. In 1995, the stock market collapsed, and this proved to be the undoing of CR Bhansali. He was investigated, and later arrested.

UTI Scam – The UTI scam involved the flagship US-64 scheme of UTI, which was meant to channel the funds of small investors into instruments bearing high returns. The economic liberalization in India with operations of UTI led to a situation where

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[28]http://www.caclubindia.com/forum/top-10-financial-scandals-91487.asp

in the Government was forced to announce a huge bailout of about Rs. 3,500-4,000 crores in order to prevent default in payments to the investors. Later, it turned out that the UTI Chairman appointed at that time, Mr. P S Subramanyam, along with a couple of executive directors, acted to selectively benefit a powerful coterie of brokers and industrialists, while at the same time, jeopardizing the interests of lakhs of small investors.

Home Trade Scam – Around the year 2000, a finance portal emerged on the financial landscape, and gained quick recognition on the back of endorsements by personalities like HrithikRoshan, Sachin Tendulkar and Shahrukh Khan. The portal, owned by Sanjay Agarwal, claimed to deal in gilts. Soon, RBI got suspicious of activities of some cooperative banks in the gilt market, and the scam was uncovered. It was the brokers and bankers combining to rob people's money. The total scam size was reported to be around Rs. 300 crores, and more than Rs. 200 crores were spent on publicity costs alone.

Ketan Parekh Scam– Ketan Parekh, a qualified CA, and a stock broker, identified a number of stocks (popularly called the K-10), and took up huge positions in these. For this purpose, he used a large number of Benami accounts and smaller stock exchanges, such as the Kolkata and Ahmedabad stock exchanges. He borrowed heavily from banks like Global Trust Bank and Madhavpura Mercantile Cooperative Bank. Unfortunately, he was stuck in a bear cartel, and was soon pounded to pulp on the stock exchange. The extent of the scam was estimated to be around Rs. 1,500 crores.

Abdul KarimTelgi Scam - This scam promised to be the mother of all scams in India, initially quoting a figure of Rs. 30,000 crores as the scam size. Later, RBI clarified that this figure was rather exaggerated, and the correct figure was around Rs. 200 crores. Again, this scam exposes how the India system works – Mr Abdul KarimTelgi, the scam plotter, paid bribes to get access to the security press in Nasik, where stamp papers and currency notes are printed. He later used this knowledge to print fake stamp papers. At the height of the scam, Telgi's network spanned 14 states, 125 banks and more than 1,000 employees.

DSQ Software Scam – Though this scam was modest in terms of money involved (only Rs. 600 crores), and did not very much affect the general public to a great extent, yet it is notable for how it came into being. The main player in the scam was Mr. Dinesh Dalmia, who was the MD of DSQ Software Ltd. This company issued around 1.3 million shares in 2001, and these shares were allotted to four companies on a preferential basis. NSDL, a stock depository, dematerialized and helped in delivering the shares. Nothing wrong in that, except that the shares were not even listed on any stock exchange!

IPO Scam – A number of key operators, including corporate stock brokers such as Karvy and India Bulls, were involved in the IPO scam that spanned the years 2004 – 2005. The modus operandi was simple – the operators would open thousands of fake accounts to purchase shares in IPOs, in the hope of selling them later at huge profits. A spate of IPOs issued during this period were heavily oversubscribed due to this scam, sometimes by as much as 40 times. This can happen only if the system is poorly regulated and supervised.

Satyam Scam– One fine morning in January 2009, RamalingaRaju, Chairman of Satyam Computer Services, publicly admitted to falsification in the company accounts and various other irregularities, and sent a chill down the collective spine of the Indian financial system. Coming on the back of the global recession, this incident threatened to bust the Indian outsourcing industry and the stock market, but for some deft bailout work by the government. The worth of this scam was around Rs. 7,000 crores. It was with the help of some expert consultants that the company underwent a changeover to Mahindra Satyam taken over, by Tech Mahindra.

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History of Recent Major Operational Risk Events

Year	Particulars
2012	Hedge Fund Manager Trading in Chinese Bank Stocks – Securities and Exchange Commission (SEC) charged the manager of two New York-based hedge funds with conducting a pair of trading schemes involving Chinese bank stocks and making $16.7 million in illicit profits. Sung Kook "Bill" Hwang and his firms Tiger Asia Management and Tiger Asia Partners agreed to pay $44 million to settle the charges. (12/12/12)
	Investment Banker and Nine Others – SEC charged an investment banker and nine others who garnered more than $11 million in illicit profits trading on confidential information about impending mergers. The investment banker misused his position at Wells Fargo Securities to illegally tip friends about four impending merger transactions involving firm clients. (12/5/2012)
	Two Retail Brokers – SEC charged two brokers who worked at a Connecticut-based broker-dealer with insider trading on nonpublic information ahead of IBM's acquisition of SPSS Inc. One of the brokers learned confidential details from his roommate, a research analyst who obtained the information from an attorney working on the transaction who discussed it in confidence. The insider trading yielded more than $1 million in illicit profits. (11/29/2012)
	Hedge Fund Firm and Two Others – SEC charged Stamford, Conn.-based hedge fund advisory firm CR Intrinsic and its former portfolio manager along with a medical consultant for an expert network firm for their roles in a $276 million insider trading scheme involving a clinical trial for an Alzheimer's drug being jointly developed by two pharmaceutical companies. (11/20/12)
	Health Care Company Employees and High School Friends – SEC charged three health care company employees and four others in a New Jersey-based insider trading ring of various high school friends generating $1.7 million in illegal profits and kickbacks by trading in advance of 11 public

	announcements involving mergers, a drug approval application, and quarterly earnings of pharmaceutical companies and medical technology firms. (11/19/12)
	Silicon Valley Executive in Galleon Scheme – SEC charged a former senior executive at a Silicon Valley technology company for illegally tipping convicted hedge fund manager Raj Rajaratnam with nonpublic information that allowed the Galleon hedge funds to make nearly $1 million in illicit profits. (10/26/12)
	Investment Bank Analyst – SEC charged a former analyst at a Boston-based investment bank with illegally tipping a longtime college friend with confidential information he gleaned from unsuspecting co-workers about clients involved in impending mergers and acquisitions which resulted in more than $600,000 in illegal profits. (9/27/12)
	Georgia-Based Trading Ring – SEC charged eight individuals living in the Griffin, Ga., area for their involvement in an insider trading ring that generated more than $500,000 in illegal profits based on nonpublic information about an upcoming company merger. (8/28/12)
	Founder of Equity Research Firm – SEC charged the owner of the California-based equity research firm Insight Research with insider trading as part of agency's ongoing investigation of insider trading involving "expert networks" that provide specialized information to investment firms. (6/28/12)
	Yahoo Executive and Ameriprise Manager – SEC charged a former executive at Yahoo! Inc. and a former mutual fund manager at a subsidiary of Ameriprise Financial Inc. with insider trading on confidential information about a search engine partnership between Yahoo and Microsoft. (5/21/12)
	Hedge Fund Managers and Analysts - SEC charged multi-billion dollar hedge fund advisory firms Diamondback Capital Management LLC and Level Global Investors LP as well as seven fund managers and analysts involved in a $78 million insider trading scheme based on nonpublic information about Dell's quarterly earnings and similar information about Nvidia Corporation. (1/18/12)
2011	Goldman Sachs Employee - SEC charged Spencer Mindlin and his father

with for sharing confidential information about Goldman's trading strategies and intentions that he learned while working on the firm's ETF desk.

Global Consulting Executive - SEC charged a former global consulting firm executive and his friend who once worked on Wall Street for utilizing confidential information about impending takeovers of two biotechnology companies for more than $2.6 million in illicit profits.

Corporate Board Member - SEC charged former Mariner Energy Inc. board member H. Clayton Peterson and his son with insider trading on confidential information about the impending takeover of the company. The son also tipped several close friends. The Petersons and their tippees obtained more than $5.2 million in illicit profits.

Former Major League Baseball Player - SEC charged Doug DeCinces and three others with insider trading ahead of a company buyout and obtaining more than $1.7 million in illegal profits. DeCinces agreed to pay $2.5 million to settle the SEC's charges.

Emergency Action Against Three Swiss-Based Entities - SEC obtained asset freezes against entities charged with insider trading around an acquisition announcement. The asset freezes were intended to prohibit the foreign firms from transferring the proceeds of their illegal trading overseas.

Former NASDAQ Managing Director - SEC charged Donald L. Johnson, a former managing director of The NASDAQ Stock Market, with insider trading on confidential information that he misappropriated while working in a market intelligence unit that communicates with executives at listed companies about impending public announcements that could affect their stocks. Johnson obtained illicit trading profits of at least $755,000 during a three-year period.

Former Front Point Partners Hedge Fund Portfolio Manager - SEC charged Dr. Joseph F. "Chip" Skowron, a former hedge fund portfolio manager affiliated with a Front Point Partners LLC healthcare fund, with insider trading based on confidential information about negative details of an experimental drug that he received from Dr. Yves Benhamou, a medical researcher overseeing a clinical drug trial. (The SEC charged Benhamou on 11/2/10 for his misconduct in this matter). The material non-public

	information that Skowron received allowed the hedge funds that he managed to avoid losses of at least $30 million.
	Insider Trading Scheme Involving Corporate Attorney and Wall Street Trader - SEC charged corporate attorney Matthew Kluger and Wall Street trader Garrett Bauer for their involvement in a highly organized serial insider trading ring that traded in advance of merger and acquisition announcements involving clients of the law firm Wilson Sonsini Goodrich &Rosati. The ring made at least $32 million in illegal profits between April 2006 and March 2011.
	Kluger, Bauer, and Middleman Settle SEC Charges - Kluger, Bauer, and their mutual friend Kenneth Robinson agreed to give up their ill-gotten gains plus interest to settle the charges against them.
	Insider Trading by FDA Chemist - SEC charged Cheng Yi Liang, a chemist at the U.S. Food and Drug Administration, with insider trading on confidential information concerning upcoming announcements of FDA drug approval decisions, generating more than $3.6 million in illicit profits and avoided losses.
	Expert Networks Insider Trading Scheme - SEC charged a New York-based hedge fund and four hedge fund portfolio managers and analysts who illegally traded on confidential information obtained from technology company employees moonlighting as expert network consultants, in a scheme that netted more than $30 million in illicit profits.
	On 8th February 2011, SEC Charges Hedge Fund Managers and Traders in $30 Million Expert Network Insider Trading Scheme.
	Former Board Chairman of Home Diagnostics - SEC charged George Holley, a co-founder and former Chairman of the Board of Home Diagnostics Inc., with illegally tipping friends and business associates with inside information about an impending acquisition of the company. Holley's tips resulted in combined illicit profits of at least $170,000.
2010	In 2010, information technology major Wipro detected a fraud committed by one of its employees, who siphoned off around $4 million from company's funds by getting access to a colleague's password. The money was diverted from one of Wipro's bank accounts over the last couple of years and came to

light when it showed an overdraft transaction despite the company having sufficient balance. The company confirmed that only one person was involved in the act, who was responsible for maintaining its financial books and had powers to authorise payments whenever needed. The treasury head, Shreemal said the fraud did not show up in the company's routine accounts reconciliation as it involved small amounts over a long period. According to reports, the employee siphoned off company's money to his personal accounts in multiple transactions of between Rs 1 lakh to Rs 1.2 crore.

Former Law Firm Technology Manager and Brother-in-Law - SEC charged a former information technology manager at a Delaware law firm and his brother-in-law with insider trading on confidential information about impending mergers and acquisitions by the law firm's clients. The insider trading scheme resulted in over $182,000 in illegal profits.

Medical Researcher Tipping Inside Information about Clinical Trial - SEC charged Yves Benhamou, a French medical doctor and researcher, with tipping a hedge fund manager with confidential information about a clinical drug trial that he was overseeing. (The hedge fund manager was subsequently charged by the SEC on 13/4/11 for his misconduct in this matter). Benhamou tipped the hedge fund manager with non-public negative details about an experimental drug ahead of a public announcement by the company that manufactured the drug. Based on Benhamou's tips, the hedge fund manager sold his shares in the drug company, allowing the hedge funds to avoid losses of at least $30 million.

Pharmaceutical Company Insider and Former Hedge Fund Manager - SEC charged James W. Self, Jr., a pharmaceutical company insider, and Stephen R. Goldfield, a former hedge fund manager, with insider trading in advance of an announcement that AstraZeneca would acquire MedImmune, Inc. The material non-public information about the acquisition allowed the former hedge fund manager to realize illicit profits of approximately $14 million.

Asset Freeze for Insider Trading by Spain-based Traders - In an expedited investigation, the SEC swiftly charged two residents of Spain with insider trading and obtained an emergency asset freeze. The residents made nearly $1.1 million by trading while in the possession of material non-public

	information in advance of the public announcement of a tender offer by BHP Billiton Plc to acquire Potash Corp. of Saskatchewan Inc. One of the defendants was the head of a research arm at Banco Santander, S.A., a Spanish banking group advising BHP on its bid.
	Igor Poteroba, an investment banker at UBS Securities LLC, and two others were charged for clandestine trading practices that netted approximately $1 million in illicit profits by trading ahead of at least 11 mergers, acquisitions, and other corporate deals. The traders used coded e-mail messages in an attempt to conceal their unlawful trading.
2009	Vinayak S. Gowrish and Adnan S. Zaman, former employees at major global financial institutions, and two of their friends were charged for in a serial insider trading scheme to profit on highly confidential merger and acquisition information.
	Galleon Cases - In the Galleon cases, the SEC has charged 29 defendants for widespread and repeated insider trading in the securities of 15 companies generating illicit profits totaling nearly $90 million. The illegal conduct involved Raj Rajaratnam and his New York-based hedge fund Galleon Management making cash payments in exchange for material non-public information. The case eventually ensnared corporate executives, consultants, rating agency personnel, proprietary traders, hedge fund executives, and public relations personnel.
	Three New York-based attorneys at the law firm Ropes & Gray LLP were charged for tipping inside information in exchange for kickbacks and six Wall Street traders and a proprietary trading firm involved in a $20 million insider trading scheme. The SEC alleged that the three lawyers tipped material non-public information about confidential corporate acquisitions by firm clients to a network of traders and hedge fund managers in exchange for kickbacks.
2008	French bank Societe Generale uncovers an alleged 4.9 billion euro (then worth $7.14 billion) fraud by a futures trader, Jerome Kerviel, who fooled regulators and overstepped his authority. Kerviel was later convicted on charges of forgery, breach of trust and unauthorized computer use for covering up bets. He was ordered to pay back to the bank the money he lost

	and was banned for life from working in the financial industry.
2006	Rajiv Gandhi, former company secretary and CFO of Wockhardt, along with his immediate family members, was alleged to have traded in the pharma company's shares on the basis of unpublished price-sensitive information (Wockhardt's financial results). SEBI imposed a monetary penalty of Rs 5 lakh on Gandhi.
	After five years of investigation, SEBI held Dilip Pendse, former MD of Tata Finance, guilty of insider trading. Pendse was alleged to have helped J Talaulicar, former director of Nishkalp Investment and Trading, a subsidiary of Tata Finance, to offload a large chunk of the NBFC's shares at a premium, prior to the public announcement of Nishkalp's huge loss. SEBI imposed a monetary penalty on Pendse, besides debarring him from dealing in the securities market for 2 years.
2004	Samir Arora, former Asia-Pacific head of Alliance Capital Mutual Fund, was charged with indulging in unfair trade practices for disposing off a considerable quantity of shares held by the fund under his management which resulted in a sharp decline in the valuation of Alliance. SEBI noted that when the US-based fund decided to sell its Indian interests, Arora was one of the contenders. SEBI banned Arora from dealing in securities in any manner for a period of five years.
2002	Former currency trader John Rusnak accused of hiding US$691 million in losses at Allfirst bank of Baltimore, at the time under parent Allied Irish Bank, pleads guilty to one of the largest bank fraud cases in U.S. history.
1998	SEBI pulls up Hindustan Lever (now Hindustan Unilever) and its then five directors SM Datta, KB Dadiseth, R Gopalakrishnan, A Lahiri and MK Sharma for alleged insider trading. The case involved HLL purchasing a sizeable chunk of Brooke Bond Lipton shares from UTI, prior to its public announcement related to the merger of the two outfits, which, according to SEBI, was price sensitive information. Both HLL and Brooke Bond were subsidiaries of the same parent — Unilever. It's the first case where SEBI passed an order on insider trading. Status: SEBI directed HLL to compensate UTI to the extent of Rs 3.04 crore. HLL then approached the finance ministry, which was then the appellate authority on SEBI orders. MoF ruled

	in favour of HLL. Following this, SEBI filed an appeal in the Bombay HC. Status: The final verdict is yet to be pronounced.
1996	Sumitomo Corp., a 300-year old Japanese metals trader, discovers that its star copper trader, Yasuo Hamanaka, amassed $2.6 billion in losses in unauthorized trades over a decade. The revelation caused copper prices to plummet worldwide. Sumitomo has paid millions of dollars in class action lawsuits and Hamanaka served more than seven years in prison.
1995	Collapse of Britain's Barings Bank after a trader in Singapore, Nick Leeson, lost 860 million pounds (then worth US$1.38 billion) on futures trades. The fraud prompted banks worldwide to tighten internal checks.
	Toshihide Iguchi, a New York bond trader for Japan's Daiwa Bank, charged with hiding $1.1 billion in trading losses he accumulated over 12 years. The bank later pleaded guilty to failing to notify U.S. authorities sooner. It was hit with $340 million in fines and shut its U.S. operations. Iguchi was sentenced to four years in prison and fined.
1991	Bank of Credit and Commerce International (BCCI), operating in nearly 70 countries, is seized by bank regulators, acting on auditors' reports of huge losses from illegal loans to corporate insiders and from trading transactions. Some 250,000 depositors left without funds. Claims exceeded US$10 billion.

Annexure-5

Glossary of Operational Risk Terminology

ABC Analysis is a method of classifying items according to a ranking criterion that determines their importance. The ranking procedure groups items on user selectable performance criteria, such as cost, sales, profitability, turn-over, or a user defined ranking. This allows a firm to focus attention on items based on the relative importance of those items to the organisation. ABC ranking system is useful because many types of businesses find that the '80/20' rule may be applied to them. For example, that 80% of all sales are generated from around 20% of stock holdings. For obvious reasons it is important to be able to distinguish between the top performing items from other items in inventory pool.

Asset and Liability Management: In banking, asset and liability management is the practice of managing risks that arise due to mismatches between the assets and liabilities (debts and assets) of the bank.

Available for Sale: Accounting standards necessitate that companies classify any investments in debt or equity securities when they are purchased. The investments can be classified as: held to maturity, held for trading or available for sale. An available-for-sale security is a debt or equity security that is purchased with the intent of selling before it reaches maturity, or selling prior to a lengthy time period in the event the security does not have a maturity. This type of security is reported at fair value; changes in value between accounting periods are included in comprehensive income until the securities are sold.

Banking Book shows those Group assets, liabilities and off-balance-sheet items that are not in the trading book.

Basel Accords: The Basel Accords (Basel I Accord, the Market Risk Amendment and the Basel II Accord) are the cornerstones of international risk-based banking regulation, the results of a collaborative attempt by banking regulators from major developed countries to create a globally valid and widely applicable framework for banks and bank risk management. Basel II, the 2004 Basel Capital Accord, include a

set of recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision. Formally referred to as the ―International Convergence of Capital Measurements and Capital Standards — A Revised Framework; Published in June 2004.

Basel Committee on Banking Supervision: The Basel Committee on Banking Supervision is a forum for regulatory cooperation between its member countries on banking supervision-related matters, was established by the central bank governors, and consists of senior representatives of bank supervisory authorities and central banks from major economies.

Beta Factor (Operational Risk): The beta factor is the fixed percentage of average positive annual gross income (over three years) of the eight different business lines a bank may have and is used to calculate its operational risk capital.

Betas: Beta describes the return sensitivity of an individual stock or a portfolio of stocks to that of the market.

Business Continuity Plan: Business continuity planning involves the task of identifying, developing, acquiring, documenting, and testing procedures and resources that will ensure continuity of a firm's key operations in the event of an accident, disaster, emergency, and/or threat.

Business Risk: A risk that is derived from the specific services and products and are particular to the industry of the firm concerned. These risks are often subsets of strategic risk and occur or originate from business units.

Cash Reserve Ratio: is a ratio which banks have to maintain with itself in the form of cash reserves or by way of current account with the Reserve Bank, computed as a certain percentage of its demand and time liabilities. The objective is to ensure the safety and liquidity of the deposits with the banks.

Certificates of Deposit: A deposit of funds for a specified term that earns interest at a specified rate or rate formula and issued by corporates /FIs. CDs may be secured or

unsecured. CDs may be for terms as short as one week or for terms of 10 years or longer. CDs may have fixed or floating rates. CDs may be issued in either non-negotiable or negotiable form and in either physical or book-entry form.

Collateralized Borrowing and Lending Obligations (CBLO): A money market instrument that represents an obligation between a borrower and a lender as to the terms and conditions of the loan. Collateralized borrowing and lending obligations (CBLOs) are used by those who have been phased out of or heavily restricted in the interbank call money market. CBLOs were developed by the Clearing Corporation of India (CCIL) and Reserve Bank of India (RBI). The details of the CBLO include an obligation for the borrower to repay the debt at a specified future date and an expectation of the lender to receive the money on that future date, and they have a charge on the security that is held by the CCIL.

Commercial Paper: An unsecured, short-term debt instrument issued by a corporate typically for the financing of accounts receivable, inventories and meeting short-term liabilities. Maturities on commercial paper rarely range any longer than 270 days. The debt is usually issued at a discount, reflecting prevailing market interest rates. Commercial paper is not usually backed by any form of collateral, so only firms with high-quality debt ratings will easily find buyers without having to offer a substantial discount (higher cost) for the debt issue.

Contributory Factor: a risk factor or controllable factor that contributes to loss frequency or loss severity.

Controllable Factor: an endogenous contributory factor that contributes to loss frequency or loss severity (such as inadequate training, unsafe working conditions or lack of supervision).

Cost of Risk: a financial measure of risk defined as the expected loss, plus the capital multiplied by the cost of capital.

Country Risk : Risk of clearing, settlement and client money regulation not being as strong as in the UK/US Law, Infrastructure, Information distribution may be less transparent and/or obtainable.

Data Risk: Occurs when data is incorrectly generated, updated, stored or used. Corrupted or incorrect data in critical systems (including risk systems) can have a devastating impact. Unauthorised access, use or publication of confidential client or business data can have such an impact as to put at risk the very existence of the organization.

Demand & Time Liabilities of a bank may be in the form of demand or time deposits or borrowings or other miscellaneous items of liabilities. Liabilities of the banks may be towards banking system (as defined under Section 42 of RBI Act, 1934) or towards others in the form of Demand and Time deposits or borrowings or other miscellaneous items of liabilities.

Demand Liabilities : 'Demand Liabilities' include all liabilities which are payable on demand and they include current deposits, demand liabilities portion of savings bank deposits, margins held against letters of credit/ guarantees, balances in overdue fixed deposits, cash certificates and cumulative/ recurring deposits, outstanding Telegraphic Transfers (TTs), Mail Transfer (MTs), Demand Drafts (DDs), unclaimed deposits, credit balances in the Cash Credit account and deposits held as security for advances which are payable on demand.

Disaster Recovery Plan: Disaster recovery planning involves an analysis of business processes and continuity needs; it may also include a significant focus on disaster prevention. Disaster recovery is the process by which you resume business after a disruptive event. The event might be something huge-like an earthquake or the terrorist attacks on the World Trade Center-or something small, like malfunctioning software caused by a computer virus. Given the human tendency to look on the bright side, many business executives are prone to ignoring "disaster recovery" because disaster seems an unlikely event. 'Disaster Recovery Plan' and 'Business Continuity Plan' both are referred for the same intention because of their many common considerations. Whereas DRP is the process meant for taking steps

post incidences and BCP is a comprehensive approach to run the organisations in all situations not only after a natural calamity but also in the event of smaller disruptions including illness or departure of key staffers, supply chain partner problems or other challenges that businesses face from time to time.

Diversification: A portfolio strategy designed to reduce exposure to risk by combining a variety of investments, such as stocks, bonds, and real estate, which are unlikely to all move in the same direction. The goal of diversification is to reduce the risk in a portfolio. Volatility is limited by the fact that not all asset classes or industries or individual companies move up and down in value at the same time or at the same rate. Diversification reduces both the upside and downside potential and allows for more consistent performance under a wide range of economic conditions. Diversification should not be confused with hedging, which is the taking of offsetting risks. With diversification, risks are uncorrelated. With hedging, they have negative correlations. The concept is often explained with the age-old saying "don't put all your eggs in one basket."

Duration is a measure of price sensitivity for a fixed income instrument and quantifies the sensitivity of the price of a fixed-income investment to a small incremental change in interest rates.

Economic capital: Economic capital is "the amount of equity capital required for the company to achieve its optimal rating." It absorbs unexpected losses, up to a certain point, depending on the desired confidence level. The confidence level is decided by senior management of the Bank and endorsed by the board. Economic capital is most relevant to shareholders. It is meant to absorb unexpected losses. Economic capital does not cover expected losses. $EC = WCL(\alpha)-EL \quad EL = PD * GD$

Event: an occurrence; something that has happened (e.g., a loss).

Expected Loss: the average loss; this can be calculated as the probability weighted mean of the severity distribution. The aggregated expected loss, with a one-year time horizon, is the average amount of money that is expected to be lost in one year, on average. This represents the probability weighted mean of the aggregate loss

distribution and can be calculated as the product of mean frequency and mean severity.

Expected Losses: nontechnical term used to describe losses one commonly observes typically the smaller losses. This is NOT to be confused with ―Expected Loss, which refers to the statistical mean of a loss distribution.

External Loss Data: loss data that comes from sources outside an individual organization and that reflects the loss experience of other institutions.

Frequency Distribution: a statistical distribution of the number of events with associated probabilities. Common frequency distributions include Poisson, Binomial and Negative Binomial.

Frequency: the number of events occurring during a specified time period.

Held for Trading: Debt and equity investments that are purchased with the intent of selling them within a short period of time (usually less than one year). Accounting standards necessitate that companies classify any investments in debt or equity securities when they are purchased. The investments can be classified as held to maturity, held for trading or available for sale.

Held to Maturity: Accounting standards necessitate that companies classify any investments in debt or equity securities when they are purchased. The investments can be classified as held to maturity, held for trading or available for sale. A held to maturity security is a debt or equity security that is purchased with the intention of holding the investment to maturity. This type of security is reported at amortized cost on a company's financial statements and is usually in the form of a debt security with a specific maturity date. Unlike held for trading securities, temporary price changes are not shown in accounting statements for held to maturity securities. Since stocks do not have a maturity date, they cannot be classified as held to maturity securities. The interest income received from a held to maturity security is run through the income statement, however the gains and losses go through comprehensive income until it is realized.

Impact: the aftermath of what happens after a negative event occurs; e.g., loss of reputation, write-down of an asset, etc.

Incident Reporting Dashboards: The Incident Reporting Dashboards are instruments designed to bring critical incident information to the forefront in an effort to streamline an organization's reporting and decision making processes. Using the Location Dropdown list, users have the ability to drill down to specific locations providing crucial real-time information on specific areas of their organizations.

Incident: synonymous with event; term often used by personnel outside the risk management profession.

Internal Loss Data: loss data that is collected by an individual institution and reflects its own loss experience.

Key Performance Indicators (KPI): Indicators showing a change in performance that may be evidence of increasing or decreasing efficiency and effectiveness of processes and procedures.

Key Risk Indicators (KRIs): The identification of risks and their indicators used in the risk management process. It is important that KRIs are monitored for evidence of increasing or decreasing risk levels and also for their continued relevance.

Key Risk: Identified as risks that could significantly impact on the achievement of the objectives of a business unit. Likely to be proactively managed by Head of Function/Department on a frequent (i.e. monthly) basis. Typically 15 to 20% of total risks. Firms develop key risk indicators to measure profile changes of the key risks.

Know Your Customer: A due diligence exercise untaken by banks, financial institutions and other regulated companies to identify their clients, know their

activities and ascertain relevant information pertinent to doing financial business with them.

LikertScale Pattern: A Likert scale is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the Likert-type scale, even though the two are not synonymous. The scale is named after its inventor, psychologist Rensis Likert. Likert distinguished between a scale proper, which emerges from collective responses to a set of items and the format in which responses are scored along a range. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item, while the results of analysis of multiple items (if the items are developed appropriately) reveals a pattern that has scaled properties of the kind Likert identified.

Liquidity Risk: term used to describe potential for loss from a liquidity squeeze. However, this is a misnomer in that ─Liquidity is *not* a risk (event) because one does not measure the impact in terms of loss. Instead one measures the loss in a reduction in the value of marketable securities (market risk). Where the liquidity squeeze is driven by exogenous factors it is a risk factor ─ something that exacerbates risk (e.g., market risk or credit risk). Where it is driven by endogenous factors (poor liquidity management), it represents a controllable factor (an operational failure).

Loss Database: A database that records incidents where a risk event has created a loss at or above a set threshold.

Loss: an adverse financial outcome resulting from an event.

Mark to Market: is a measure of the fair value of accounts that can change over time, such as assets and liabilities. Mark to market aims to provide a realistic appraisal of a bank, institution's or company's current financial situation. It is an

accounting act of recording the price or value of a security, portfolio or account to reflect its current market value rather than its book value. This is done most often in futures accounts to make sure that margin requirements are being met. If the current market value causes the margin account to fall below its required level, the trader will be faced with a margin call. Problems can arise when the market-based measurement does not accurately reflect the underlying asset's true value. This can occur when a company is forced to calculate the selling price of these assets or liabilities during unfavorable or volatile times, such as a financial crisis. For example, if the liquidity is low or investors are fearful, the current selling price of a bank's assets could be much lower than the actual value. The result would be a lowered shareholders' equity. Mutual funds are marked to market on a daily basis at the market close so that investors have an idea of the fund's NAV.

Modified duration is one of the approaches to quantify a bond's duration and approximates the percentage change in bond price for a 1% change in yield.

Near Miss: either a non-event, which nearly became an event (two airplanes nearly crash), or an event that did not result in any significant injury, illness or damage but had the potential to do so.

Net Interest Margin is a measure of the difference between the interest income generated by banks or other financial institutions and the amount of interest paid out to their lenders (for example, deposits), relative to the amount of their (interest-earning) assets. It is similar to the gross margin of non-financial companies. It is usually expressed as a percentage of what the financial institution earns on loans in a time period and other assets minus the interest paid on borrowed funds divided by the average amount of the assets on which it earned income in that time period (the average earning assets). Net interest margin is similar in concept to net interest spread, but the net interest spread is the nominal average difference between the borrowing and the lending rates, without compensating for the fact that the earning assets and the borrowed funds may be different instruments and differ in volume. The net interest margin can therefore be higher (or occasionally lower) than the net interest spread.

Operational Risk Management (ORM): The process of actively managing operational risks in a structure that adds value as well as reduces potential unnecessary losses.

Over diversification occurs when the number of individual investments in a portfolio exceeds the point where adding an investment asset does not reduce the risk of the portfolio more than the loss of potential returns. The situation when adding individual investments to a portfolio, each additional investment lowers risk but also lowers the potential return. Each time an investment is added to the portfolio it lowers the risk of the portfolio, but by a smaller and smaller amount. In addition each additional investment also lowers the potential return. At some point the number of investments where the marginal benefit of risk reduction is smaller than the loss of potential gains.

Profit after Tax is the net profit earned by the company after deducting all expenses like interest, depreciation and tax. PAT can be fully retained by a company to be used in the business. Dividends, if declared, are paid to the share holders from this residue.

Regulatory capital: Regulatory capital is rule-based (e.g., BIS 88, BIS 98) with the intention to ensure enough capital in a Bank. The Basel II Accord includes an explicit requirement (under Pillar I) for operational risk. The Advanced Measurement Approach (AMA) under Basel II, specifically, is consistent with a loss distribution approach (LDA). The AMA approach requires the calculation of a capital measure to the 99.9% ile confidence level over a one-year holding period. The LDA is natural way to meet both regulatory (i.e., external Basel) and economic (internal) capital requirements. Most financial institutions hold more capital than required by regulators.

Reputation Risk: represents the risk of a loss in franchise or brand value. Reputation risk is not a risk (event); it is an effect or impact and measures the impact an event may have on future income through decreased revenues or increased expenses.

Risk Control & Self-Assessment: A risk and control self-assessment (RCSA) is a business practice that helps a corporation's top management identify and appraise significant risks inherent in the company's activities. An RCSA approach also instructs departmental managers and segment-level employees on how to ensure that internal controls, policies and procedures are functional and adequate.

Scenario Analysis: The process of estimating the expected value of a portfolio after a given period of time, assuming specific changes in the values of the portfolio's securities or key factors that would affect security values, such as changes in the interest rate. Scenario analysis commonly focuses on estimating what a portfolio's value would decrease to if an unfavorable event, or the "worst-case scenario", were realized. Scenario analysis involves computing different reinvestment rates for expected returns that are reinvested during the investment horizon.

Severity: the monetary (direct or indirect) value of a loss.

Statutory Liquidity Ratio is a ratio which a banking company is required to maintain in the form of cash, gold or unencumbered approved securities, an amount which shall not, at the close of business on any day be less than such percentage of the total of its demand and time liabilities as the Reserve Bank of India may specify from time to time

Time Liabilities: Time Liabilities are those which are payable otherwise than on demand and they include fixed deposits, cash certificates, cumulative and recurring deposits, time liabilities portion of savings bank deposits, staff security deposits, margin held against letters of credit if not payable on demand, deposits held as securities for advances which are not payable on demand and Gold Deposits.

Trading book comprises positions in financial instruments and commodities, including derivative products and other off-balance-sheet instruments that are held with trading intent or to hedge other elements of the trading book. It includes financial instruments and commodities that: are held for short-term resale; or are held with the intention of benefiting from short-term price variations; or arise from broking and market making; or are held to hedge other elements of the trading book

Unexpected Loss: the level of loss at a stated confidence level minus the expected loss; this represents the amount of adverse deviation beyond the expected loss at a stated confidence level.

Unexpected Losses: nontechnical term used to describe losses one does NOT commonly observe — typically the large losses. This is NOT to be confused with the term —Unexpected Loss, which is a technical term and has a precise mathematical definition.

Value at Risk (VaR): A technique used to estimate the probability of portfolio losses based on the statistical analysis of historical price trends and volatilities. It includes two definitions: (1) the level of loss at a stated level of confidence or (2) the level of loss at a stated confidence level minus the expected loss.

Variance: a statistical measure of dispersion equal to the probability-weighted average of the squared distance of all possible values from the mean of the distribution.

Venture Capital Fund: An investment fund that manages money from investors seeking private equity stakes in startup and small- and medium-size enterprises with strong growth potential. These investments are generally characterized as high-risk/high-return opportunities. Theoretically, venture capital funds give individual investors the ability to get in early at a company's startup stage or in special situations in which there is opportunity for explosive growth. In the past, venture capital investments were only accessible to professional venture capitalists. While a fund structure diversifies risk, these funds are inherently risky.

This glossary of terms is compiled from various sources and is believed to be fairly correct although no responsibility can be taken for any errors or omissions. Against this backdrop, the researcher recommends relevant publications and websites for further information concerning risk sources, definitions, controls and risk management.

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List of Articles submitted for Publications

1. NPAs Management in Indian Banking – Policy Implications,

   Co-authored with Prof. Arya Kumar

   Manthan, IMS Journal, Vol VII Issue 2 December 2012, pp 9-17, ISSN number 0974 7141.

2. Operational Risk Management in Treasury Operations in Banks – Issues and Concerns,

   Co-authored with Prof. Arya Kumar

   Journal of Business Plus Markets, BIMTECH, (Submitted and under review process)

3. Operational Risk Management Challenges in Treasury Operations in Indian Banks and Financial Institutions,

   Co-authored with Prof. Arya Kumar

   Indian Banker, Journal of Indian Banks Association, (Submitted and under review process)

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Akhilesh Tripathi, is presently Chief Manager in State Bank of Bikaner & Jaipur, an associate of State bank of India, the largest state owned bank in India. He possess a vast experience and varied exposure in wide spectra of banking operations and administration ranging from Branch operations, Credit Management, Investment Management, Treasury Management, Risk Management, Change Management, Relationship Banking to Economic Research and Equity Analysis.

A seasoned banker with an accomplished banking career spanning over more than two and a half decades, his exposure has enabled him to evaluate banking and financing strategies, risk entailments and options to redress them as also commentate on banking related burning issues. The present research is an outcome of that. He is a guest faculty to staff training centre of his bank as well to few other professional courses imparting institutions on a wide range of topics covering Working Capital Management, Project management, Investment Management, Treasury Management, Risk Management, Change Management and Relationship Banking etc. He had conducted workshops and seminars on change management for junior, middle and senior management cadre of officers, during his stint in Business Process Reengineering Project of his bank. He has also worked as a Faculty Guide to students for carrying out Student Internship Projects.

His academic credentials include a basic degree education in commerce, an MBA, a CAIIB and a few certificate courses in the area of banking, treasury and risk management. He is alumnus of Indian Institute of Management, Indore and Birla Institute of Technology and Science (BITS), Pilani. He is also member of PRMIA, GARP, ISACA and Indian Institute of Banking and Finance (IIBF), Mumbai.

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Brief Biography of the Guide

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 Center 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 for 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 in 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 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 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 thesis, and is supervising 6 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 thesis, 50 students in undertaking special study oriented projects. He has delivered more than 32 invited talks/chaired sessions during last 6 years, especially in the area 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 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. Has been 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).