

The Scope of Developing Optimization Models for Insurer's Operational Risk from Risk-Return Trade-Off Perspective

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2 Executive summary

The debate on operational risk management in the insurance industry has gained momentum in recent years, mostly due to meeting the regulatory and rating agency capital requirements. The New Basel Capital Accord (NBCA), known as Basel II, which has been endorsed into insurers' Solvency II¹, establishes that a bank (or insurance company) should develop a framework for managing operational risk and evaluates the adequacy of capital given this framework. The framework should cover the bank's (insurer's) appetite and tolerance for operational risk, as specified through the policies for managing this risk, including the extent and manner in which operational risk is transferred outside the bank. It should also include policies outlining the bank's (and insurer's) approach to identifying, assessing, monitoring and controlling/mitigating the risk. Several studies have been conducted and several quantitative models have been proposed to manage the operational risks that a global insurer typically faces.

This study is an attempt to revisit the characteristics of insurers' operational risk in insurance and compare it with current understanding and application. It was found that, in practice, there clearly exists an uneven understanding about operational risk. The problem is more about definitions and the current approach to operational risk aims to serve the regulatory capital requirements rather than support the growth of the business.

It is revealed that there are many risks in the insurance business, which are mainly operational in nature, but it is difficult to fit them under the Basel II definition (which has been adopted in insurance, e.g. Solvency II). The study found a clear distinction between insurers' operational risk and strategic risk; however, this distinction is not explicitly recognized either at industry level or regulatory level. The study suggests that strategic risk is a decision-making issue at the higher level of the management hierarchy. This is more about setting an agenda, which has a slow and long term effect on the performance of the firm. However, operational risk is attached to the implementation (or execution) level of firms' strategic decisions. It is understood that a good decision could bring the firm down if not implemented properly; however, what makes a good decision is an issue of strategic

¹ Solvency II requires insurers to hold sufficient capital such that the probability of insolvency within the next year is no greater than 0.5%. Solvency II is anticipated to take effect from 2013 and it is designed to facilitate the development of a single market for insurance services, ensuring a level playing field and a uniform level of consumer protection.

management. It is understood that operational risk depends on the level of human expertise, robustness of the system and technology utilised.

The area of operational risk in the banking and insurance sectors is new and evolving. At this stage of development, we have inadequate data to model and analyze in order to make predictions of future operational loss events. It is found that the insurance industry may have excellent modelling and analysis expertise but, at this stage, it does not have sufficient knowledge and methodology to track the causes of system failures, processing errors and human unpredictability, including the factors that amplify them in the event of crisis. The important question is how can we rely on results based on incomplete and unreliable operational risk data and feed them into a firm's strategic decision-making process. There is a realization in the industry that risks characterized by their operational and strategic nature influence the failure of financial firms significantly. Consequently, our priority should be to understand the causes and characteristics of the elements of operational risk and then build a record (or database). As industry experience on these significant issues is developed, accuracy in modelling and quantifying operational risk will be achieved over time.

The study also found that whilst operational risk causes are due to internal factors, strategic risk causes are due to external factors. Since the action of humans (or human behaviour and organizational culture) plays a vital role in the level of operational risk an insurer holds, both the strategic risk and operational risk are not quantifiable in the same sense we see in financial risks. The success of operational risk management depends on how quickly the firm identifies the underlying causes of the problems (e.g., managerial incompetence in terms of expertise, lack of integrity, and risk communication systems across the firm) and fixes them appropriately. Consequently, the theory of loss prevention (which is one of the expertises of insurance companies in managing underwritten risks) was found to be the best strategy for managing operational risk. However, this contradicts a study proposing the modern understanding of operational risk management, which concentrates on high-level unexpected losses only.

The link between low-level operational (expected) losses and high-level (unexpected) losses is clear in this study; however, the influence of low-level operational risk factors in raising high-level operational risk factors has not yet been tested. In the presence of the heterogeneous characteristics of operational risk, the study finds an optimization model

from a risk-return perspective (a technique of management science) to be the possible solution to problems associated with operational risk management.

However, the risk and return characteristics under economic wisdom were found inappropriate for operational risk. It is suggested that research on operational risk should be founded on individual and organizational risk preferences. It is important to note that managerial risk preference cannot be revealed without studying the context of the problem. Consequently, study of the maximization of return whilst minimizing operational risk in insurance should take account of the underlying management theories from the risk and reward paradox in an organizational context.

3 Introduction

3.1 Research Background

The topic of operational risk has recently received considerable attention in the financial sector. This is due to the increasing complexity of sophisticated financial products, diversity in organizations' business functions and dependency amongst financial markets as a result of globalisation (Jobst, 2007). In addition to the initiative of financial firms (i.e., banks and insurance companies), regulators, rating agencies and analysts are increasingly focusing on the characteristics of operational risk. Some high profile losses have awakened the financial industry to looking back into the causes of operational risk and their potential impact on firms.

Capital adequacy regulations (e.g., Basel II and Solvency II, including those of a similar nature) require appropriate capital charge for operational risk. The financial industry has witnessed considerable effort and exercise in quantifying operational risk in numerical terms, which is in line with other risks (e.g., financial). Although significant efforts are found in financial risk research, there exists inadequate concentration on the area of operational risk. In addition, it is observed that the initiatives to measure solvency of financial firms intentionally excluded strategic risk. Moreover, there remains considerable doubt and ambiguity in defining and understanding operational risk. The focus and effort remain on certain aspects of risk management; in particular, around data collection and the measurement of operational risk in relation to the components of capital assessment. In essence, little research has been undertaken in understanding the characteristics for quantification of operational risk. In addition, many questions remain unanswered regarding management of operational risk in the insurance sector. There is no consensus on where operational risk is itself a separate category of risk. Moreover, similar to market risk, should operational risk-taking provide an opportunity to organizations? If operational risk only causes loss (i.e., a downside risk), should we follow the same measurement and management techniques that the industry is familiar with using for market risk?

To explain these gaps in the literature, the Joint Risk Management Section of the Society of Actuaries, Canadian Institute of Actuaries, and the Casualty Actuarial Society (joint

sponsors) decided to sponsor this research project to examine the characteristics of operational risk in insurance and to develop a theoretical foundation for managing operational risk. The ultimate aim of this study is to explore the characteristics of operational risk for financial firms in order to develop a greater understanding in the face of the currently prevailing ambiguity and complexity of the topic.

3.2 Research Motivation and Scope

The motivation for this study comes from the definition proposed by the Basel II Committee, which excludes strategic risk whilst defining operational risk. The understanding is that without the strategic risk, the consideration of all [significant] risks of the firm in calculating banks or insurance companies' capital adequacy is obviously incomplete. Findings of a fieldwork regarding the relevance of operational risk in insurance are presented and discussed. However, the study goes beyond the sector-based (e.g., banking, insurance, etc.) definition and takes a broader perspective of the issues relevant to the overall financial sector. The analysis and conclusion of the study provides significant input for the development of an integrated control and risk management mechanism for the mitigation of operational risk in financial services.

The research commences on the following five arguments of operational risks. These understandings were developed in the PhD study completed by the author with four major European insurers during 2002 and 2006.

1. The characteristic/nature of operational risk varies across the financial industry and even within the insurance sector in terms of the business models (i.e., life or property & causality). The definition of operational risk is too general and must be modified (or redefined) when it is applied in insurance; for example, in banking, operational risk may be dominated by such actions as sanctioning a credit (or loan) or dealing with/limiting a trading activity. However, it may not be true in another business sector, such as insurance, where a premium is paid upfront; a well-designed pre-survey of the insurable peril during the process of underwriting, along with a strict cancellation clause, may mitigate potential operational risk to a huge extent. However, decision error/omission in the case of reinsuring the insured

property/peril policy to a reinsurer could cause a substantial loss to the concerned insurer.

2. It is understood that the terms 'operational risk' and 'strategic risk' are often interlinked and it may be realistic, in some cases, to emphasise on strategic risk rather than operational risk. For example, a decision error at top management level (i.e., a strategic risk, such as choice of people/experts or technology) may give rise to operational risk. Furthermore, the financial/reputational impact of a faulty strategy (which is a strategic risk) may be more severe than poor execution of a strategy (which is an operational risk).
3. Operational risk holds heterogeneous characteristics as it often overlaps with other risks; for example, financial, insurance, hazard, etc. In addition, there are sub-categories of operational risk, such as fraudulent behaviour, human error, modelling/estimation error, etc., which may not be additive. For example, employees' fraudulent behaviour is distinct from system risk (e.g., model and estimation error). Consequently, the measurement and management of several categories of operational risk needs distinct perspectives and methodologies. Indeed, one can mitigate and control the fraud risk by implementing strict policies, procedures and internal auditing. However, system risk cannot be mitigated in a similar way, even by spending considerable amounts of money on modelling techniques and technology. In fact, modelling error is an unavoidable risk, as it may be related to the dynamics of risk and economic volatility (the recent financial crisis and the failure of large banks can be cited as good examples).
4. Operational risk management in insurance has two aspects – one is the control of capital and the other is the quantification of capital in line with regulatory and rating agency requirements. Since the purpose of enterprise risk management (ERM²) is to balance risk and return at a firm-wide level, researches on operational risk should maintain a link between these two aspects in order to minimize the implications of any future surprises.

² Theoretically, ERM refers to a co-ordinated process for measuring and managing risks proactively on a firm-wide basis irrespective of their sources and type. The sources of key risks in insurance are broadly categorized as underwriting, financial, operational and hazard.

5. In the presence of the heterogeneous characteristics of operational risk and the associated uncertainties (i.e., incomplete/subjective information) coupled with behavioural elements, it could be appropriate to view operational risk management as an optimization problem within the scope of risk analysis and optimal decision making from the perspective of a risk-return trade-off. However, this approach could be different from the approach used in investment risk because of the asymmetric distribution of operational loss data.

This study verifies these five arguments with updated literature and primary data collected through interviews.

4 Literature Review

There is little evidence of consistent and complete understanding of operational risk in insurance. In contrast, the idea of operational risk in non-financial sectors, such as airlines, energy, IT and the manufacturing industry, is established and they are dealt with in the literature about operational management. For example, Beroggi and Wallace (2000) proposed a model for the management of operational risk in a transportation business, focusing on the errors in action-taking and decision-making in real-time (i.e., sudden and unforeseen) events. Although people and systems are involved in both the financial and non-financial sectors, the irrational behaviour of people and markets increases the subjectivity in understanding and managing operational risk in the financial sector. Consequently, the concept, including the tools and techniques for understanding and managing operational risk in the non-financial sector (e.g., optimisation), may not be applied as it is in the financial sector and few studies have attempted to overcome the limitation.

The academic discussion on operational risk in insurance is new. Consequently, the theories, concepts and ideas on operational risk are ill-structured. Cummins *et al.* (2006) provided a brief review of literature on operational risk and revealed that there remain a few studies that focus on the financial sector, in particular, banking and insurance. Most research works on risk management have concentrated on the field of finance where the purpose of risk management was argued to reduce the probability of costly lower-tail (i.e., low frequency and high frequency events) outcomes (Stulz, 1996). Alternatively, the focus of the financial perspective of risk management is to support the organizations in continuing with their investment strategy. However, the operational risk associated with the execution of firms' investment strategies was inadequately researched in the literature about risk management.

A comparison of operational risk with strategic risk also reveals a similar understanding. In the case of 'operational risk', a few have attempted to explore the understanding compared to measurement. However, in the case of 'strategic risk', the opposite is true and most of the works have focused on the conceptual understanding of the topic. In line with the Basel II requirements, Scandizzo (2005) provides a systematic method for mapping operational risk in the process of its management (i.e., identification, assessment, monitoring/reporting and

control/mitigation). He discovered that the analysis of the cause of operational failures originated from risk drivers, such as people, process, technology and external agents, and he linked them to consequent financial losses by using key risk indicators that are the ultimate challenge for operational risk management. He suggested a scorecard with the inputs of both qualitative and quantitative information, which can be utilised as a monitoring tool of operational risk, in order to take appropriate preventive and control measures. A number of studies; for example, Jobst (2007) and Flores *et al.* (2006) have discussed several statistical techniques for operational risk measurement and subsequent regulatory requirements. However, a detailed review of the technical literature shows that they focused on the quantification aspects of operational risk and are therefore beyond the scope of this study, which aims to explore the key characteristics of operational risk rather than the variability and accuracy of quantification techniques. However, some challenges of quantification are picked up to understand the characteristics of operational risk and strategic risk.

4.1 The Characteristics of an Insurance Business Model

4.1.1 Insurance versus Banking

Unlike other businesses, insurers receive premiums upfront and pay claims later. In extreme cases, such as long term liability claims, payments can stretch over decades. In this type of 'pay now and get service later' model, insurers actually perform a major money-holder role since accumulated money eventually goes to others, including investment. Since underwriting of new business and settlement of old claims is a continuous process, the amount of money on hold (unless something unexpectedly happens) remains remarkably stable in relation to the volume of premiums.

Consequently, the amount of money on hold grows with the growth of insurer's business. If premiums exceed the total of expenses and eventual losses, insurers end up with underwriting profit that is then added to the investment income. This combination of underwriting profit and investment income allows insurers to enjoy the use of free money and holding money becomes an accretive way of making money. Unfortunately, this lucrative holding model is often penalized by markets through tough competition, which, in turn, causes the insurance industry, the property-casualty business in particular, a significant underwriting loss. In usual circumstances, this underwriting loss is fairly low. However, in some years when the industry faces more than the expected number of large catastrophes, the overall size of claims exceeds the underwritten premiums and outstanding claims reserves. This exposes an insurance company to deep trouble and some insurers really struggle to survive (Buffett, 2009).

This specific nature of insurance business makes it very different from financial intermediaries, such as banks. Whilst banks are in the borrowing and lending business, insurers act as risk takers and managers of insurance risks that arise either from individuals or from small and large businesses. Insurers manage their underwritten risk through pooling in the insurance and reinsurance market; meanwhile, banks manage their risk through hedging in the derivatives market. Within banking, the retail/commercial and wholesale/investment banks have different business operations and risk management. In addition, their risk profiles are very different from each other. Banking, investment banking in particular, is a transactional business supported by short-term funding, which heavily depends on disruptions in the capital market or funding, and it significantly affects the

creditworthiness of the investment banks. This was seen in the 2007 financial crisis. Unlike banks, insurers' business is not transactional but is very much strategic in nature. Insurers cover risk exposures through reinsurance, which is global by nature. Consequently, insurers are exposed to fewer operational errors and, even then, they are not life threatening. It is argued that, unlike banks, insurers do not create systemic risk in the economy (GA, 2010).

4.2 The Risks of an Insurance Business

Similar to other businesses, insurance businesses are exposed to several risks in their business operations, which are typically classified as follows.

4.2.1 Underwriting (or Insurance) Risk

Insurance companies assume risk through the insurance contracts they underwrite. This includes both the perils that are covered by specific lines of business, such as motor, fire, marine, etc., and the specific processes associated with the management and conduct of the business. In addition, this underwriting risk includes several sub risks, such as underwriting process risk, pricing risk, claims risk, net retention risk, and reserving risk. Some of the underwriting risks are due to the variation in the frequency and severity of the claims; however, insurers diversify these risks through a greater portfolio and an adequate reinsurance policy.

4.2.2 Credit Risk

This is the risk of default (causing financial loss), which is associated with an insurer's investment portfolio, in the case of changes in the credit quality of issuers of securities (in the company's investment portfolio) and debtors (e.g., mortgagors). Insurers invest in the capital market, including equity and subordinate debts banks and other enterprises; thus, exposing insurers to default credit risk. In addition, insurers are exposed to credit risk due to various types of concentrations or exposures in the market. Furthermore, insurers may face reinsurance counterparty risk due to not receiving payment from insurers in the case of their default or financial difficulties.

4.2.3 Market Risk

Similar to other financial companies' capital market volatility, interest rate fluctuations and exchange rate volatility expose insurers to market risk.

4.2.4 Operational Risk

This risk is usually seen as a residual risk not falling under the above risk categories. In line with the Basel II definition, it is often defined in terms of risk of losses due to inadequate or failing processes, people, and systems, such as fraud, as well as risks from external events.

4.2.5 Liquidity Risk

This refers to insurers' exposure to an inability to fund or settle the claims of policyholders due to insufficient liquid assets. The risk from asset-liability mismatch is a function of insurers' liquidity risk. Several factors, such as credit rating downgrade, negative publicity, and economic financial crisis, can contribute to insurers' liquidity risk.

4.2.6 Natural and Man-made Hazard Risk

This type of risk arises due to vulnerability from natural catastrophes, such as storms, floods and earthquakes, and insurance protection is designed to compensate the financial loss after the events. In addition, man-made catastrophes (e.g., terrorism) are also considered as a hazard risk. These types of risk can be considered as part of the core underwriting risk.

It is important to mention that some of the risks described above can arise independently (e.g., hazard risk) but some do not (e.g., market risk and liquidity risk are somehow linked to each other). It depends on how you view the risk as to whether it is a silo viewpoint or in a holistic perspective. It is evident that operational risk is common to all risks, as they are somehow exposed to human interventions.

4.3 Theoretical Foundation of Operational Risk

The theoretical foundation of operational risk has evolved from the field of strategic management research. Although there is insufficient academic literature that explicitly gives a theoretical foundation of operational risk, there are considerable works of strategists that can be utilised to establish a conceptual framework of operational risk for financial firms. In a theoretical paper, Wiseman and Catanach (1997) discussed several organizational and behavioural theories, such as agency theory and prospect theory, which influence managerial risk-taking attitudes. They found that, within the variety of relations among risk choices, managers exhibit simultaneous low and high-risk preferences.

Utilising the notion of the utility theory, Jensen and Meckling (1976), in light of agency theory, suggested that an agent's risk preference changes with the variability of an owner's vigilance or monitoring status. Alternatively, agents' superb performance diminishes owners' levels of monitoring whilst demonstrating risk-seeking characteristics and vice-versa. This proposition is reflected in Wiseman and Gomez-Mejia's (1998) behavioural agency model of managerial risk taking, in which it is argued that variability in firms' incentive structures, such as income stream uncertainty, changes executives' risk preferences and behaviour. Likewise, the behavioural theory of the firm suggests that managerial risk taking initiatives, such as hedging, is encouraged by the deteriorating performance of the firm (Palmer and Wiseman, 1999). In essence, a managerial risk-taking attitude is considered as a proxy of measuring organizational risk (Bowman, 1982; Fiegenbaum and Thomas, 1988, 2004). In line with Kahneman and Tversky's (1979) prospect theory, Bowman (1980, 1982) discovered an inverse relationship between risk and return. It was suggested that managers demonstrate risk-seeking characteristics in the case of gain and risk aversion regarding loss relative to a reference point. Tversky and Kahneman (1982) argued that managers' decentralised risk choices may be different from that of owners, who exhibit a holistic view, and the sum of silo risk choices considerably differs from that of the consolidated portfolio. The strategists' conclusion of managerial risk-taking initiatives is also recognised by finance researchers. For example, Stulz (1984, 1990) identified that firms intend to maximise hedging until the variance of the investment portfolio (i.e., risk) is minimised; whereas, managers trading in hedging contracts individually, face significant costs (Froot *et al.*, 1993).

4.4 Measurement Issues for Operational Risk

It is evident that the measurement methodology for operational risk follows what has been innovated in the banking sector under Basel II capital requirements. Three different approaches of increasing sophistication (basic indicator, standardized, and advanced measurement) have been suggested under Pillar 1 of Basel II. The basic indicator approach, which is less risk sensitive, utilizes one indicator of operational risk for a bank's total activity. The standardized approach specifies different indicators for different business lines. The advanced measurement approach, which is most risk sensitive, requires banks to utilize their internal loss data in the estimation of required capital for operational risk.

These approaches to quantifying and managing operational risk have been suggested for insurance companies by Solvency II in Europe.

Most of the large insurers are expectedly following the advanced measurement approach (AMA) as part of their economic capital models, which requires insurers to develop their own methodologies in quantifying operational risk as suggested in the Basel Committee in Banking Supervision (2006). It is argued that, using AMA, insurers can access the incentive of lower capital change in addition to flexibility in monitoring and managing operational risk (Akkizidis & Bouchereau, 2006).

A number of studies, such as Kuritzkes (2002) and Embrechts *et al.* (2003), have focused on several techniques for operational risk measurement in which top-down (basic indicator approach) and bottom-up (standardised and advanced measurement approach [AMA]) methods are utilised. They stated that a portion of a bank's gross income constitutes its operational risk capital both in the basic indicator approach and in the standardised approach. However, in the AMA, a bank benefits from the scope of proposing the amount of regulatory capital by utilising its internal risk models. Chapelle *et al.* (2008) analysed the implications of the AMA for the assessment of operational risk and found that, by increasing the number of observations by integrating external data (i.e., extremely large losses) with the internal loss database, banks can match the profit side of operational risk management with the cost-side of the managerial actions. Furthermore, Guillen *et al.* (2007) proposed a method to integrate expert opinion with internal and external operational loss data and concluded that 'operational risk capital evaluation can be significantly biased if under-reporting is ignored'. A number of researchers (Valle and Giudici, 2008; Bilotta and Giudici, 2004; Chavez-Demoulin *et al.*, 2006) have used several statistical techniques, such as actuarial, casual, and Bayesian, to calculate operational risk capital by utilising internal models but the adequacy, accuracy and consistency of data remains as an inherent problem towards the accurate measurement of operational risk. However, it is found that these risk quantification studies primarily focused on the implication issues rather than the causes of operational risk.

In identifying the causes of operational risks, a number of studies (Cummins *et al.*, 2006; Dickinson, 2001; Guillen *et al.*, 2007) categorise them into internal and external sources. They listed incidents, such as breach of laws and agreements, fraud, professional misconduct in

client services and business practices, business disruption and model/system/process failures, as common internal causes of operational risks. Furthermore, they argue that organizations may hold operational risk due to external causes, such as failure of third parties or vendors (either intentionally or unintentionally), in maintaining promises or contracts. Ideally, organizations have little control over such external causes. They are mostly insurable to a certain limit but the concern is that the losses, which exceed the limits (i.e., long-tail events), have massive potential for destroying the bottom-line (i.e., survival) of the firm.

It is seen that not much has been studied about the characteristics of operational risk in the insurance industry. However, a recent study entitled “A new approach for managing operational risk” by Towers Perrin and OpRisk Advisory (2009) has been conducted on operational risk in insurance.

The author of this study has read their report carefully and has summarized the key features below.

4.4.1 Operations Risk versus Operational Risk

For the operation of a business it has always been essential to prevent fraud, maintain internal controls, and reduce errors in transaction processing within the natural course of corporate activity. Historically, corporations have relied on internal controls within business lines and these were supplemented by independent audit functions in order to monitor the execution of organizational policy and procedures. The risk associated with such errors in operations is known as “operations risk” and the focus was merely on the day-to-day decision making in executing corporate strategy.

However, risks associated with high-level decision making (e.g., mergers and acquisitions) were not explicitly covered under such an “operations” risk management framework. Due to several economic and organizational factors, such as globalization, competition, increased shareholder expectations, sophistication of technology and, importantly, the lack of ethical values, large organizations face a new type of risk that does not fully come under the scope of “operations” risk. In other words, the area of operations risk has broadened and the accuracy and scope of the traditional risk mitigation approach (e.g., internal control, auditing) needs to be revised (Deighton, 2009). It is understood that this new type of

operation risk can be massive and sometimes plays the central role in some organizations' total failure. This new form of risk is increasingly called "operational risk".

4.4.2 Unique Character of Operational Risk

Operational risk is embedded with other top-line risks, such as underwriting, credit, market, and liquidity risks. Operational failures often manifest themselves with these top-line risks.

4.4.3 Traditional Versus Modern Operational Risk

The traditional approach to risk management, which is based on the loss prevention approach, is associated with average loss rather than large catastrophic events. Traditional Operational Risk Management (TOpRM) focuses attention on the set of commonly observable threats and control weakness associated with routine losses. This can be part of the general management tasks of the business commonly termed "business risk management". The risk is usually absorbed by the yearly profit rather than from deployment of extra capital to cover these risks. It fails to reveal the largest but most important risks such as sales and business practice violations and acts of excessive risk taking.

Organizations that follow the traditional approach may be unaware of their most significant risks. Consequently, organizations that base risk-control optimization decisions on the result of the traditional approach can easily become over-controlled in areas where they have the least threat to survival (average loss), but remain significantly under-controlled in the areas where they have the most threat to survival (worst case losses). TOpRM cannot maintain homogeneity between high level and low level risks.

4.4.4 Agency Problem and Operational Risk

Principal-agent (P-A) risk is one of the most important operational risks. This risk refers to circumstances in which there is separation of ownership and control and also when agents, who control or act on behalf of the organization, may pursue actions that are in their own interest but not necessarily in the best interest of the principals (stockholders). This is because of the information asymmetry between the managers and the stockholders in which managers hold more information about the business than stockholders.

The agency theory suggests that the reduction of this information asymmetry motivates the managers to pursue strategies that conform to the risk tolerance standards of the

stockholders. P-A risk has been the driving factor behind many of the largest losses, including the AIG event. This P-A risk cannot be managed by TOpRM.

4.4.5 The Focus of Modern Operational Risk

Although operational risk is associated with events, activities and circumstances, it cannot necessarily be defined as the cause of failure in achieving business or corporate objectives. Alternatively, operational risk should be viewed within the framework of risk-return trade-off while reducing the probability of unexpected loss. The opportunity secures capital incentives which, in turn, motivate the organization to enhance their risk measurement and management capabilities.

Modern Operational Risk Management (MOpRM) is a top-down approach that firstly focuses on the major risk within a comprehensive and mutual risk architecture and drills-down only in those risk areas where more granularity is required. MOpRM could be very effective in mitigating P-A risk.

4.4.6 Operational Loss Database

The annualized operational loss data, which actually comes from several homogeneous losses, suffers from quality issues as they do not necessarily incorporate extreme (catastrophic) losses. Consequently, the conclusion derived from the distribution may mislead the decision makers in charging capital for high-level (low frequency and high severity) operational losses.

The data for operational risk may come from both internal and external sources, including expert opinion. The possibility of bias in cases of external sources can be ignored for large losses over \$10,000; however, the model developed with the external data may incline towards an industry-average solution rather than a firm-specific resolution.

4.4.7 Enterprise-wide Risk Management

Many organizations still view operational risk modelling as a compliance exercise contributing into the computation of regulatory capital rather than economic capital. However, the Solvency II “use tests” require insurers to demonstrate that the internal model is widely used and plays an important role in the following:

- System of governance
- Risk-management system
- Decision-making processes; and
- Economic and solvency capital assessment and allocation processes

4.4.8 Benefits of Modern Operational Risk Management

The key concerns of MOpRM are the high-level risks that bring the organization down. The aims of MOpRM are to:

- Facilitate the holistic management of all operational risks, based on a consistent definition of risk and a comprehensive risk architecture/taxonomy.
- Create a structured and transparent process for factoring risks into the business decision-making process at both a tactical and strategic level. Specifically, provide managers, senior managers, and C-level executives with the tools and information they need to optimize risk-reward, risk-control and risk-transfer in the context of cost-benefit analysis. It follows a scientific method of modelling and quantifying risk, aggregating risks, and feeding them into strategic decision making.

4.5 Summarizing the Gap in the Literature

Two types of understanding or perspective on operational risk have emerged from the literature in terms of financial implications (loss of money). It is understood that the first type has direct and immediate financial implications and the second type has indirect financial implications, in which the result is not immediately visible. Whereas, the first type focuses on the components of capital assessment and adequacy, such as requirements of Basel II and Solvency II, the second focuses on the controlling and governance-related regulations, such as Sarbanes Oxley and Turnbull.

In addition, at least two sets of knowledge or views have emerged from the literature. The first set of knowledge affirms the quantification of operational risk, in which proposing a solution (i.e., determination of risk-adjusted [economic] capital as a buffer to risk) is the key focus. The consideration of operational risk is an issue for top management where the focus is to save the firm from high-profile (financial) losses, which severely damage the bottom

line issues and/or survival of the firm. The second set of knowledge undertakes a broader view of operational risk while the complexities and heterogeneity are acknowledged. The purpose of such a view is to explore the complexities associated with the operational risk of a firm within a holistic perspective whilst recognising the relationship between operational risks with other risks of the firm. Clearly, the approach is targeted to identify problems and make recommendations rather than to provide precise solutions. However, both approaches have merits and demerits. The modelling approach, which is advocated by management science and financial economics, takes an analytical view to suggest precise solutions to the associated problems.

The second view takes the philosophical route within the perspective of strategic management and detects the interrelationships between operational risk factors with others to conceptualise the potential overall consequences. However, it does not focus much on providing precise solutions, unlike the former approach. Apart from the definition and quantification-related issues, there remains some criticism in the literature regarding the effectiveness of the approach of capital adequacy for operational risk. Kuritzkes (2002) argues that no amount of capital is realistically reliable for operational risks; in particular, those arising from external events, such as September 11, because management effectively holds little control over them.

The rest of the report is structured to firstly analyse the empirical data of the industry responses on the definition of operational risk as proposed by Basel II and Solvency II. Thereafter, the characteristics of operational risk, as seen in practice, were investigated and the link of operational risk with insurers' other core risks was discussed. The structure of ORIC's operational risk insurance industry database was described before the respondents' views on the scope and challenges of quantifying and modelling operational risk in practice were analysed. Next, the respondents' views on the overlapping characteristics of operational risk with insurers' other core risks were analysed. In this context, the characteristics of insurers' operational risk were compared with the operational risk of banks. Subsequently, the concept of risk-return/reward trade-off was discussed from both economic and strategic management perspectives; then the scope of managing insurers' operational risk from the perspective of risk-return trade-off was investigated. Finally, a conclusion is drawn.

5 Data Analysis and Findings

The data for this study mainly came from interviews with leading senior level insurance industry professionals across Europe and the USA, who are in charge of managing operational risk in their respective organizations. Each interview lasted 45 minutes on average and was conducted using both face-to-face and telephone interview methods, depending on the circumstances and availability of individual interviewees. A structured questionnaire was sent to the respondent interviewees before the interview, which was audio recorded and thereafter transcribed and revised. The same questionnaire was used for all interviews. All interview transcripts are preserved as confidential documents for the researcher and the respondents' views remain anonymous in the texts of this report. In order to maintain confidentiality, the list of respondents is not disclosed.

The previous section described the academic literature on operational risk. We will now turn our focus to how operational risk is defined in the financial industry, especially in the banking and insurance sectors.

In Basel II, the common industry definition of operational risk is:

“The risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events”

Although the definition includes legal risk, strategic and reputational risk is not included in this definition for the purpose of operational risk. The Basel committee believes this is appropriate for risk management and, ultimately, measurement.

Source: Basel Committee on Banking Supervision, Consultative Document, Operational Risk, January 2001, accessed at <http://www.bis.org/publ/bcbzca07.pdf> on 1st January, 2011

The Solvency II definition of operational risk is:

“Operational risk means the risk of loss arising from inadequate or failed internal processes, or from personnel and systems, or from external events (Article 13(29) of Level 1 text). Operational risk shall include legal risks and exclude risks arising from strategic decisions, as well as reputation risks (Article 101 4(f) of the Level 1 text).”

(Ref: CEIOPS Advice for Level 2 Implementing Measures on Solvency II: SCR Standard Formula – Article III (f) Operational risk: former CP53)

5.1.1 The Characteristics of Operational Risk in Practice

In this context, the investigation concentrates on discovering the characteristics of operational risk in the empirical world; that is, in organizational practice. The respondents were asked the following questions:

- 1. How do you define operational risk in your [insurance] business?**
- 2. How does it fit with your business functions?**

Several responses were received and they are attached in Appendix A.

An analysis of the responses reveals that:

- (i) *The focus of modern operational risk management is on large and infrequent events:* Although the definition of operational risk in both banking and insurance businesses focuses on day-to-day manual errors, it is the large and infrequent losses that draw much concern of management. However, large events do not happen often in the normal course of business.
- (ii) The management of large losses needs specialised knowledge and tools
- (iii) Operational risk may harm the ordinary course of insurance business
- (iv) *Definitional ambiguity:* The definition of operational risk is very broad and places a broad range of risks into one basket

5.1.2 The Link of Operational Risk with Other Core Risks

After revealing the definition and characteristics of operational risk in practice, the investigation focuses on “how different operational risk is from other core risks”. With this focus, the investigation asked respondents:

3. How did the concept of operational risk evolve in your organization?
4. What is its current status?

Several responses were received and they are attached in Appendix B.

An analysis of the responses reveals that:

- (i) *Operational risk in insurance is different from banking:* The evolution, scope and practice of operational risk in insurance are different from banks. In insurance, the operational risk is always there due to the dynamic operational nature of the core business risk; that is, the underwriting risk, in particular.
- (ii) *Operational risk associated with risk taking rather than business processing:* The focus for evolving operational risk management is around the business managers’ risk taking issues. This is different from the operational risk from a traditional focus on business processing issues.
- (iii) *Holistic management of operational risk across the organization:* There is a shift of operational risk management from the silo (departmental) to organizational (or firm/group-level) holistic thinking. The intention is to integrate the operational risk across the key business and/or risk categories and provide support to mitigate the strategic business decision-making issues.

5.1.3 Operational Loss Database

After revealing the evaluation and current status of operational risk in practice, the study focuses on the characteristics of operational risk data and how they are collected in practice.

Respondents were asked the following questions:

5. Does the dataset represent the correct characteristics of operational risk?

- 6. Is the external database sufficient for modelling and measurement of operational risk?
How do you use operational risk data for measurement and management of your risk?**
- 7. Does the external database help to manage your firm-specific operational risk?**

Several responses were received and they are attached in Appendix C.

An analysis of the responses reveals that:

- (i) *Inadequate data about operational risk:* Issues of inadequacy and inconsistency exist in the operational loss data. The inadequacy issue arises mainly because there are many causes of operational risk and management has different views on the same cause. This is a categorization problem which is influenced by individual risk perception, business philosophy and management culture.
- (ii) *Internal and external operational loss data:* The adequacy of operational loss data is subsidized by internal loss data and external industry-based loss data.
- (iii) *The external industry-based data is useful for some insurers.* However, others, especially reinsurers, do not find it important because of the specific nature of their business. Consequently, operational loss data are business-specific; that is, primary insurers versus reinsurers; life insurers versus non-life insurers. Operational loss data are even firm-specific due to a firm's specific business models, such as conservative versus risk-concentric/based.

After revealing the characteristics and use of operational risk data, the investigation focuses on how they are collected and recorded in practice.

It is found that several vendors provide operational loss external data. For example:

- Fitch's OpVar is a database of publicly reported operational risk events showing nearly 500 losses of more than ten million dollars between 1978 and 2005 in the U.S. The 2004 Loss Data Collection Exercise (LDCE) collected more than a hundred loss events in the U.S. valued at 100 million dollars or more in the ten years to 2003.

Apart from ORIC, individual insurance companies will have their own claims records containing accurate settlement values.

- The Operational Riskdata eXchange Association (ORX) is well established as a database of operational risk events in banking. It is a consortium collecting data from thirty member banks from twelve countries and it has more than 44,000 losses, each over €20,000 in value.
- Open Pages, SAS and Willis also created a database of public operational risk loss events from the financial services industry.

In addition, consortium-based loss data for insurers' operational losses exist and these databases comprise loss events reported to a consortium by its members, who, in return, get access to anonymous, pooled industry data on operational loss events and near miss incidents. The Operational Risk Consortium Ltd (ORIC), established by the Association of British Insurers (ABI), provides a database of operational risk events.

In this context, the study looked into the structure of the ORIC database. The information was gathered in a prearranged WebEx interview with one of the ORIC staff (i.e., an ORIC respondent).

5.1.4 The Structure of the ORIC Database

ORIC is an anonymous combined database and the consortium members are from life, nonlife, composite, primary insurers and reinsurers. The majority of data (approximately 65%) are subscribed by life insurers. The database was built on and from the second quarter of 2005 and, at the beginning of 2009, there were 2,700 observations in the database. In the beginning, it was initiated with 16 members and, by the end of 2009, its membership had grown to 27.

The data is delivered by the consortium members in a web-based system subject to verification by vendor. It is divided into the following five sections.

Section 1 is designed to identify and categorise data and gather information on the event itself. They have a sort summary title and a more detailed activity description which describes the type of event, the loss amount, etc.

Section 2 identifies the geographical regions of the losses and the causes of loss in terms of level I, II and III, etc. A list of three levels of losses is seen in Appendix D (Table 3). This is a precise version and the details of the categories can be found on the ORIC website.

Table 1 illustrates seven events in the Level I category, 17 events in Level II and 72 in Level III respectively. It is necessary to mention here that while Level I and II are used from Basel I and Basel II, Level II has insurance industry-specific details.

Section 3 captures the size of the event in terms of its duration. However, it is not a mandatory reference.

Section 4 is the most important one and the basis on which most analysis is done. “Impact” really means the financial impact and the size of the impact is often categorised into a scale of 0 to 5, in which 0 means no impact and 5 is a significant impact on share price, etc.; sometimes, the severity is measured on the degree of international media coverage, etc. They are very subjective and vary from one company to another.

In *Section 5*, the actual impact of the loss is captured in financial terms (i.e., severities); some of them are quantifiable and others are non-quantifiable. For quantifiable losses, a threshold of £10,000 is maintained. If it is quantifiable, the actual amount of the loss is entered and if it is unquantifiable, then 0 is entered.

Once the data are inserted by the participating members, it is then refined, validated and integrated by the vendor and several reports are produced demonstrating the behaviour of the data in various charts and diagrams. The members not only see their own data but also have the opportunity to view the industry data of their peers in terms of size, type of business, and geographical location.

Figure 1: Illustration of ORIC Operational Loss Data

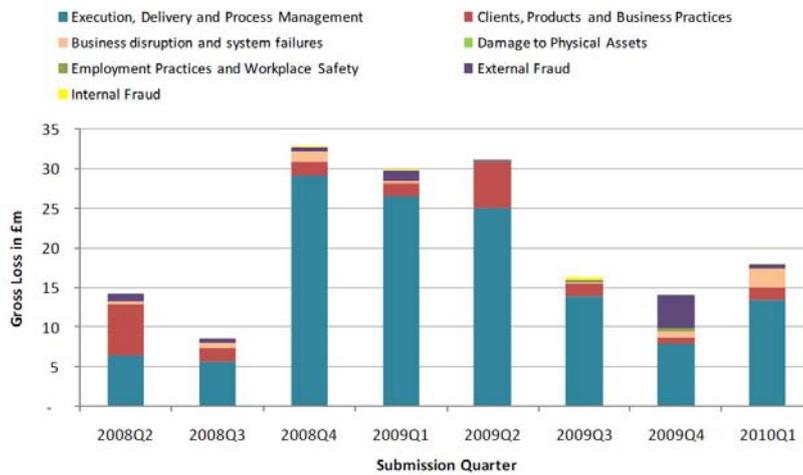


Figure 1 illustrates ORIC operational loss data collected from a demo version of the database and it shows the quarterly gross loss under the causes of the level 1 category. For example, the industry (limited to the subscribing members) holds an exposure of approximately £29m for the execution, delivery and process management category and this category dominates throughout the database. It also illustrates that internal fraud maintains the lowest level of exposure and only became prominent in the third quarter of 2009.

Figure 2: Size of Operational Loss from Level II events

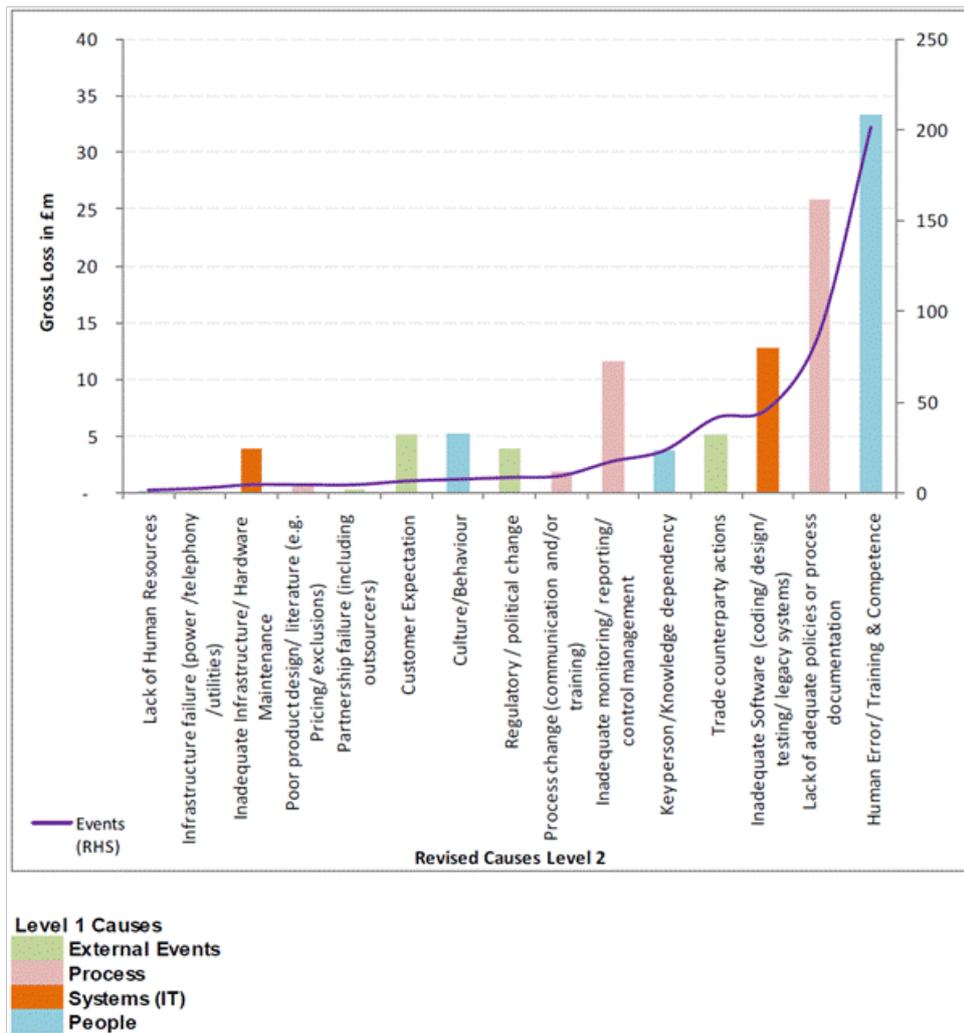


Figure 2 illustrates the loss severity in £m for Level II events and their frequency. For example, human error/training and competence (which comes under the level II category “Transaction capture, execution and maintenance” and the level I category “Execution, delivery and process management”) suffered approximately £32m gross losses and also holds the highest level of frequency with 200 events.

Table 1: Allocation of Operational Losses from Level 2 Category

Event Category Level 1	Event Category Level 2	Severity	Frequency
Business disruption and system	Systems	7%	8%
Clients, Products and Business Practices	Advisory Activities	9%	10%
	Product Flaws	3%	2%
	Suitability, Disclosure and Fiduciary	5%	4%
Employment Practices and Workplace Safety	Employee Relations	0%	1%
Execution, Delivery and Process Management	Customer Intake and Documentation	2%	4%
	Customer or Client Account Management	11%	14%
	Monitoring and Reporting	2%	1%
	Trade Counterparties	0%	3%
	Transaction Capture, Execution and Maintenance	55%	41%
	Vendors and Suppliers	3%	3%
External Fraud	Theft and Fraud	1%	6%

- Greater than 30%
- Between 15% and 30%
- Between 5% and 15%

Table 1 illustrates that 55% of the total losses under the level II category “transaction capture, execution and maintenance category” (which comes under “execution, delivery and process management” level I category) dominates the database, which also represents 41% of the total loss events in the database. This means that this is not only a very high severity event but also a high frequency event.

Figure 3: Gross Operational Loss by Business Function

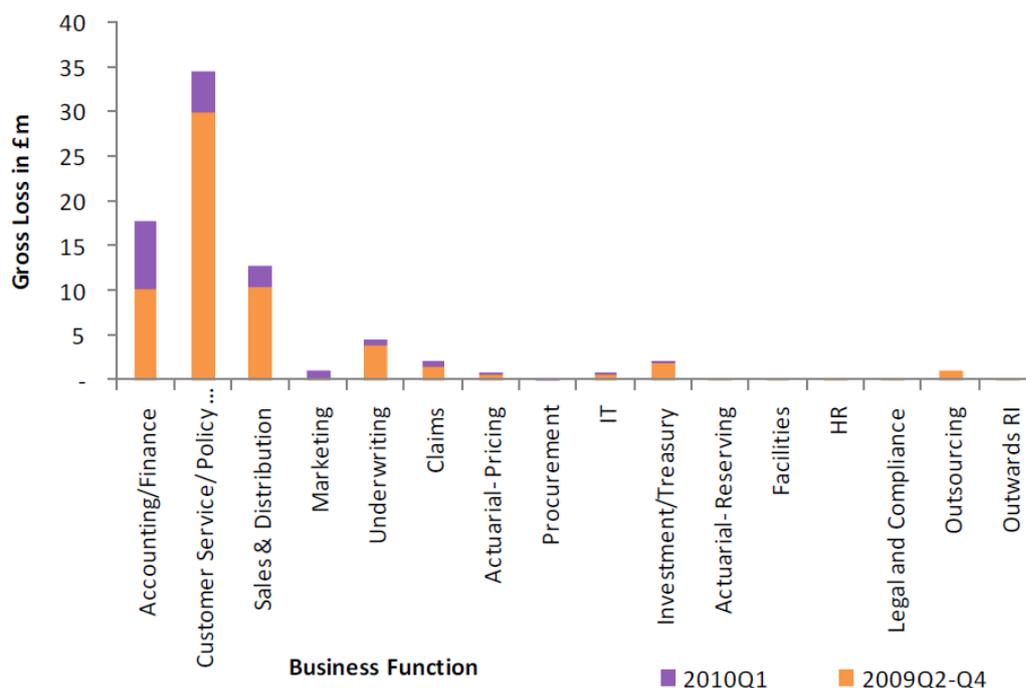


Figure 3 illustrates the gross loss for particular business functions in quarter 2 to quarter 4 and that “customer service and policy administration” holds the highest gross loss of £30m (on average) compared to £4m in the first quarter of 2010. The business functions, e.g., “sales and distribution”, are self-explanatory to the subscribers.

In describing how subscribing insurers use the database, the ORIC respondent suggested:

“I think our consortium members use the database a lot to inform their scenario analysis³ process; for example, they run a workshop and they put their business experts in to make an assessment of frequency and severity of the operational risk they face; they use events that are reported to us by the consortium members to actually try to inform that discussion. We guess that the people use our database a lot for embedding the process of their operational risk management with their distinct culture and change the culture of managing operational risk. They use many of the events reported in our database as examples to teach their business functions how to report and potentially measure the loss events and develop their company’s database purely for their modelling, curve fitting, and capital charge, etc. Again, there are some variations in the way companies use the database; some companies are interested in more qualitative aspects of a database whilst other companies are more

³ ABI’s publication titled “Scenario Analysis of Operational Risk in Insurance – a guide to sound practices”, February 2010 comprehensively described the scenario analysis technique.

interested in purely quantitative figures and size in terms of having more data points to fit into the distribution. They may like to rely purely on their internal loss events but they might get 10 or 20 per year, which are clearly not enough and they get 2,000 (for example) by joining the consortium.”

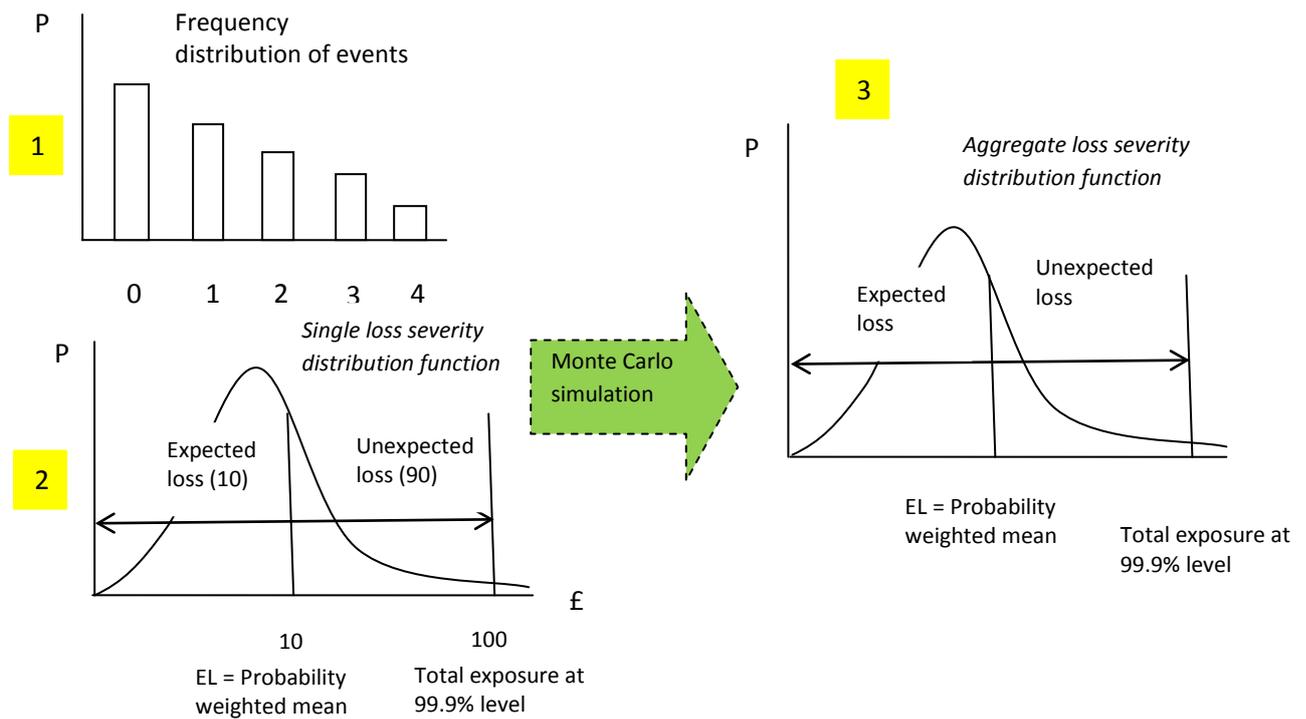
Several significant issues have been pointed out in the above quote. First, the subscribed data are not necessarily real but can be hypothetical as they are generated from scenario analysis. Second, the consortium database represents the culture of a particular subscriber and may not be particularly useful to another subscriber with a different culture. Third, the use of the consortium database differs from one company to another as some focus purely on the quantitative figures of the database to drive their modelling and measurement issues; meanwhile, others use it to learn the qualitative aspects of the database and to develop a culture of operational risk management in their organizations.

5.1.5 Techniques of Quantifying Operational Risk

After revealing the structure of an external database, the study focuses on how the quantification of operational loss is calculated. Alternatively, it shows how this data fits into the curve for modelling purposes and, in particular, how to build an aggregate loss distribution model with operational risk data.

The following diagram and texts describe how to compute the expected loss and unexpected loss at a 99.9% tolerance level for operational risk data by using the Monte Carlo simulation.

Figure 4: Aggregate Loss Distribution



Source: OpRisk Advisory and Towers Perrin (2010)

Figure 4 illustrates how the aggregate expected loss and aggregated unexpected losses are calculated by combining frequency and severity distributions.

- The frequency distribution shows the probability of events occurring based on a one-year time horizon
- The severity distribution shows the probability associated with loss magnitude and has no time element
- The aggregate distribution, which describes cumulative loss exposure for the specified time horizon, is generally created through a computer-assisted Monte Carlo simulation

The total risk exposure and unexpected loss (risk) are always measured at a specific probability level, which is also the target risk tolerance level. For example, total exposure at the 99.9% probability level with a one-year time horizon represents the level of loss where a

large loss is expected to occur in one thousand years or has only a 0.1% $(=(100-99.9)\%=0.001=1/1,000)$ chance in any given year.

The risk tolerance level is often set at the probability level associated with survival of the firm. For example, a 99.9% tolerance level and a one-year time horizon indicates that the firm is only willing to tolerate a 0.1% (or 1/1,000) chance of becoming insolvent in any given year

- A 99% risk tolerance indicates a more aggressive risk profile. Here the firm is willing to risk becoming insolvent with a 1% chance (i.e., 1 in 100) in any given year.
- A 99.9% risk tolerance indicates a more defensive risk profile. Here the firm is willing to risk becoming insolvent with a 0.1% chance (i.e., 1 in 1,000) in any given year.

In this context, the expected loss means the mean (or average) aggregated loss from the events. The unexpected loss is a specific number that represents the potential level of adverse deviation from the expected loss (i.e., mean) up to the total exposure at the N% level (as described above). For example, if total exposure at the 99.9% level is \$100 and the expected loss is \$10, then the unexpected loss (or risk) is \$90 $(=100-10)$. A similar approach was suggested in a research paper (Selvaggi, 2009) produced by the Association of British Insurers.

It is understood that the quantification of risk means estimating risk capital figures at a high level, at a specified probability level (e.g., 99.9%). The output of the computer simulated modelling exercise produced an aggregated loss severity distribution function which illustrates the expected and unexpected loss areas.

5.1.6 Scope and Challenge of Quantifying Operational Risk

At this stage, the study investigates the scope for quantifying operational risk in insurance. Several comments were noted from the respondents on the quantification exercise of operational risk and they are attached in Appendix E.

Analysis of the above responses

Several issues have arisen from the responses on the topic.

- (i) Misunderstanding the purpose and limitation of modelling

It is seen that many people do not have enough understanding of the purpose and limitation of risk models. There appears to be a conception that modelling is everything in operational risk management. In fact, it is not only for predicting what is going to happen in the future, but it is also designed to understand the amount of exposure that the company is to face in each of the risk categories at a specific time along with a predetermined confidence level. However, the groups of people who do understand the limitations of the operational risk model have raised some important questions. For example, some argue that, in the name of operational risk measurement, the insurance industry is actually measuring manual errors but not market volatility using a VaR type volatility measure. However, error is related to the internal factors of the firm. How could one link the company's internal manual errors with market volatility?

(ii) The gap between the quantification results and their application in business

There appears to be a considerable gap between the quant's team and the business managers within the industry. While the quant's team focuses narrowly on the results of the operational errors, the business managers take a broader view on the causes (sources) of operational risk. Consequently, the results of the quantification exercises, which are mostly targets to capital charge for solvency purposes, are often misleading to the business. To them, the impact of operational risk is not bound into the financial results, which they regard as direct impact, they impact a firm's reputation, customer satisfaction, etc., which cannot easily be measured in monetary terms. Measuring the capital for operational risk, as required for Solvency II, is different from managing the insurance business. This analysis suggests that operational risk management currently remains distinct or remote from risk management functions and these insurance companies are not benefitting from the risk quantification efforts to manage the risk of the business effectively.

(iii) The significance of forward-looking risk measurement techniques (e.g., scenario analysis)

It is seen that, unlike banking, the emphasis of operational risk in insurance is on a qualitative approach with more focus on scenario analysis. Modelling is still used but not to a large extent; in banking, it is possible that modelling is everything. In insurance, it is a much more balanced approach and rightly so because insurance

events take much more time to materialize. Large operational losses do not happen as frequently as in banking, which is much more transaction-based and much more exposed to liquidity risks; therefore, the insurance industry should understand caveats more, along with different causes, different triggers, facts, etc. It is understood that all quant's works give a snapshot of the amount of capital needed to hold for risk at a period of time; however, capital is not the only answer for the operational risk of a firm. Consequently, it is important to use scenario analysis of expert opinions, stress testing, etc. to support the single digit capital number.

(iv) Integration of objective and subjective perspectives of operational risk

It is seen that modern management of operational risk in practice often takes an objective view towards a subjective thought. This is because of the characteristics of subjectivity which is, by nature, an individual response and does not really fit into scientific computations. Although the quality of data for operational risk is problematic, the capability of risk management without models is arguably reduced. However, the challenge is just where you draw the line between subjectivity and science in the management of operational risk.

(v) Problem of integrating hard data with soft data

It is difficult to categorise the financial impact (i.e., operational losses) that could result from "event 3" categories (see Table 2); for example, accounting error can happen due to faulty management error. In addition, some of the data for the level 3 event category are categorical (e.g., anti-trust). It would be nonsense to ask a question such as "how much money has the company lost due to anti-trust?" However, it makes sense to collect the answer by asking, "what is the level of impact of anti-trust on its share price on a 0-5 scale where 0= no impact and 5=significant impact?" These data are categorical and there is no meaningful scientific technique (as far as the investigator is aware) to integrate such categorical data with quantitative data. However, there is a desire in the industry to move from a pure COSO type approach to a risk-based approach, allowing some degree of subjectivity around the quantification of operational risk (see the analysis in (iv) above).

5.1.7 Overlapping Characteristics of Operational Risk

After revealing the quantification problem for operational risk where inadequacy, subjectivity, etc., appear to be the key reasons, the study focuses on a vital issue of whether operational risk holds overlapping characteristics with other core risks of insurance business.

5.1.8 How does insurers' operational risk differ from that of banking?

In this context, the study investigates the extent to which the operational risk in insurance is different from that of banking. This is because the concept of modern operational risk management in insurance is evolved from banking.

Table 4 in Appendix F illustrates the classification of operational risk in the banking industry and analysis of this table reveals that the loss event classification is designed to capture the manual errors of transactions in the banking business. The whole purpose of operational risk management in banking is to improve the operating efficiency of the business transactions. In other words, it is to ensure a safe, reliable, efficient, and secure payment, clearing, and settlement system. Moreover, it is to stop intensification of operational risk to other types of risk, such as market, credit, and liquidity; this has been echoed in the Basel Operational Risk publication (Basel Committee of International Settlement, 2001):

“The scope of the [operational risk] framework ...focuses primarily upon the operational risk component of other risks and encourages the industry to further develop techniques for measurement, monitoring and mitigating operational risk”.

Source: Basel (2001)

Finding the link of operational risk with other core risks is important to seeing how banks and insurance companies define and manage their core business risks.

5.1.8.1 How is operational risk managed in practice?

While credit risk is the core business risk for a bank, insurers consider the underwriting risk as their core business risk. Banks typically use several techniques, such as (i) formal agreements with customers, (ii) financial collaterals, (iii) guarantees and similar instruments (e.g., credit insurance), and (iv) credit derivatives, such as credit default swaps, credit

linked debt instruments, and securitization structures, to mitigate their credit risk exposure. The techniques that insurers use to mitigate their insurance underwriting risks include (i) establishing limits for underwriting authority, (ii) requiring specific approvals for transactions involving new products or when established limits of size and complexity may be exceeded, (iii) using a variety of reserving and modelling methods to address the various insurance risks inherent to insurance business, and (iv) ceding insurance risk through proportional, non-proportional and specific risk reinsurance treaties (Sweeting, 2007). In addition, the regular reviews of actuarial assumptions on mortality and morbidity development carried out by actuaries and requisite amendment of rating rules ensure that risk and process management are adequate.

Table 5 in Appendix G illustrates some examples of how banks and insurance companies mitigate their operational risk. It becomes clear that management of operational risk is the primary responsibility of the business managers (risk takers). However, some concerns remain in the insurance industry that operational risk is closely attached to underwriting risk, which is regarded as the core business risk of insurance companies.

Some responses in this respect are attached in Appendix H.

The responses argue that operational risk should be managed as a part of underwriting risk. However, the responses for questions 9-14 support the need for management of the operational components of insurers' several key risks and for quantifying and managing them in a separate framework. Those who are in favour of treating insurers' operational risk under the umbrella of insurance risk find it hard to justify the pricing error (for example) as an operational risk. In their opinion, if somebody makes an error in pricing, it is done and claims more than the average is expected. They do not find the role of an operational risk expert useful to fixing the error before and after it happened.

In analyzing the responses, we can notice that a boundary issue arises in separating operational risk from insurance risk. Two forms appear, as follows:

- (i) Operational risk is integrated with underwriting risks (which is insurers' core business risk) and operational risk should be managed as a part of managing insurers' underwriting risks
- (ii) The operational components of insurers' risks (e.g., underwriting, investment, credit, etc.) need to be segregated, similar to banks' Basel II requirements.

It is found that regulations bind organizations to categorize risks in their overall decision-making purposes. However, they actually categorize risks in terms of their exposure in the way they manage their business philosophy and available resources, which is reflected in the way different degrees of emphasis are placed on different categories of risk. Additionally, the methodology for management of risk differs across firms; some put much emphasis on management and others on measurement. Some firms start with the root cause of operational risk and concentrate more on the course of events, not merely on implications (i.e., financial exposure). Meanwhile, some others concentrate on the type of events and their potential loss exposure as their risk assessment and modelling exercise.

We will now turn to one of the key points for investigation in this study, which is the scope for developing optimization models for an insurer's operational risk from a risk-return trade-off perspective. The next section examines what a risk-return trade-off means in terms of operational risk.

5.2 The Risk-return Trade-off for Operational Risk

The literature review reveals that the role of operational risk management is to reduce operational failures in the decision-making process whilst allowing the characteristics of risk and reward trade-off. Alternatively, the benefits of operational risk management depend on how well its risk and reward trade-off is managed. However, the immediate challenge is to determine the risk-return characteristics of operational risk, which is well established for market risk. It is interesting to see how a risk-return framework fits within operational risk; therefore, the characteristics of financial risk are compared with operational risk in Table 5.

Table 5: Key Characteristics of Market Risk and Operational Risk

Market Risk	Operational Risk
Direct loss: can be expressed in numbers	Indirect loss: cannot be expressed in numbers
Result of market performance	Result of manual and system errors
Traded in secondary market	Not traded
A unique risk category	A by-product of several other risks
Influenced by investors' behaviour and actions	Directly influenced by human choice, preferences, and culture
Not insurable	Insurable to a certain extent
External to the firm	Internal issue
An objective output	A subjective phenomenon and quality issue
The value is determined by the interaction between the firm's performance and capital market players (i.e., investors)	The value is determined by the set-up or infrastructure of the organization and its users (e.g., principal and agent)
Ex-post historical performance data	Ex-ante forward looking expert opinion
Data are easily accessible	Information are not easily accessible
Uniform (homogeneous) data	Heterogeneous data

The above table reveals that operational risk is different from market risk in many ways, ranging from the causes to the type of data. It suggests that operational risk is something unwanted but is on-going risk (in a downside sense). The organization cannot make any money out of it. However, market risk is desirable and an organization always pursues this type of risk to support business growth. The study investigated if there is any scope to fit operational risk into the risk-return trade-off context. However, the study noted this is one of the key barriers to applying the risk-return trade-off notion in operational risk, borrowing the concept from economics and finance literature. The key question arising is how to perform a statistical analysis when the data are subjective i.e., categorical.

5.2.1 Risk and Return Literature

The risk and [rate of] return literature was studied from two perspectives:

- (i) Equity market
- (ii) Organization

5.2.1.1.1 The Concept of Risk-return in Finance and Economics

The root of the risk and return relationship within the context of the equity market is Markowitz's work on the portfolio theory in the finance and economics discipline. This study proposed a positive relationship between risk and return and the concept of "risk-return trade-off" rapidly expanded in capital market transactions.

In contrast, the root of risk and return (reward) in an organizational context was put forward by Bowman (1980) in the strategic management discipline. He found negative associations between corporate risk and return within industries and explained how risk-return relations for organizations may differ from those of equity markets. He described this negative association as a “risk-return paradox”. He proposed that “the firm with lower risks and higher returns (to the firm) can have its securities priced relatively higher by the securities’ marketplace, thus lowering its return to the securities’ buyer, which then eliminates the paradox at the level of the securities’ owner or buyer” (Bowman, 1980).

Now let us find what risk and return means in these different contexts. The theoretical perspective of risk differs in finance and strategic management literature. In finance, risk is the volatility of results (i.e., equity prices) and it is largely analysed within the efficient market hypothesis; consequently, market forces determine the risk and return relationship. Finance theories explain the trade-off for risk and return, which essentially reveals the amount of market risk an organization should take to produce a certain percentage of return for its investments. The concept of risk appetite and its computation to a single digit dollar amount for any specific market risk category is highly relevant in this context.

Figure 5: Mean-variance Efficient Portfolios for Tradable Securities

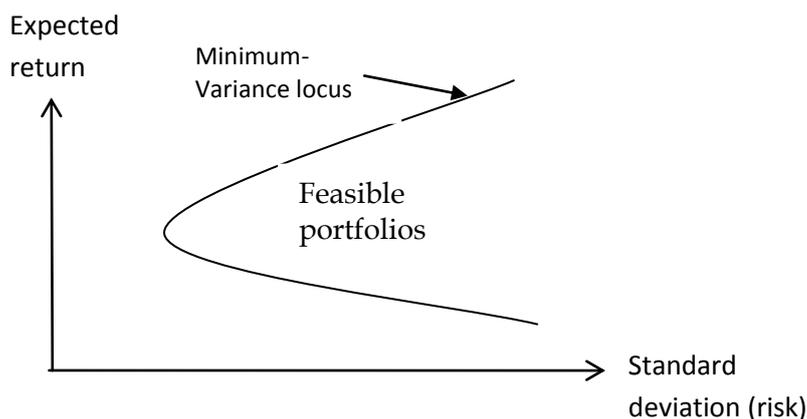


Figure 5 illustrates a very simple structure for how risk-return trade-off is structured in a mean-variance framework for market risk. The investor constantly looks for an optimum portfolio within the feasible region in order to take advantage of risk and return trade-off for financial risks.

The whole idea of a risk-return trade-off is based on the concept that there must be some incentive for taking risk; without the incentive, the risk-return trade-off concept would not work. It is understood that the operational risk cannot be traded and diversified; consequently, there are no risk-return trade-off considerations with operational risk from a finance and economics perspective.

We noticed that the jargon “risk-return” and “risk-reward” are often used interchangeably. We found that, whilst “risk-return” is used in economics and finance literature, “risk-reward” is used in strategic management literature; therefore, we will now focus on strategic management literature to understand the meaning and use of “risk-reward”.

5.2.1.1.2 The Concept of Risk-reward in Strategic Management

Strategy is concerned with how to position the company in the competitive market. Unlike equity price, which reflects the expectation of the capital market, corporate strategy reflects an organization’s culture, business models, risk preferences, and the desire of the people working for it. Although profitability represents the indirect price of corporate strategies, there is no established market to readily exchange corporate strategies. The key lesson for strategic risk management, according to Warren Buffett (a successful stock market investor), is to “avoid businesses whose futures you can’t evaluate, no matter how exciting their products may be”.

The following possible explanations for the “risk-return paradox” are proposed by Bowman (1980):

- a) Differences in the quality of management enabled some firms to more consistently achieve both lower risk and higher return than poorly managed firms
- b) The investment decisions of some firms reflect risk seeking rather than risk aversion
- c) Less profitable firms take risks that more profitable firms avoid, and
- d) Market dominance may permit both higher profit and lower risk

It is understood that, in the context of “risk-return trade-off”, the finance and economics literature focuses on the role of market players i.e., investors. However, as the above

explanation of “risk-return paradox” shows, strategic management literature focuses on the following:

- Role of managers within the organization. The role is motivated by their risk preferences and investment decisions.
- A firm’s strategies within their industry context.

Given the characteristics of operational risk (see Table 3 in Appendix D) the role of managers within the organization is of paramount importance. Consequently, it is a challenge for the investigator as to whether to peruse the research on operational risk from economics and finance theories or from management theories.

6 Conclusions and Policy Implications

After analysis of the data and relevant literature, the study concludes with the characteristics of operational risk, challenges of modelling and quantifying operational risk and optimizing operational risk from a risk-return trade-off.

Conclusion 1: The current practice of operational risk management tends to take an objective view on a subjective problem.

We verified the characteristics of operational risk and found it is characterized by individual actions, organizational culture, individual's emotions, understanding, response to risky situations, etc. We found that, unlike financial risk, operational risk is not traded in the capital market; consequently, the data, which includes a high level of subjectivity, cannot be directly fed into mathematical/actuarial models. Therefore, the VaR type risk measurement technique, which may be effective for market risk, does not fit well for measurement of operational risk. We found that organizations are struggling with the measurement of operational risk because of the subjective nature of the data. Most importantly, there is a debate on where to draw a line between the subjective and objective data of operational risk. We conclude that:

“The management of operational risk cannot progress effectively without considering the subjectivity associated with operational elements of the business. However, the line dividing the subjective and objective elements of operational risk depends on the individual insurer's risk philosophy, business model and corporate strategy to achieve its business objectives.”

We found that the practice of operational risk in developed countries is comparatively more robust than other countries, which is partly due to the mature regulatory landscape and superior management culture. However, we observed that for some countries outside the UK (for example), the notion of reporting errors, mistakes or failures is something quite strange to many people because they think that there will be an immediate penalty or fine, if they do so. That is why subjective issues, such as organizational culture, are an important issue in operational risk management.

Conclusion 2: The current practice of operational risk management is divided into two perspectives, which are (i) internal control and corporate governance-based and (ii) risk-based. They are founded on two separate sets of skills. Whilst the focus of (i) is the errors in the process and systems, (ii) is closer to core business and risk categories and concentrates around a manager's risk-taking initiatives.

We found that the risk and reward relationship from the perspective of enterprises is based on the following understanding:

- (i) The level of risk to which an organization is prepared to expose its resources in order to achieve its corporate objectives.
- (ii) Given the resources, the level of risk that an organization has the ability to accept (i.e., risk appetite or tolerance) to achieve its corporate objectives.
- (iii) The level of risk from tolerance to exposure (organizations often have exposure to risk much higher than their level of risk tolerance) needs extra care to justify the potential reward with this level of risk. In an economic sense, the reward is measured in terms of shareholders' value added.

This 'extra care' is traditionally provided by a mechanism known as 'internal control'. An internal control, which takes a generalist view on risk, can be best described as a set of systems and processes or guidelines, the ultimate aim of which is to mitigate the risk (downside sense) at the entry point, where possible.

Since internal control (in higher versions, it is regarded as 'corporate governance') takes a general view on risk, it is unable to capture the dynamics of technical risk, such as underwriting risk, credit risk, and market risk, that have special characteristics directly linked to the core business activities. We found that the internal control is structured in the three lines of defence model – the big risk is in the first line in which managers take risk on a day-to-day basis; the operational risk managers sit in the second line, which provides oversight, strategy, and tools and equipment to manage risk. The third line is providing independent assurance that everybody is performing their role and responsibilities effectively. Although, in general perspective, operational risk arises from manual errors, the characteristics and implications of manual errors in a manufacturing firm are totally different from a financial firm. We also found that they also differ within the financial industry, such as between banking and insurance. Moreover, we found that, although the

causes of the operational risk (manual errors) may be similar in core risk categories, such as underwriting risk, credit risk, and market risk, the manifestation of results and implications for the business differ extensively. Consequently, internal control and corporate governance mechanisms cannot reach the root causes of such operational errors and are therefore unable to control their manifestations and implications. We also found that it is the respective business managers, who take core risks for the business (e.g., credit risk) and hold superior knowledge on the operational risk associated with that particular business. One respondent suggested “the operational risk managers need to oversee what the business managers are doing and make sure that they are not taking excessive risks”. The group operational risk manager is there to provide policy and procedure to the individual business managers, which is consistent with other businesses as well as linked to group strategy. In other words, the group operational risk manager takes a holistic view of operational risk across several businesses and risk categories.

In this context, the group operational risk managers should (at least theoretically) hold knowledge on:

- The core business of the firm
- The characteristics of operational risk associated with all risk categories
- The link (relation) of operational risk from one category to another
- How and when operational risks across the categories accumulate
- How the operational risks of a specific category, as well as their accumulation, affect the implementation of strategy
- The mitigation of accumulated operational risk in the development of corporate strategy

We found that internal auditors traditionally hold the generalist view of operational risk and essentially look after the tasks of operational risk management in many companies, including insurance companies. Comments from respondents include:

- “Most operational risk managers are from an audit background. They have nothing to do with modern operational risk management most of their understanding remains within the policy and procedures based on regulatory requirements.”
- “Basically, my first job is to say (i) have you identified all the risks? – yes; (ii) do you have an appropriate control in place? – yes; (iii) can you tell how they are running

and are they running effectively? If they are OK, I've done my job. The audit manager will come in and show me how the control is running; show me what can be done to mitigate this or that risk, etc. So, they want much more detail for their testing than I would have. Whilst internal audits rely on testing, we, as the operational risk people, rely on self-assessment of the businesses."

- "The traditional role of auditors in operational risk management ended 4 or 5 years ago when the FSA made it clear that it is a compromise of the independence of the audit function."

We conclude that: -

"Operational risk is a by-product of insurers' other key category risks, which are operational underwriting risk, operational market risk, operational credit risk, etc. The general view of operational risk cannot capture the industry and business specific operational risk. Consequently, specialised knowledge on operational risk is essential to manage them. The operational risk people should be technically smart (e.g., modelling) rather than, for example, credit risk people."

Conclusion 3: Unlike banking, operational risk in insurance is not a major area of concern.

We found that insurers' businesses are mainly operational by nature. However, the way operational risk management is currently designed and implemented in practice (mostly aligned to meet regulatory requirements), does not entirely fit with insurance companies' actual operational risk profile. This research provides a gap analysis between the current practice of operational risk in insurance and what it should be. We understand that actual operational risk management is about identifying risk, thinking about risk, trying to compare risk appetite across different lines of business, thinking about the control, mitigation, and exploitation strategies, including the scope of business opportunities. We found that there is quite a good discipline regarding operational risk management around the insurance industry; however, there appears to be a lack of understanding in separating operational risk from insurance risk.

We conclude that:

“Operational risk is embedded in the insurance risk and operational risk can be managed best as a part of an insurance (e.g., underwriting) risk management process. Consequently, considering operational risk as a separate risk category, along with insurers’ other significant risks, is debatable.”

This conclusion is vital to distinguishing the operational risk of insurance companies with other financial services, particularly banking. Insurance policies include a long-term promise to compensate the insured in cases of any insurable event actually occurring. Both parties to an insurance contract hold the right to cancel the contract in the case of any breach [unlikely] happening during its term. In addition, there is scope for insurers to amend for operational errors, if any are committed during the underwriting process. However, this is not the case for a bank when executing a trading contract or a contract for lending money. In addition, while reinsuring the underwritten risks, [primary] insurance companies can insure for operational risk associated with the underwriting process⁴. This unique operational structure of insurance companies strongly supports conclusion 3 above.

Conclusion 4: A considerable gap exists between the quantification exercise of operational risk and the way operational risk is actually managed in the business. At present, the efforts on the quantification of operational risk contribute little in the area of insurers’ business decision making.

We found that the whole idea of managing operational risk of a business is missing in current practice. Insurers consider the management of operational risk because they want as much certainty as possible around the outcomes in medium and longer periods of time (e.g., next twelve months or five years). We found that, unlike market risk, operational risk is not directly involved in money gain and loss. To support the growth of the business, insurers need to manage operational risk as efficiently as possible; however, in reality, regulations drive practice. It appears from current industry practice that a majority of insurers (with some exceptions) are concentrating more on the regulatory requirements of operational risk (Basel II, Solvency II). However, the research suggests that insurers should be more interested in the profit and value creation of their business rather than capital requirements for operational risk.

⁴ To learn more about insurers’ unique functions and business model, interested readers are recommended to read the work of the Geneva Association on the “Systemic Risk in Insurance” (GA, 2010).

We conclude that:

“Insurers need a broad and well-defined base of operational understanding of their business, which is very different from quants-based operational risk measurement and modelling.”

A further difficulty arises in the quantification of operational risk. History suggests that almost every instance of an insurer’s failure happens due to not meeting the expectations of their policyholders. Capital market turmoil could be a secondary issue in insurers’ insolvency. This type of risk (miss-selling, which is mostly operational) is ongoing (i.e., always there) but it takes a long time to materialize; when it is exposed, the result is devastating. Consequently, it is difficult to predict their occurrence (e.g., 1 in 200 events).

Conclusion 5: The practice of operational risk management should take a risk-reward view from a strategic management perspective.

We verified whether the risk-return trade-off technique is applicable for operational risk management and found that the root of the risk-return trade-off is in economics and finance literature. This concept was firstly proposed by Markowitz in 1952 to explain the portfolio selection within the scope of an efficient market hypothesis. This theory explains investors’ risk-aversion characteristics. The understanding is that risk and return are positively correlated. We found that the data for operational risk is very different from financial market data. Whilst management gains from financial risk taking, operational risk is a daunting threat that management always try to avoid. Operational risk-taking is not intentional; in fact, operational risk is a by-product, which arises in the course of other risk-taking activities. Moreover, operational risk can neither be traded in the secondary [capital] market nor diversified; consequently, no risk-return trade-off considerations exist with operational risk.

We conclude that:

“Operational risk cannot be viewed as a separate category of risk along with the core risks of insurers’ business (e.g., underwriting, market, credit, etc.). The

characteristics of operational risk associated with underwriting risk (for example) are very different from the investment risk (for example). The heterogeneous characteristics of operational risk do not satisfy the criteria for a risk-return framework in an economic sense."

In this context, we discussed Bowman's risk-return paradox from the literature of strategic management and we found that this risk-return paradox is considered within the broader scope of risk beyond an efficient market concept. The strategic management literature describes risk within the scope of managerial attitude in risk taking and decision making at the organizational level. It is seen that, whilst economic studies provide a positive risk-return relationship, strategic management studies suggest their negative relationship. We found that faulty strategic decision errors are much more dangerous (i.e., value destroying) than operational (manual) errors.

We defined operational risk as:

"Human, machine, system, and processing errors in the course of implementing corporate strategy, which can result in failure in achieving corporate objectives."

The GIRO working party defines strategy as "a long-term series of actions designed to take a company from its current state to its desired future state, and aims to provide a sustainable competitive advantage over other companies in the same market." In strategic management, risk is measured in consideration of a firm's position relative to industry competitors. Two key phrases, which are 'quality of decisions' and 'quality of implementation of decisions', are often confused in separating strategic risk from operational risk. We understand that, whilst adverse business decisions by top management contribute to strategic risks, poor quality of implementation is caused by manual (operational) errors.

We defined strategic risk as:

"The risk of potential failure of the organization due to faulty decisions of the top management on major strategic matters, which also leads to a firm's poor performance when compared to its competitors in the industry"

(The industry definition of strategic risk as used by several banks is given in Appendix I.)

We understand that the ultimate aim of an organization is to identify the risks of its business and then manage them accordingly, in terms of its risk appetite and culture, in order to achieve strategic goals. We found that categorization of risk is effective at a certain level but, thereafter, everything is wrapped up into business risk, which is in line with Miller's (1998) view on integrated risk management in international business.

We found that an organization may fail to achieve corporate objectives even though there is no error in the implementation of strategy; notwithstanding this, operational errors are obvious in organizational functions. In this understanding, we however found some justification for capital charge for such operational risk; however, we found that manual errors alone cannot threaten the survival of the firm. Operational risk was found to be a low-level risk and we understood that there must have been some high-level strategic issues that failed to work correctly behind the scenes. We can justify this argument with the examples of AIG and Equitable Life.

AIG's biggest mistake was that they did not understand the risk inherent in the decision to sell CDOs. They did not have enough stress and scenario testing around it, i.e., they did not collate scenarios in wider events. They were aware of risk taking but did not have enough knowledge on the size of the loss.

The failure of **Equitable Life** was not a surprise; everyone in the public domain in the industry knows how the top management managed the company, even knowing the risk of their business.

Consequently, we concluded that:

"Instead of the risk-return trade-off, the concept of the risk-return paradox may be closer to describing operational risk. However, in this context, risk should be considered from a strategic risk management perspective."

We found that the insurance industry at present is not yet differentiating operational risk from strategic risk. The industry was still found to be in classic life insurance territory in

which the focus is on pure numbers (e.g., ICA, Solvency II, etc.). However, it is expected that once it gets to the point of concern with scenarios, then the industry will start searching for big issues; for example, issues behind bankruptcy or causes of big problems. The industry can then focus on the management of strategic risk. Notwithstanding, the industry is still picking up the low-level noises and one respondent argues that “this is helping us to identify and think about our strategic risks.” However, the sign is posted by Solvency II’s use of test requirements, which require insurers to assess their internal risk in terms of its application within their risk management processes.

Conclusion 6: Although insurers’ strategic risk and operational risk evolve differently, they contribute to each other’s evolution.

We found that, in many instances, operational failures happen due to sloppy or poor management. However, it is noticed that management failure in many circumstances combines with some on-going business environment issues that actually trigger massive losses and even the failure of the entire organization (i.e., insolvency). That is why we think management should put emphasis on the management of strategic risks in addition to their current effort on managing operational risk. Notwithstanding, there are many operational failures behind the scenes that need to be recognised as well.

Moreover, unlike financial risks (e.g., Black Monday; stock market crash), operational risk losses do not happen suddenly; perhaps, they are the result of many small and medium size prolonged events (e.g., principal-agent conflicts). Consequently, it is wise for management to focus on and sort out small and medium issues (which happen more frequently) rather than big events. Unlike financial risks, the big events in the world of operational risk are the result of many small and medium sized events. History suggests that big things do not happen purely due to bad luck; they must have something working underneath that influenced the big things happening.

This does not mean that management should focus merely on the small and medium sized events and ignore large/catastrophic events. The spirit of this argument is based on the fact that large/catastrophic losses should not be seen as isolated events. History suggests that the root (approximate) causes of large/catastrophic losses are mostly small and often

unimaginable and overlooked by traditional internal control and corporate governance systems. The 2008 financial crisis is a prominent example for such oversight. The recent (April 2011) interim report⁵ of Independent Commission of Banking in the UK identified that the conglomeration of retail and investment banking is the root cause of the 2008 financial crisis. The near collapse of AIG because of the liability created by AIG FP (that generated only 3% of AIG's revenue) is another example of overlooking small/medium sized events in the early days of the development of large/catastrophic losses.

Consequently, it is argued that operational risk management should proactively focus on the small/medium sized losses *ex-ante* (pre-event) and distinguish which small/medium size events could cause mass destruction (i.e., catastrophes, unexpected loss) in the foreseeable future. The focus of modern operational risk management is importantly on the former type of events and traditional operational risk management may be sufficient for the latter type.

The study observed that, in practice, there exists some controversy as to whether modern operational risk management should focus on small/medium losses or large/catastrophe losses. It is revealed that timing; that is, *ex-ante* (pre-event) and *ex-post* (after-event) losses, is a crucial issue for management thinking and taking appropriate measures for operational risk. It is argued that "management should spend time thinking about what might be the big/catastrophic events and identifying which small/medium events would lead to a catastrophic impact, and then prioritize which small/medium-sized events the organization controls and manages."⁶ The *ex-post* analysis of loss is necessary but not sufficient because future operational losses are unlikely to follow the past pattern. This emphasises the argument that thinking about operational risk proactively (i.e., *ex-ante*) is an issue of strategic priority; that is, should top management allow the AIG type excessive profit generating house while over-risking the entire business group. Day-to-day operational errors are merely a small issue compared to those associated with requiring strategic decisions.

We conclude that:

⁵ The report was accessed at <http://s3-eu-west-1.amazonaws.com/htcdn/Interim-Report-110411.pdf> on 30th April 2011.

⁶ This argument has been from one of the reviewers of the draft project report.

“Operational risk itself is unlikely to be a major cause of organizational failure. It is strategic risk that often causes severe damage through top-level faulty decisions. However, the implications of poor operational risk management cannot be neglected given its use in the strategy development process”.

Managerial and organizational risk preferences drive the riskiness of strategic choices, such as capital structure, asset allocations, and diversification. Practically, owners’ risk preference cannot ignore the risk preferences of managers’ in making strategic decisions. However, we found that managers’ individual risk preferences are associated with operational risk. Consequently, there is some role for operational risk in the riskiness of firm-level [strategic] risk and the strategy development process should consider the level of operational risk of the firm. We found that although operational risk and strategic risk evolve differently, there appears to be significant influence from operational risk on the evolution of strategic risk. Theoretically, the level of operational risk controls the strategic risk, provided the strategic planning process includes the operational data; for example, reports. However, it might not be true in many instances, such as hostile takeovers, where strategic failures happen even in the absence of operational risk.

In this context, a question arises as to whether an error in a high-level (strategic) decision is considered an operational risk. A high-level decision is not taken instantly; it follows a process called a decision process, i.e., problem identification, quantification, and so on. It is possible for errors to happen at any step of the decision-making process and, in that case, we call it operational risk. An error at any step of the decision-making process may or may not lead to a faulty decision; additionally, there could be a faulty decision even if there is no error in any step of the decision process. Top-level executives are not engaged in manual jobs in the financial industry, which are undertaken by lower-level employees. Surprisingly, there are no examples of a financial firm becoming bankrupt (or brought down) due to manual errors. There is some tendency to mark principal-agent risk as an operational risk; however, as the literature suggests, this is a high-level strategic issue and in no way can it be linked to manual errors. Errors resulting in “agency conflict” are a bi-product of a high-level strategic issue (Sheedy, 1999), which can be explained by strategic decision-making literature. Consequently, operational risk is embedded in the strategic risks.

Conclusion 7: The research on insurers' operational risk management should focus from the perspectives of management theories.

In this context, the research raises a vital question whether insurers' operational risk should be studied either from finance and economic theories or management theories. The analysis of respondents' statements suggests that management of operational risk is a decision making problem given the organizational internal complexities involving business peoples' attitudes and understanding in risk taking, reporting, communication, integrity, skill, etc.

Consequently, it is concluded that –

“Operational risk can be best studied from the perspective of management theories instead of from financial and economic theories”.

We believe that operational risk could be investigated further within the scope of three management theories, which are the prospect theory, behavioural theory of firm, and agency theory. That investigation remains outside the scope of this research but a brief description of these three theories is attached in Appendix J. Following is an initial thought about modelling operational risk (preferably strategic risk also) from a risk-reward perspective.

7 Proposals for a Theoretical Foundation of Modelling Operational Risk from a Strategic Risk Management Perspective

The above conclusions suggest that, in current understanding, operational risk is viewed as an error in policy implementation rather than an error in policy choices. In some industries, such as investment banking, the outcome of errors in policy implementation is much greater than errors in policy choices; nevertheless, this is not the case in the insurance business. Unlike banking where the risk is associated with transactions, the risks in insurance (underwriting, in particular) are more of a strategic nature and errors in day-to-day functions cannot be considered as serious issues. Virtually, insurance policies are designed with provisions to rectify errors in policy wordings, including cancellation, which are not possible in banking transactions.

We understand that through the reduction of premiums the insurance company transfers some of the insured's risk to the insured; thus, reducing their own risk. This is because the insurance premium reduces with the caring action of the insured towards his/her property (as reflected in the price of insurance). In other words, as a norm of loss, the insured takes care of the operational risk attached to the insured property and the insurance company recognizes it positively through a reduction in the premium. This is a win-win situation as the insurance company finds it is cheaper through reduction of the insurance premium rather than having higher claims. This is similarly true for shareholders in the capital market because owning a company is high risk rather than owning a portfolio of shares – the latter is comparatively less risky. This is because owning a company means taking the responsibility for operational risk and strategic risk whilst believing in the expertise of managers. Therefore, by owning a portfolio of shares, investors transfer the operational risk to the company (i.e., managers). Consequently, operational risk within the definition of Basel II and Solvency II has no potential to bring the insurance company down, leading to insolvency. Notwithstanding, it is strategic risk that insurance companies are most worried about.

It can now be suggested that it is very hard to quantify operational risk using the techniques available for market and credit risks. In addition, it is rather important to justify whether quantification of operational risk is worth focusing on in insurance business having regard to the superior significance of strategic risk. We have seen that the risk-return trade-off is not easily tracked in operational risk using finance and investment theories. We understand that research into operational risk should be founded on the individual's and organizational risk preferences. However, managerial risk preference is complexity driven and, without studying the context of the functional problem, the research on operational risk is incomplete. We have discussed the construction and implications of several management theories in the literature review.

In terms of the agency theory, the principal (shareholders) transfer the operational risk to the agents (managers) but retain the strategic risk. From the perspective of the theory of loss prevention, there is a trade-off between risk and return from a decision-making perspective in which optimal decisions increase the return whilst reducing the risk. Clearly there is a benefit for both the principal and agent if the contract is maintained.

Since the consequences or outcome of the operational risk cannot be presented in absolute monetary terms, one argument suggests that the level of capital depends on how the firm manages the risk. It is true that some operational risk can be insurable (e.g., fraud, estimation error, D&O losses, etc.) but they are mostly uninsurable, even when they happen due to internal causes. Consequently, all operational risk cannot be classified as insurable risk. However, it is sensible to consider the residual operational risks that are not insurable, for capital charge purposes. It is revealed from the research that one should look at the operational risk just with a blank sheet. We found that operational risk and, more importantly, strategic risk is the origin of all other risks for an insurance firm. Keeping all other risks on one side for the time being, we should decide what the operational risks of the firm are and then define them in a coherent way. It will then emerge that the risks arise due to internal causes of the firm forming a category of risk, which is, in fact, operational risk. On the other hand, another category of risk will emerge from causes which are external to the firm (mainly due to the influence of other agents e.g., capital market) and they are not insurable but, preferably, can be hedged. The current classification of risk, as seen in the Basel and Solvency regime, defines in the opposite way to that conceptualized above, as the market, credit, and liquidity risk, etc.; however, preferring the external cause or events and then putting all the residual risk within the basket of operational risk does not seem sensible and coherent. However, thinking of the world of risk of a firm as the result of its internal causes right from the beginning and then gradually moving towards risk arising due to external causes seems an organically grown idea in categorizing risks of a firm. It is incoherent to classify operational risk under a residual heading (the current approach in Basel II). Such an approach to defining operational risk is fuzzy and will be fuzzy since the residual means that it could be anything.

Therefore, we have two characteristics of operational risk. One is that it arises due to the internal causes of the firm and the other is that the internal causes are controllable by efficient contracts (either by insurance or self-regulating policy and procedures). In one sense, it is a constraint but it is more of a trade-off rather than a constraint. This can be modelled within a risk-reward perspective of strategic management. The main thing is that they (risk-return trade-off of operational risk) are manageable. Theoretically, firms invest in resources, systems or whatever to minimize operational risk. In an ideal world, such a risk-return trade-off can be down to zero theoretically provided the firm ensures proper terms and conditions of the contract (since the causes of operational risk remain within the hands

of management). However, other risks (e.g., strategic risk, which is the risk associated with decisions) cannot be down to zero, as they are external to the firm. Consequently, quantification output of operational risk can add a little value in the management of operational risk for an insurance company. Furthermore, quantification exercises for operational risk cannot contribute to minimizing the enterprise risk, which leads to insolvency in worst-case situations for an insurance company. However, management of strategic risk is more meaningful and capital adequacy regulations should concentrate and value more insurers' efforts in managing their strategic risk.

However, a framework for managing strategic risk is complex, as it integrates capital risk management and corporate governance issues. A broader examination of developing a framework for the management of strategic risk is outside the scope of this study. However, a broader knowledge of management theories is necessary for developing such a framework. A discussion on several management theories that may help with this is attached as Appendix J.

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9 Appendixes

Appendix A

The Characteristics of Operational Risk in Practice (Unedited Responses)

- i. "I see that the operational risk management is ill defined and a lot of wrong people have got into the operational risk management."
- ii. "The definition of operational risk which I see is borrowed from banking is all right but the way it is applied in insurance does not actually marry-up with the definition. The way it is defined, that's fine, but it is refined in actual application in practice. The way it is interpreted includes strategic decision processes, reputational issues, etc., all these things, which are clearly not operational."
- iii. "In recent years we suddenly get a huge population of operational risk emerging from the business units."
- iv. "One of the interesting things in the Basel II definition of operational risk is that Basel II is only concerned with the direct loss at a single outcome but not the indirect loss. It is very broad and covers many things I think at the end of the day the starting point of operational risk has to be clean and simple."
- v. "What I understand is that there are risks which are both within and beyond the control of the organization - some of them have substantial influence of our business operations, some of which we actually choose to participate in even though they are not within our control, we have a little ability to mitigate them. We start with the risks on which we have better control and separate those which we can't control with the usual risk mitigation techniques as a matter of business operations. They are of special characters and need a different set of techniques and skills to handle them. Yes, all of the operational risk that the business faces in its day-to-day existence has to be specifically linked back to the corporate objectives of the organization. Indeed, there is a link between what we want to do and what can stop us of doing this and that gives us a relevant thought of

separating these two types of operational risk. At the end of the day we have a portfolio of risk and a lot of them are manifesting themselves into the process.”

- vi. “There are some generic risks that are relevant to achieve our business objectives but they are not actually manageable through the usual business process.”

- vii. “I think there are risks which are around and systemic nature and we cannot do much about them but we have to be ready to respond to them when they occur and there are generally, in my view, of very low probability but very high impact losses, which may fit into the business resilience category. This motivated us to accept new ideas and adopt new practices to achieve our corporate objectives.”

- viii. “Here in the United States the regulatory requirements often drive organizational practices and the practice of operational risk management is not an exception. A lot of companies do see operational risk is a SOX and COSO type process which is very like an audit process. However, the recent ERM type modern operational risk management is very much focused on high impact and high likelihood events rather than the losses that happen in the normal course of business.”

- ix. “In our operational risk we would think more about the internal fraud rather than the external fraud that we see in our core business areas, e.g., underwriting, claims, etc.”

Appendix B

The Link of Operational Risk with Other Core Risks

The following unedited responses were received.

- a) "The fact is that operational risk has not been recognized as a risk in the insurance industry until recently and it is not rocket science."
- b) "Operational risk has not seemed a significant issue in the insurance industry probably due to the mindset of the people working in the insurance industry. In addition, it could be because of the lack of time to talk about this and now the time came on for whatever reasons, the people started talking about operational risk."
- c) "In the banking sector the concept of operational risk has evolved in a completely wrong way."
- d) " In our organization operational risks were evolved for three key reasons (i) to take a holistic view of the departmentally practiced operational risk e.g., IT security, fraud investigation, etc.; (ii) meeting the expectation of financial markets, S&P in particular; and (iii) meeting the requirements of Solvency II."
- e) "The execution of corporate strategy through the day-to-day business process generates a substantial amount of operational risk for our business. "
- f) "Now there are a lot of compliance and risk function joining together. In line with the Walker Review we have separated into a Board Risk Committee from Group Audit Committee. "
- g) "The key challenge for operational risk management is the engagement with the business functions. Since operational risk is a result of process failure, it remains intangible before it crystallizes; people can't see this; they can't touch this; can't hold

it. It is important to get the business to understand and prioritize operational risk issues.”

- h) “The concept of operational risk in insurance was growing up from the banking world and the banking world is mainly exposed to the credit risk, liquidity risk and so on (a type of the pure risk). However, there are a lot of other things that cause the uncertainty on the way a business is run and the definition of operational risk tried to capture them.”
- i) “The aspects of running a business, the strategic decisions, for example, or even reputational issues are about enterprise risk management, which says we must think all risks holistically and we must not leave anything else. I observed that when people actually work with operational risk they often define it narrowly and that’s probably wrong.”
- j) “Our risk profile basically focuses on four key risks: credit, market, insurance and operational and of them credit, market and insurance dominate our overall risk profile in terms of resources, attention and degree of risk.”
- k) “I see that in ICA (individual capital assessment) a 10% capital is required for operational risk. It means that it is important but it is not as important as insurance risk, market risk, etc. I think that’s wrong. In most companies, operation risk is thought as the failure in day-to-day operations, business continuity and so on. But in reality it should be around the whole of the strategy, and there would be a lot of variations in the underwriting results for an insurance company if you got the operational management wrong. So I think that there is huge opportunity to be met in the areas of operational risk management in insurance. “
- l) “In an ideal world, risk is the success for insurance companies and a proper risk management is important to achieve business goals, at least from a CEO perspective. Nevertheless, it should be driven from the top. Observing the current development

of operational risk I am not sure about the level of implementation and it could be because of the pressure of time, the lack of information and the mindset. In the manufacturing world the real time engineering model is applicable to monitor what is going on in the factory or a plant. However, in the financial services world things often do not go as it is thought at the beginning.”

Appendix C

Operational Loss Database

The following unedited responses were recorded.

- a) "The external data for operational losses would be meaningful if they come from the set of organizations that have a risk profile the same as yours."
- b) "The inadequacy of operational loss data can happen in two ways. First, there may be enough quality data but they hold for a short period of time (time issue), and second, inadequate data even in a long period of time (volume issue)."
- c) "As a reinsurer the external database is not useful to us. It is not only the small size of data; it is more about the inconsistency in the type of data the database offers. One should differentiate reinsurance business from primary business. The operational database for insurance is heavily dominated by mis-selling risk. However, in our reinsurance business we are selling to educated customers those typically large corporations. In this world we don't have any mis-selling; the customers understand what they are buying and we know what we have to pay if any claim arises."
- d) "Unlike Banking, we do not have any internal loss database in our organisation. It does not make any sense to us to model operational risk using either internal or external loss data to support our strategic decision making issues. Our operational risk data are mostly expert opinion based and extracted from forward looking scenarios."
- e) "We subscribe to an external loss database (an anonymous industry loss data) that gives us some indication what happened in the industry in the last 4 or 5 years. However, it can only be an indication ...organizations have different size, different scale, but we take the causes and think if the same would occur in our organization than what could be the outcome given our specific nature of business, culture, size,

market, etc. In fact, we use the external data to improve the quality of our internal data.”

- f) “Our database for operational risk focuses on the causes of loss events rather than types of losses. We believe that an extreme event, e.g., failed M&A resulting insolvency, which we categorize as strategic risk, does not happen on its own. We found several other elements, which are beyond strategic controls, effectively influence the ultimate extreme events, modelling, for example, and the management decision that is based on faulty modelling of a project (e.g., M&A) lead to a massive loss in that particular project. We report such cause of failures as operational risk in our database.”
- g) “If you look at miss-selling for example; miss-selling is a major operational loss for mainly life insurers. It took many years to be materialized and crystallize; it may be the case that the insurer sold those policies five or ten years ago; and it is understood as a significant risk as only when the claims started to emerge (equitable life, for example). So any sort of miss-selling stuff is more likely to hit the life insurance business adversely and I found that the root causes of many cases are still the operational failures.”
- h) “To us, miss-selling, which ultimately triggers a product failure, is an operational risk event and we have got many of those in our database; we actually do not distinguish much between operational risk and strategic risk.”
- i) “In the United States the key sources of operational risk in the insurance industry are really driven around sales practices, compensation practices, which the industry faced a number of issues during the 1990s.”
- j) “From the database one insurer is able to see the events that are hitting other insurers. We make available a number of benchmarking reports so that consortium insurers can compare their experience against peer groups in a more customized way

... it includes a substantial amount of important management information that can be used to benchmark loss experiences of one insurer against their peers.”

- k) “The quality factors of the database, i.e., size, consistency, confidentiality matters, etc., are a constant area of development within our consortium members. It is due to the different level of market maturity both at national and regional levels; some insurers are well above the curve; some are further down and others are only starting now; so we recognize the variability within the market.”
- l) “The data for operational risk is complex and problematic. I suppose data for other risk categories (e.g., market, credit, etc.) are results of financial transactions are straightway available from the secondary sources (e.g., capital market). However, operational risk data (i.e., information) is still an output of difference of culture; size and organizational infrastructure; level of understanding of risk exposures; lack of communications and human interactions, etc. They can only be captured sensibly by analyzing the relevant root causes of an event rather than its financial effect. Consequently, we must allow a certain level of subjectivity around the database.”
- m) “Some operational loss data, e.g., fines, regulatory penalty, etc., that are available in the public domain, are not essentially detrimental to large insurers. However, for the actual operational risk data (i.e., inadequate reinsurance buying, internal fraud cases, etc.) the insurers need to rely mostly on the local business to report. Consequently, you cannot detach operational risk management from local business management. If you do then you will remain completely isolated from the actual business.”
- n) “We are not currently a member of external operational loss data providers but we are looking to become one. We collect internal loss data and external loss data – that’s important – but we don’t use and I think any insurance company – can use external loss database because there is only 1600 or 2000 loss incidents – and we don’t believe there is sufficient on there do an stochastic modelling on the loss basis. We calculate operational risk and we do still use other methods on “what if” scenarios.”

- o) “In terms of model estimation error, I think it is a very timely question and currently we do by inference because we look at process failure, execution, delivery and process management, risk within operational, and within that we have not validated the model appropriately, or made error in the estimation, and that are outside of our delegated authority, within title that it is an operational risk. Interestingly, we didn’t get that model estimation error until now, we will categorize it under solvency II.”

Appendix D

Table 3: Detailed loss event type classification in Insurance Operational Risk by ORIC

Event categories		
Level 1	Level 2	Level 3
1. Internal fraud	1. Unauthorised activities	1. Unauthorised use of computer system to defraud firm or customer 2. Unauthorised transactions 3. Under-reported transactions 4. Over-reported transactions 5. Falsifying personal details
	2. Theft and fraud	6. Theft of assets 7. Destruction of assets 8. Forgery impersonation 9. Disclosure of confidential information 10. Accounting irregularities 11. Misappropriation of assets
2. External fraud	3. External fraud	12. Theft of assets 13. Forgery impersonation 14. Fraudulent billing by suppliers 15. Fraudulent claims
	4. System security	16. Hacking 17. Theft of information 18. Viruses

3. Employment practice and workplace safety	5. Employee relations	19. Harassment 20. Terminations, including tribunals 21. Industrial activity 22. Management 23. Loss of key personnel
	6. Safe environment	24. Health and safety 25. Public liability 26. Employee liability
	7. Diversity and discrimination	27. Equal opportunities 28. Human rights
4. Clients, products and business practices	8. Suitability, disclosure and fiduciary	29. Regulatory impact 30. Data protection act 31. Regulatory compliance of appointed representatives 32. Customer complaints 33. Treating customers fairly
	9. Improper business or market practices	34. Money laundering 35. Other improper market practices 36. Insider dealing 37. Tax evasion 38. Anti-trust
	10. Product flaws	39. Product defects (unauthorised, etc.) 40. Product literature defects 41. Product design 42. Unintentional guarantees

	11. Selection, sponsorship, and exposure	43. Client fact-findings 44. Client exposure
	12. Advisory activities	45. Mis-selling due to mortgage endowment 46. Mis-selling (other)
5. Damage to physical assets	13. Disasters and other events	47. Natural disaster losses 48. Losses from external sources (terrorism, vandalism) 49. Physical assets failure (not systems)
6. Business disruption and system failures	14. Systems	50. Hardware 51. Software 52. IT network 53. Telecommunication 54. Utility outage/disruption 55. External interference (excluding fraudulent activity)
7. Execution,	15. Transaction capture, execution and maintenance	56. Customer service failure 57. Data entry error 58. Transaction system error 59. Management information error 60. Accounting error 61. Incorrect application of charges 62. Incorrect unit pricing/

delivery and process management		allocation 63. Management failure 64. Inadequate process documentation 65. Training and competence
	16. Monitoring and reporting	66. Failed mandatory reporting 67. Inaccurate external reporting
	17. Customer intake and documentation	68. Incomplete/ incorrect application documents 69. Contract document incorrect 70. Inappropriate underwriting 71. Inappropriate reinsurance 72. Missing documentation

Source: ORIC at <http://www.abioric.com/oric-standards/risk-event-categories.aspx> as on 29 Dec 2010.

Appendix E

Scope and Challenge of Quantifying Operational Risk (Unedited Responses)

- a) I think the quantification of operational risk is extremely difficult. Whatever mathematical model you set up you will end up with unreliable results in terms of its application in real business issues. We don't quantify our operational risk at all and until the Solvency II says we must quantify, we will not quantify operational risk.
- b) I am not persuaded on the understanding that modeling should lead the operational risk management practice in the insurance industry. In market risk it can help a bit there but I can see that insurers' spending a lot of money in operational risk management but I don't think they are getting any value out of it because all initiatives and moneys have been focused on quantifying it.
- c) I am quite comfortable for not quantifying operational risk because I can't do it in a sensible way and it is better for me to rely on soft issues, e.g., communication errors, risk culture, etc., than making up a number.
- d) Look at the banks in Basel II; there had been an arms race to build models to quantify operational risk in order to come up with the numbers and they all had to get advanced model approval. In the mean time several got that but in most cases the business had no idea what they have to do to manage the numbers. In reality the quant's team for operational risk management, in particular, remains totally remote from the actual business operation people.
- e) I don't say that you should not concentrate on modelling operational risk. Undoubtedly, you should do that in an advanced world. However, the thing is that it is a wrong question at the wrong time. I think what we should do in operational risk at this stage of development is people either focus on the qualitative part and build the quality data. It is observed that people focus on a very small amount of data from a large number of risk events, for example, if you have 20 risk events and you treat them equally even when only one is worrying and the remaining 19 are nowhere you are going to get. And both sides of it end up doing work which they believe they

have to do if regulations required to do it – the business is over here and ignoring them both.

- f) Even if you quantify the operational risk and come up with a number and ask the question OK my operational risk is that much and how am I going to reduce it, which is a typical question for market risk. Your quant's team will not give the answer to this; operation risk team is not there yet, because each part is acting differently. So I think you are in the advanced world, and in the real world we have massive disconnections in what's happening in operational risk.

- g) We distinguish the management of operational risk from its measurement. The measurement issues focus on the capital charge for the operational error for core risks, e.g., insurance and market risks. Any failure in the reserving process is considered as a significant risk failure and we cover it under our operational risk management.

- h) In case of measurement and quantification issues of operational risk we primarily face three key challenges, i.e., (i) how to achieve the level of consistency across the data; (ii) how to ensure that no significant risk is missing into our risk profile; and (iii) the quality of data because that contributes to our capital charge and is a significant issue for us.

- i) There is a difference in the operational risk profile between life and pension companies and general insurance companies. One of the things we need to do in the life and pension company is to provide the ICA and ICAP – the capital analysis against the risk ...we have quite sophisticated modelling of operational risk that give us a capital requirementnow we only model the key significant risk in a business risk – so we might have 20 or 30 key operational risks...and those would be modelled and in a way that relates into 1 in 200 year eventswe then have a capital allocation need to hold against those based on the potential impactso we can aggregate across the risk things where they are similar across the group.

- j) In the quantification exercise we assess risk in terms of their likely probability and likely impact. For the impact, we consider financial impact, reputational impact, customer impact and strategic impact and literally it is a relative score that can be read across the table ...we then link these scores with the potential financial outcome and then fed into your risk mitigation strategies.
- k) The principle that I personally apply is “never believe in models”. A model is an implication of something that is used in your decision making process. The quality of data is essential and if the quality of data is poor then the output will invariably be poor as well. I think the operational risk, in particular, the issue of difficulty in getting quality data virtually controls the success of measurement. How can you numerically measure the potential impact of an operational error, which is essentially a subjective issue; and its cause exists in many forms? In our standing the indirect loss of an operational event is much higher than direct loss.
- l) We believe that it is important to emphasis more on the exceptionally large operational risk events from the consortium or publicly available database rather than small and medium size losses. We recommend to use forward looking techniques (e.g., either scenario analysis or stress testing or both) to determine the possibility (if any) of occurring similar events in your own organization including the way it could happen with potential impact in terms of both financial and reputational perspectives. The external data could be important because in the internal loss data one can likely cover a part picture because you might not capture those events that have already materialized in your company but the exposure is waiting to happen.
- m) It is difficult to answer why some insurers follow a purely qualitative approach to their operational risk management; others follow a quantitative route and the rest use a mixture of both. I guess it depends on management’s philosophy and focus, and where management feels more comfortable. In some insurance companies that I have observed the operational risk management is purely driven from the top. If you are a company in a relatively specialized piecemeal area you might not even use our database which has almost 3,000 data points and in this particular area you still

end up with very few loss events; so clearly in that case modelling becomes very, very difficult and you, therefore, need to complement with some other approaches.

- n) We traditionally followed a pure COSO type qualitative risk assessment to manage our operational risks. This gave us the scope to gather sufficient data for our operational losses. However, we are gradually moving towards an actuarial model-based view of operational risk after we realized that there are certain operational issues around our credit, market and insurance risk.
- o) I understand why we need a precise definition of operational risk. If you want to develop a capital model, which is very different from running a business, a narrow definition of operational risk is necessary. For actuaries, the models are more meaningful but that's not to say anything wrong with modelling; it is really important how we develop the models, how we use them and how they are interpreted. The meaning and use of risk in measuring [economic] capital is one but they are different in running an insurance business.
- p) Success of risk models depends on the accuracy of the judgment on their parameters. You cannot capture all things that may go wrong with operations. However, using expert evidences helps you to make the best judgment about the parameterization of the model. This is one of the reasons why I agree with FSA's stress testing initiatives. It is important to understand the possible consequences of risk events than narrowly defined in stochastic models.
- q) You can do everything correctly, but errors and volatility happens. This is outside of your expectation but your business is there to take risk. The only thing that you can do is make a bit of selection to take risk.
- r) In operational risk management we purely focus in quantifying the impact of operational failure, legal costs, rectification cost in regulatory penalties, customer restitution (compensation) cost. We do not focus on the market impact but it is done by the financial guys.

- s) We do differentiate the measurement from the management of operational risk. In terms of management, we see this from a business management perspective. The management is about the actions we take in response to the measurement output. We see operational risk management as like managing the business; you cannot manage your business without managing your operational risk.

Appendix F

Table 4: Detailed loss event type classification in Banking Operational Risk

Event-type category (Level 1)	Category (Level 2)	Activity example (Level 3)
1. Internal fraud	1. Unauthorised activity	1. Transactions not reported (intentional)
		2. Transactions type unauthorised (willful monetary loss)
		3. Fraud/credit fraud/worthless deposits theft / extortion / embezzlement / robbery
		4. Misappropriation of assets
		5. Malicious destruction of assets
		6. Forgery
		7. Check knitting
		8. Smuggling
		9. Account take-over/impersonation/etc.
		10. Tax non-compliance/evasion (willful)
		11. Bribes/kickbacks
		12. Insider trading (not on firm's account)
2. External fraud	2. Theft and fraud	13. Theft/robbery 14. Forgery 15. Check knitting
	3. System security	16. Hacking damage 17. Theft of information (willful monetary loss)
3. Employment practices and workplace safety	4. Employee relations	18. Compensation, benefit, termination issues 19. Organised labour activity
	5. Safe environment	20. General liabilities (slips and fall, etc.) 21. Employee health and safety rules events 22. Workers compensation
	6. Diversity and discrimination	23. All discrimination types
4. Clients, products and business practices	7. Suitability, disclosure and fiduciary	24. Fiduciary breaches/guideline violations
		25. Suitability/disclosure issues (KYC, etc.)
		26. Retail customer disclosure

		<ul style="list-style-type: none"> violations 27. Breach of privacy 28. Aggressive sales 29. Account chumming 30. Misuse of confidential information 31. Lender liability
	8. Improper business and market practices	<ul style="list-style-type: none"> 32. Antitrust 33. Improper trade/market practices 34. Market manipulation 35. Insider trading (on form's account) 36. Unlicensed activity 37. Money laundering
	9. Product flaws	<ul style="list-style-type: none"> 38. Product defects (unauthorised, etc.) 39. Model errors
	10. Selection, sponsorship and exposure	<ul style="list-style-type: none"> 40. Failure to investigate client per guidelines 41. Exceeding client exposure limit
	11. Advisory activities	<ul style="list-style-type: none"> 42. Disputes over performance on advisory activities
5. Damage of physical assets	12. Disasters and other events	<ul style="list-style-type: none"> 43. Natural disaster losses 44. Human losses from external sources (terrorism, vandalism)
6. Business disruption and system failures	13. Systems	<ul style="list-style-type: none"> 45. Hardware 46. Software 47. Telecommunications 48. Utility outage/disruptions
7. Execution, delivery and process management	14. Transaction capture, execution and maintenance	<ul style="list-style-type: none"> 49. Miscommunication 50. Data entry, maintenance or loading errors 51. Misused deadlines or responsibility 52. Model/system mis-operations 53. Accounting error/entity distribution error 54. Other task mis-performance 55. Delivery failure 56. Collateral management failure 57. Reference data maintenance

	15. Monitoring and reporting	58. Failed mandatory reporting obligation 59. Inaccurate external report (loss incurred) 60. Negligent loss or damage of client assets
	16. Trade Counterparties	61. Non-client counterparty mis-performance 62. Miscellaneous non-client counterparty disputes
	17. Vendors & Suppliers	63. Outsourcing 64. Vendor disputes

Source: Basel Working Paper on the Regulatory Treatment of Operational Risk, September 2001 accessed at http://www.bis.org/publ/bcbs_wp8.pdf

Appendix G

Table 5: Mitigation techniques for operational risk by Banks and insurers

Royal Bank of Scotland	HSBC	Swiss Re	Zurich
<p>By enhancing control frameworks and policy standards to improve the identification and management of operational risk within each division.</p> <p>The three lines of defense model and the Operational Risk Policy Standards apply throughout the group and are implemented taking into account the nature and scale of the underlying business.</p> <p>The Operational Risk Policy Standards are supported by the following key operational risk management techniques (i) risk and control assessments; (ii) scenario analysis; (iii) loss data management; (iv) key risk indicators; (v) new product approval process and (vi) self-certification process.</p>	<p>A centralized database is used to record the results of the operational risk management process. All Group companies are required to report individual losses when the net loss is expected to exceed US \$10,000.</p> <p>Operational risk self-assessments are input and maintained by the business unit.</p>	<p>Senior managers of business and corporate units are responsible for managing operational risk in their area of activity based on a centrally coordinated methodology. The self-assessments are reviewed and challenged by operational risk specialists in each of the dedicated risk management units. In addition, risk management experts review our underwriting decision processes.</p>	<p>The ongoing initiatives such as The Zurich Way and Operational Transformation help us manage operational risks through standardization of processes.</p> <p>We consider controls to be key instruments for monitoring and managing operational risk.</p> <p>Although primarily focused on important controls for financial reporting, our internal control effort also includes related operational and compliance controls.</p> <p>Therefore, we continue to strengthen the consistency, documentation and assessment of our internal controls for significant entities, processes and locations.</p>

Source: Annual Report 2009 of the respective organisations. Also see Appendix A for further details.

Appendix H

How is operational risk managed in practice?

Followings are some unedited responses noted in this context -

1. There is a regulatory requirement to differentiate between risk categories, e.g., insurance risk and operational risk, etc., although many insurance risks are operational by nature.
2. I think in insurance the main struggle probably happens in segregating operational risk and insurance risk (e.g., modelling errors in pricing insurance products). In many companies this is purely seen as an underwriting risk and some others as an operational risk. Such different views influence the business to think differently and it can be a huge challenge - a very difficult task.
3. In my view it is everything other than specific credit, market, and insurance risks. The issue that we got to be little bit careful because we take insurance risk on and it is little bit funny to make sure that we are not managing operational risk that is basically insurance risk - is the failure to make an appropriate assumption insurance risk or operational risk - it is a bit difficult to perfectly define it.
4. It is difficult to separate operational risk from pure insurance risk. Insurance business, by nature, is mostly operational. I think insurance risk is the risk arising from pure fluctuations in the claims and having more claims, above than expected, is a matter of worry for all insurers. It could be possible that because of the randomness in the insurance market cycle one might end up with a negative outcome that you did not assume initially; even if there is no failure in the actual development in the process of the product. It is a different sort of risk and doesn't fit exactly under the traditional definition of operational risk. You have to manage this differently and there is very little you can do with it. Even then, we capture these in our operational risk database.
5. There are many risks in insurance which are not classified as operational risk but they are basically operational in nature. I think we take a pragmatic view here. We know what market risk is, we know what credit risk is, we know what our insurance risk is, we know what liquidity risk is, if any risk is not one of those then our tendency is to put them under the operational risk bucket.
6. Insurance is a business of acquiring and managing risk and, by definition, risk is the volatility (or uncertainty) surrounding an insurer's book of business including insurers' ability of paying claims, etc. In banking sense, this underwriting portfolio must include operational risk and it then becomes narrower at that point while insurers' operational risk management is concerned. There is a lack of understanding as insurance business is purely operational by nature. Historically insurers' are good managers of the operational risk attached to their core business and they perform it through reinsurance, product pricing, reserving, distribution, claims management, etc.

7. We have our pure insurance risk bucket and we model policyholders' behaviour, lapse behavior, surrender behavior, etc., into this bucket. Now on the operational risk side for insurance risk we still look at the claims development process for incorrect pricing, faulty model assumptions, errors in reserving, etc. So we cover the policyholders' behavior part of our actuarial type insurance risk management and on the operational side product pricing, claims management processes, which are issues for managerial concerns.
8. I am selling insurance products and there is a whole process around in selling where I have to apply my prudent judgment in pricing, underwriting acceptance, claims settlement, etc., and these risks are insurance risk and all of these are operational but it cannot be accurately measured other than through the insurance risk.
9. We recognize that there is an overlap in operational risk and other pure types of risk (i.e., market, credit and insurance). In addition to defining each risk type individually, we also define market operational risk, credit operational risk, and insurance operational risk. This is because we have seen that operational risk has exhibited from these pure types of risks.
10. If you look at credit risk, for example, the risk of counterparty default is a pure credit loss. However, what matters to our operational risk management is that there is some credit operational element inherent to the transactions and execution of contracts between the parties. Our concern is that the operational failure due to mismanagement of these transactions, disputes with counterparties, etc., are not purely credit risk, there is an operational component attached to them. Our approach is in line with the capital requirements of Basel II that banks are already doing for operational risk with their credit risk portfolio.
11. It is important for us to segregate what are pure credit, market and insurance risks and what are their operational components. This separation gives each group clear scope to manage them on the frontline within their allocated areas and responsibilities.
12. We people make assumptions that are thinkable in terms of reality – or what reality it would be in the future – and that's not operational risk – this is just insurance risk. But the people have incorrect information from which to make that assumption or had the wrong people who take decisions outside the guidelines or outside their authorities – it is operational risk.
13. When there is a clean human mistake that any reasonable person would come and say that is completely stupid then that would be called operational risk. But if it fits within the sort of gray area of an optimistic versus pessimistic assumption we might like that insurance risk.

14. Now if in setting the credit risk appetite or credit risk limit a mistake is made that instead of being recorded as £1 million it is recorded as £10 million and if as the consequence we become exposed to counterparty for £10 million that counterparty fails and that's an operational risk rather than a credit risk. If on the other hand we have a credit limit of £10 million and we got to £20 million and the credit policy would flag in as risk appetite and somebody overwrote that then potentially there is a breach of the credit policy and it would show that the credit policy has deliberately been breached and all of the controls in place have failed to work and that would still be a credit policy failure.

Appendix I

Definition of strategic risk by selected banks and insurance companies

Insurers/Banks	Definition	Mitigation
Commerzbank	Business strategy risk is defined as the risk of negative deviations from given business targets arising from previous or future strategic decisions and from changes in market conditions.	To ensure proper implementation of Group strategy to achieve the required business targets, strategic controls are carried out through quarterly monitoring of quantitative and qualitative targets in the Group and segments. In addition, we also constantly monitor market and competitive conditions, capital market requirements, changed regulatory conditions, etc., with relevant changes resulting in adjustments to Group strategy
Zurich	The unintended risk that can result as a by-product of planning or executing a strategy. Strategic risks can arise from (i) inadequate assessment of strategic plans; (ii) improper implementation of strategic plans; (iii) unintended changes to assumptions underlying strategic plans.	The Group works on reducing the unintended risks of strategic business decisions through our risk assessment processes and tools, including the Total Risk Profiling™ process. The Group Executive Committee regularly assesses key strategic risk scenarios for the Group as a whole, including scenarios for emerging risks and strategic implications.
Generali	Strategic risks regard external changes or internal decisions which might compromise the company's prospective competitive positioning. This category therefore includes risks related to profitable growth, capital efficiency, governance alignment, risk appetite and tolerance, external growth and investments, reputation and membership of corporate group.	Control of strategic risks consists of a systematic evaluation of the actual performance and underlying business assumptions, eventually adjusting the portfolio of actions to the new environment. The responsibility for strategic risk management is ascribed to top management under the direct control of the Board of Directors. The principal instrument in which these people are directly involved is strategic planning, which has three year's structure and is reviewed annually.
Allianz	Strategic risk is the risk of an unexpected negative change in the company value, arising from the adverse effect of management decisions on both business strategies and their implementation. This risk is a function of the compatibility between strategic goals, the business strategies and the resources deployed to achieve those goals. Strategic risk also includes the ability of management to effectively analyze and react to external factors, which could impact the	These risks are evaluated and analyzed quarterly in the same way as reputational risk. In addition, strategic decisions are discussed in various committees (e.g., Group Capital Committee, Group Risk Committee, and Group Finance Committee). The assessment of the associated risks is a fundamental element of these discussions.

	future direction of the relevant operating entity or the Group as a whole.	
Munich Re	<p>Munich Re defines strategic risk as the risk of making wrong business decisions, implementing decisions poorly, or being unable to adapt to changes in its operating environment. The existing and new potential for success in the Group and the segments in which it operates creates strategic risks, which generally arise early on and can lead to a significant long-term reduction in corporate value.</p>	<p>We counter this risk through the activities of our Strategy Committee, which discusses strategic planning and significant strategic issues and decisions, and regularly monitors their implementation.</p> <p>The Strategy Committee comprises members of the Group Committee, and hence the CRO, plus the CEOs of the business segments and the Head of Group Development. As a result, strategic-decision making processes are intermeshed with risk management. IRM is additionally involved in the operational business planning and in the processes for mergers and acquisitions.</p>

Appendix J

Strategic management theories for operational risk

1 Prospect theory

It explains risk-return paradox as risk-taking by troubled firms. As proposed by Kahneman and Tversky (1979) the key understanding of prospect theory is that –

- (i) People measure outcomes relative to a reference point, typically the current wealth level; and
- (ii) People evaluate probabilistic choices using a value function that is concave above the reference point (risk avoiding) and convex below (risk seeking).

In this context the established argument follows that low performing firms will seek risk and high performing firms will avoid risk. This is because low performing firms define their current outcomes as undesirable and high performing firms define their current outcomes as above a reference point. The research findings argue that –

- (i) For firms with performance below industry average or full sample average, returns and risk correlate negatively
- (ii) For firms with performance above the industry average or full sample average, returns and risk correlate positively
- (iii) The pattern differs over time with greater environmental stability, increasing the strength of positive risk-return associations for high-return industries and with greater environmental instability strengthening negative risk-return associations for low-return industries.

However, the criticism is that since prospect theory attempted to explain individual behaviour, its assumptions may not make sense for firms.

2 Behavioural Theory of the Firm

Within the perspective of the economic literature the theory of firm suggests that all the economic functions that are in fact performed by firms could, theoretically, be performed by individuals acting on their own behalf. Firms exist to maximize the value of shareholders in terms of the present value of the future profit. Several models, e.g., CAPM, have been developed to derive the value of a firm in the presence of market uncertainty (Cummins, 1976).

In addition, society has organized itself into firms in which principals (i.e., shareholders) hire agents (managers) to co-ordinate economic effort, and transaction costs are thereby dramatically reduced. This more efficient design creates a new cost, however, that arises from the principal-agent conflict. This economist's view of the objective of a firm was criticized by psychologist's arguing that this deterministic view does not consider the behavioral aspects of managers in decision making (Jensen and Meckling, 1976).

Studied by Bromiley (1991) the central theme of Behavioral Theory of the Firm search and responses to uncertainty provided a basis for theorizing about organizational risk. Researchers have established explicit connections between the behavioral theory of the firm and risk taking. In the Behavioral Theory of the Firm, firms have aspiration and performance levels. If performance exceeds aspirations, the firm continues to operate according to its established routines. If the firm does not perform up to its aspirations, it searches for ways to improve.

However, researchers found a link between organizational search and increased risk. Firms with extremely high levels of performance innovate because they have slack resources and such risk taking does not pose the threat of falling below aspirations. However, risk taking increases as firms move further and further below industry average performance. For firms above industry average performance, risk taking will depend on the firm's performance relative to recent performance.

Strategy researchers proposed that managers judge their position relative to one of two reference points: a bankruptcy disaster level or an aspiration level.

First, if a firm's managers expect to go bankrupt, they will take risks in an effort to avoid bankruptcy. Firms of higher performance but still low enough that bankruptcy constitutes their reference point, will avoid risk to reduce the possibility of bankruptcy.

Second, most firms will focus on an aspiration level that constitutes satisfactory performance, perhaps industry average performance or past performance. For these firms, risk taking is low-near that aspiration level and increases with distance from the aspiration level in either direction. Firms with performance below the reference point take risks trying to reach the reference point. Firms with extremely high resources well above the reference point may take risks because they can afford to gamble.

It is argued that performance below aspirations drives risk taking but little support for the "high performance allows risk taking" argument.

While the prospect theory describes individual's risk preferences, the behavioral theory of the firm describes the firm's responses to uncertainty (i.e., organizational level risk taking) relative to its performance in the industry. Consequently, the behavioral theory of the firm is attractive as it offers an organizational theory of risk taking.

3 Agency theory

Agency theory as proposed by Fama (1980) is part of the positivist group of theories which derives from the financial economics literature. It postulates that the firm consists of a nexus of contracts between the owners of economic resources (the principals) and managers (the agents) who are charged with using and controlling those resources.

The problem suggests that agents are supposed to represent the interests of their principals, but in fact, they tend to put their own interests ahead of the interests of those whom they are supposed to represent.

The agency problems occur when the principal (shareholders) lacks the necessary power or information to monitor and control the agent (managers); and when the compensation of the

principal and the agent is not aligned. In short, agency risk arises due to the divergent interests of principal and agent.

Furthermore, agency theory is based on the premises that agents have more information than principals and that this information asymmetry adversely affects the principals' ability to monitor effectively whether their interests are being properly served by agents. It also assumes that principals and agents act rationally and that they will use the contracting process to maximize their wealth. This means that because agents have self-seeking motives they are likely to take the opportunity to act against the interests of the owners of the firm.

Two types of dilemma that create agency problem are often discussed in the literature, i.e., "moral hazard" problem and "adverse selection". This occurs when the principal/owner(s) does not have access to all available information at the time a decision is made by a manager and is thus unable to determine whether the manager's actions are in the best interests of the firm.

The agency problem is also demonstrated in the recent financial crisis. When financial engineers turned mortgages into securities by issuing collateralized debt obligations, or CDOs, they thought they were reducing risk through geographical diversification. In reality, they were introducing a new risk by separating the interests of the agents who created and distributed the synthetic instruments from the interest of the owners of those securities. The agents were more interested in earning fees than in protecting the interests of the principals.

The agency has been extensively analyzed by economists, but they look at it exclusively in terms of contracts and incentives. However, they largely disregard questions of ethics and values. In particular, values, like honesty and integrity, lose their grip on people's behavior and people become increasingly motivated by economic incentives.

Incentive structure (compensation and reward system) is the key issue in controlling inadequate and excessive risk taking, governance and communication of risk information (i.e., information asymmetry) across the firm. On one side, appropriate incentives reward good behavior, but penalize inappropriate behavior on the other. Limits and controls (i.e., constraints) can be useful tools for creating the right incentives and sending appropriate signals that are tailored for each individual. A properly structured incentive can align the interest of the agent with that of the principal and thus reduce the agency cost. However, problems can arise when incentives are not properly structured and appropriate risk discipline is not exercised. For example, when limits and controls are not set, or, if they are set, when adherence to them is not monitored or enforced. Such controls provide incentives for business-line leaders to assume only the risks that the firm can absorb because they penalize those who try to take on excessive risk or inadequate mitigation in the name of maximizing short-term profit (Kroszner, 2008). The design and structure of the organization in terms of three factors, i.e., (i) assignments of decision rights, (ii) evaluation and control systems, and (iii) compensation and reward systems; gives rise or fall of the incentive problem of the organization (Hentschel, 1995).

Zalm (2009), the CEO of ABN-AMRO Bank rightly stated "the risk management profession has been very active in the development of statistical analysis, stress-tests, in guarding procedures and in scenario analysis. The number of risks identified has grown over the years. [...] However, to my knowledge, the danger that remuneration schemes and financial incentives can lead to an increased appetite for high risk among market participants and decision makers is, as yet, not on the agenda of risk managers. I think it should be."

The above description focused mainly on the economist's pragmatic view on the agency problem, which assumes that agents will generally act out of self-interest to the detriment of other stakeholders. It is hard to find a place for ethics within economists' agency theory assumptions. In criticizing the pragmatic view of agency problem, psychologists emphasize the character and integrity of the agents. They believe that there are obviously agents who do care about the interests of the principals motivated either by moral principles and values or to secure their human capital. Unlike principal owners (shareholders) the agents (managers) tie-up their human capital with the firm and hence they are affected by the success or failure of the firm (Fama, 1980). The role of company culture, values and ethics was not stressed enough in the study of agency theory. In essence, good risk management, like good corporate governance, in its entirety, is ultimately about human behaviour. Moreover, the efficient market hypothesis looks at financial markets in isolation and totally disregards politics. However, it gives a distorted picture. A conceptual framework for a better understanding of human events, which are not determined by timelessly valid scientific laws, depends on the complexity of the situations.

Most of these texts were extracted from Bromiley et al., (2006) with modifications.