Operational Risk Management

The Basel II

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Abstract:

This work shows the operational risk management and the importance of implementing an appropriate structure of risk management.

In order to contextualize the issue was addressed the concept of risk and operational risk and the various risk categories and made the frame in the various Basel Accords.

It focused on Basel II that has innovated dealing with operational risk, hitherto forgotten. In this context it was discussed the various risk assessment methods: basic, standard and advanced.

The theme is organized so that there is a common thread that culminates in risk management presenting the guidelines of the BIS in this regard and a model of a risk management framework.

Key words: Risk, operational risk, Basel, Management

List of abbreviations

AMA - Advanced Measurement Approach

ANACOM - National Communications Authority

APB- Portuguese Banking Association

ASA - Alternative Standardized Approach

BCBS - Basel Committee on Banking Supervision

BIA - Basic Indicator Approach

BIS - Bank of International Settlements

BP - Banco de Portugal

BPI - Portuguese Investment Bank

CEBS - Committee of European Banking Supervison

CGD - Caixa Geral de Depósitos

CMVM - Securities Market Commission

COBIT - Control Objectives for Information and Related Technology

COCO - The Committee on Control - Canadian Institute of Accountants Charterers

COSO - Committee of Sponsoring Organization of the Treadway Commission

EMA - European Monetary Agreement

EPU - European Payments Union

FSF - Financial Stability Forum

FSB - Financial Stability Board

G10 - the Group of Ten

G20 - the Group of Twenty

GARP - Global Association of Risk Professionals

IMF - International Monetary Fund

IOSCO - International Organization of Securities Commissions

SEA - Risk Evaluation Models

NIF - Note Issuance Facility

OECD - Organization for Economic Cooperation and Development

RUF - Revolving Underwriting Facilities

RWA - Risk Assets Weighting

SIFI - Systematically Important Financial Institutions

SIGOR - Operational Risk Subgroup of the Basel Committee's Standards Implementation Group

TSA - The Standardized Approach

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Introduction

A few years after the mandatory implementation of Basel II and already with the Basel III to be implemented the treatment of operational risk has become essential and integral part of the risk control policy of credit institutions (hereinafter referred to as IC's).

Nowadays ethical issues in the financial sector are taking on increasing importance and governments, supervisory bodies and even society itself put pressure on financial institutions to comply with regulations and standards. The subject of operational risk is more present than ever in view of recent problems with banking institutions in Portugal and around the world.

This work focuses on the operational risk under Basel II (in its original title The International Convergence of Capital Measurement and Capital Standards: A Review Framework) and in spite of the existing literature, there are still several issues such as the difficulty of the applicability of that Agreement and the various methodologies and models that address this work.

In the search for answers to these questions proceeded to the research through the collection of information necessary to carry out this study taking into account the issue under review.

It will address the taxonomy of operational risk, including the concepts and operational definitions of risk, risk assessment models and a historical approach theme to better achieve the various operational risk management methods.

We proceeded to the review of the literature, including the documents issued by the Bank of International Settelments by the Basel Committee on Banking Supervsion containing the various Basel Accords I, II and III as well as various work and articles on the subject.

Part I - Literature Review

'Think of the past to understand the present and envision the future'

Herodotus

To start the study of the subject in question is necessary to first address the notion of risk and operational risk throughout history, including the concepts of risk and the various risk categories.

Interests also characterize the Basel II Accord and its framework agreements remaining in I and III as well as the regulatory capital calculation models defined in the Agreement.

Finally we discuss the operational risk management, looking at the losses by business lines and gravity level, citing the various objectives and criteria that an appropriate management structure should have.

Chapter I - Risk

According to Matias-Pereira (2006) all organizations are subject to various types of risk that may be endogenous, which are generated by the activity itself, or exogenous, which are generated by activities outside the organization.

1.1 Historical context Risk

To contextualize the subject matter at hand look at the past and frame the risk and the importance of operational risk under the Basel Accords.

As explained Almeida (2014), throughout history, the concept of 'risk' had different profiles and has been developing in Western civilization, in different frameworks. In this development varied and loosely defined, the term 'risk' comes associated with events that escaped the control of man. Events that depended on chance and which corresponded material and human damage. This is how the term is often associated with uncertainty and danger or threat. With modern genealogy of the concept record the concerns from the century. XVIII, with the meaning and the prevention of natural disasters and accidents and social impacts result from the use of 'technology'. From the end of the century. XIX, these issues tend to stabilize based on two structural trends:

1. The transfer of responsibility (risk) to insurers, created a commercial activity that uses the statistics the systematic application of probability to characterize the uncertainties;

2. The concern for safety in order to avoid serious failures, accidents and breakdowns, led to the introduced standards for safeguarding these events.

The financial system, specifically the IC's always lived with operational risk, but until some time ago, the control procedures were simple and only recently some institutions have set up specific departments for the management and mitigation of operational risk.

As indicated by Silva (2006) citing Goodhart, Hofman and Segoviano (2004: 206) "The liberalization of markets has led to increased competition and a reduction in profit margins. Inexperience in risk management, entry into new markets and customers and the granting of loans inappropriately increased the fragility of the banking system. "

In the 30s the US President Franklin Roosevelt established the Glass-Steagall Act after the pouch 1929 crash that began the crisis 1929-1933. This New Deal policy, as it was known at the time, was presented to prevent about 5,000 banks falissem, creating a tighter regulation of bank activity by the Federal Reserve[1]prohibiting the sale of securities by commercial bank and creating the FDIC (Federal Deposit Insurance Corporation) in order to protect the deposits of banks. (Costa, 2011)

In the 70's with the oil crisis, the abandonment of the Bretton Woods system[2] and the consequent massive increase in banks' exposure to foreign exchange risk as well as the bankruptcy of some banks as *Franklin National Bank of New York* (Costa, 2011) With this led to the need for greater adjustment.

In 1974, after the collapse of Bankhaus Herstatt, the governors of the Group of Ten, established the Standing Committee on Banking Regulations and Supervisory Practices composed of representatives of the supervisory authorities and central banks of the Group of Ten, plus Luxembourg and later also Spain. The official name of the Committee was later shortened to "The Basel Committee on Banking Supervision" commonly known as the Basel Committee as mentioned by Carvalho (2007).

Against this backdrop, the G10 represented the Governors of the respective central banks decide to raise the Basel Committee under the auspices of the Bank for International

[1]Federal Reserve or Federal Reserve System is the central banking system of the United States of America. It is responsible for US monetary policy and its President Janet Yellen.
[2]Bretton Woods system - In July 1944 the conference held in Bretton Woods established the dollar as the currency of international exchange and that the US government would ensure that it could be converted into gold. In 1971 the Nixon ended the dollar's convertibility into gold.

Settlements. Initially Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom and the United States, formed the G10 (Group of Ten) later included new members, made this time by 28 countries , namely: Argentina, Australia, Belgium, Brazil, Canada, China, European Union, France, Germany, Hong Kong SAR, India, Indonesia, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

The Committee seeks to achieve its objectives by establishing minimum standards of regulation and supervision of banks by sharing supervisory issues, approaches and techniques to promote understanding and promote cooperation between countries. This cooperation allows also guard against certain risks in the global financial system, such as reputational risk.

The Committee prepares reports, agreements guidelines, which despite having no legal force, want the authorities in each country to implement the recommended measures.

In July 1988, after comments to the consultation published in December 1987 it is signed the Basel I agreement[3] (*International Convergence of Capital Measurement and Capital Standards*or Basel Capital Accord), which imposed a minimum capital reserve of 8% of risk weighted assets for credit to be implemented by the end of 1992. This framework came to be used by almost all banks with international business even from countries not members. The credit risk was calculated essentially by weights standards that will develop ahead. The agreement was drawn up in order to go evolved and in 1991 suffered an addendum to consider provisions related to losses on loans. The Agreement have changed again in 1996 related to market risk (Market Risk Amendment to the Capital Accord).

As recalled Matias-Pereira (2006, p.105) citing Stiglitz and Weiss (1981); IMF (2001) and Goldfajn (2003), "despite its contribution to financial stability, the 1988 Capital Agreement (Basel I) did not prevent some susceptible crisis undermine confidence in the system had occurred, especially in called emerging markets. "

Butler (2015) wrote that the spectacular collapse of Barings Bank in 1995, British bank that was an 'institution', has led to what many people think better risk management.

Other scandals such as what happened in Enron in 2001, and according to Deloitte (2003) cited by Costa (2011), led to the imposition of the Sarbanes-Oxley Act, which rewrote the rules of corporate governance and disclosure and emission financial reporting providing greater transparency and ethics by the managers of the companies, instilling greater accountability of these and implementing a culture of rigor, control and internal audit and accountability of corporate executives by the practices of these and before the information disclosed to the markets, led the Basel committee to feel the need to revise the Old Agreement.

[3] Now known as the Old Agreement

So in June 2004 the new Basel II (*International Convergence of Capital Measurement and Capital Standards: a Revised Framework,* known only by Basel II) came to fill some gaps in the previous agreement, more flexible rules and introducing new concepts.

This Agreement seeks to preserve the soundness of financial systems, increasing the degree of sensitivity to the actual risk profile of the institutions and admitting broader concepts of risk, such as the introduction of the concept of operational risk.

Basel II is based on three pillars:

I. minimum capital requirements that sought to go beyond the standard rules in the Basel I agreement, including market risk and operational risk in the calculation of banks' solvency ratio;
II. Process review and supervision of capital adequacy and internal assessment process;
III. Effective use disclosure as a lever to strengthen market discipline and encourage sound banking practices;

Even sothe crisis began in March 2007, also known as the sub-prime crisis has exposed the weaknesses of the financial system as a whole and banks in particular. The events 2007-08 (its origin or its depth and width) were due, at least partly according to Moura (2011) the weaknesses observed in these institutions in the field of corporate governance mainly at the level of (absence of appropriate) risk management, (poor) internal control, the remuneration policies of the management bodies (inducing excessive risk taking), the (little) involvement shareholder in decision making, the (inappropriate) background of managers, the (lack of) transparency towards stakeholders.

In July 2010 the group of Committee of supervision of governors and heads make a deal with a package of capital and liquidity reforms now known as Basel III (Basel III). In September this year the Committee announced minimum standards of higher global capital that have been approved by the G20 in Seoul[4] December following.

According to Silva, Pereira and Lino (2011) the purpose of this new regulation is mark out the excessive risk that these institutions have taken in the previous period in 2008, ie before the last global financial crisis.

As mentioned those authors, the guidelines Basel III are:

[4]G20 - Group formed by the finance ministers and central bank governors of 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, South Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom and United States) plus the European Union. They meet regularly throughout the year to discuss ways to strengthen the global economy, reform the international financial institutions, improve financial regulation and implement key reforms necessary in each member state.

1. Strengthening capital requirements of ICs;
2. significant increase in the quality of the said own funds;
3. Reduction of systemic risk;
4. sufficient transition period to accommodate the new requirements

Basel III involves mainly deal more efficiently with the concept and the relationships associated with the risk.

table 1- Chronology of BIS 1929-2013

November 1929	A committee to prepare the structure and statutes of the Bank for International Settlements in Banden-Baden, Germany.
January 20, 1930	The Final Act of the Second Hague Conference is adopted by the Heads of State and government representatives. This Act is included in the agreement between Central banks of Belgium, France, Germany, Italy, Japan and the UK and a financial institution representing the United States.
26-27 feb 1930	The Governors of the founding central banks meet in Rome to officially create the BIS.
July 1944	The UN conference in Bretton Woods agrees to the creation of the IMF (International Monetary Fund) and World Bank.
19 Oct 1950	It signed the Agreement establishing the European Payments Union - EPU by 18 European governments. BIS is appointed to act as agent of the EPU.
31 dec 1958	The EPU is replaced by the European Monetary Agreement.
dec 1974	In response to international banking failures, the G10 Governors established the Basel Committee on Banking Regulations and Supervisory Practices (renamed the Basel Committee on Banking Supervision - BCBS in September 1989)
dec 1975	The Basel Concordat calls on each country authorities to share supervisory responsibility for the activity of foreign banks.
apr 1983	Creation of the International Organization of Securities Commissions (IOSCO - International Organization of Securities Commissions)
July 1988	Central bank governors endorse the document BCBS International Convergence of Capital Measurement and Capital Standards, known as the Basel Capital Accord or Basel I to be implemented until 1992.
feb 1999	The ministers of the G7 finance and central bank governors created the Financial Stability Forum (FSF).
oct 1999	Creation of the Central Bank Governance Network in BIS.
June 26, 2004	Central Bank Governors and Heads of Banking Supervision endorse the launch of the International Convergence of Capital Measurement and Capital Standards: a Revised Framework, also known as Basel II.
2 apr 2009	The G20 creates the Financial Stability Board (FSB Financial Stability Board) with a new mandate for macro-prudential supervision.
November 12, 2010	Leaders of the G20 approve the FSB policy framework to address systemically important financial institutions (SIFIs - systemically Important Financial Institutions)
June 2011	The BCBS approves Basel III - capital rules for a global regulatory framework for more resilient banks and banking systems, introducing capital rules magazines. (Basel III global regulatory framework for more resilient banks and banking systems, Introducing revised capital rules)
January 2013	The BCBS launches Basel III - the ratios Liquidity Coverage and liquidity risk monotorização tools to strengthen global liquidity capital regulations.

Source: BIS

1.2. Risk concepts and definitions

According to Ramos (2014: 5) 'The concept of risk has naturally evolved over time, being present in developed societies, a basic principle in decision-making by politicians, managers, entrepreneurs in crisis management programs . This concept is now associated with a new paradigm, in which the technological, economic, social, legal, ethical and communicational gain prominence and justify be considered. '

1.2.1. Risk and Operational Risk Concepts

We may consider the risk as any situation that may affect the ability to achieve goals. The risk underlies any activity and decision of organizations (Gonçalves, 2011) or a combination of the probability of occurrence of an event and its consequences according to Bueno (2007) citing Handout of the Internal Control Board of the Bank of Brazil SA

Silva (2006) citing Ferreira (2004) mentions that risk is inherent in any situation involving decision-making and the results take place in the future may imply that these will differ from expected. It is because this volatility in the results, as measured by the variance, the essence of risk.

Ferreira (2004) defines operational risk as what comes from factors such as the flaws in information systems, failures in reporting systems, failures in operating procedures or the imperfections of internal control mechanisms.

According to the MAR (Risk Assessment Models) operational risk is the probability of negative impacts on earnings or capital arising from flaws in the analysis, processing and settlement of transactions, internal or external fraud, the activity be affected by the use of system resources of 'outsourcing', the existence of insufficient or inadequate human resources or infrastructure downtime.

The two main sources of operational risk losses are related to the misuse of knowledge and lack of protection for this. Human behavior associated with this factor gives rise to increased risk, as the incompetence, which is associated with the lack or insufficiency of knowledge, skill, authority or competence to perform certain task; the indifference and actions taken in bad faith. (Mendonça, Galvão and Loures, 2008)

According to GARP (Global Association of Risk Professionals), JP Morgan Chase has adapted this definition for a simple and defines operational risk as the risk of loss resulting from inadequate processes or systems or disabled or external factors.

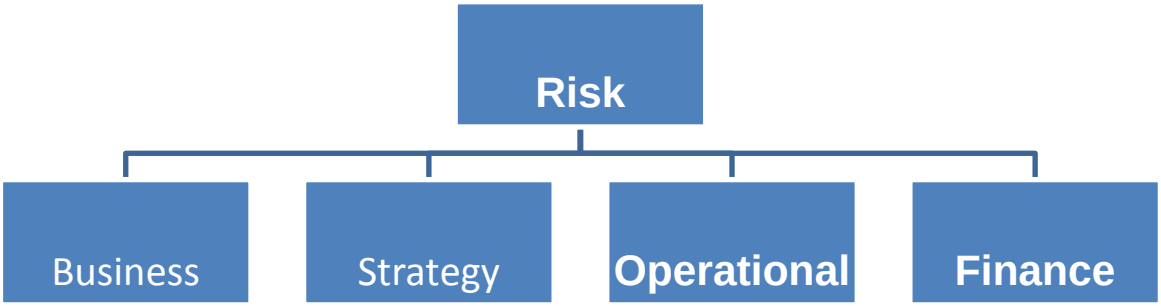
On the other hand Citibank (2011) cited by Girling (2014) included the reputational risk in its definition: 'Operational risk isthe risk of loss resulting from inadequate or failed internal processes, systems or human factors, or external events. It includes the risk of reputation and franchise associated with business practices or market conduct that Citi is involved '

The BCBS in Basel II defines operational risk as the risk of loss resulting from inadequate or failed internal processes, people or systems or from external events. The definition includes legal risk but excludes strategic and reputational risk.

1.2.2. Risk Categories

Companies are faced with a series of risks that may be classified, according to Ferreira (2004) into four categories:

Figure 1: Risk Categories



Source: Adapted Ferreira (2004)

The Business Risk is the risk associated with uncertainty about the strategic choices of the management form of institution add value for shareholders. The institution takes it voluntarily in order to create a competitive advantage.

Strategic risk is the risk associated with external risk to the institution as the changed economic and political framework in which to insert company.

Operational risk, operating or technical, is that arising from failures in information systems, failures in reporting systems, failures in operating procedures, or defects in internal control

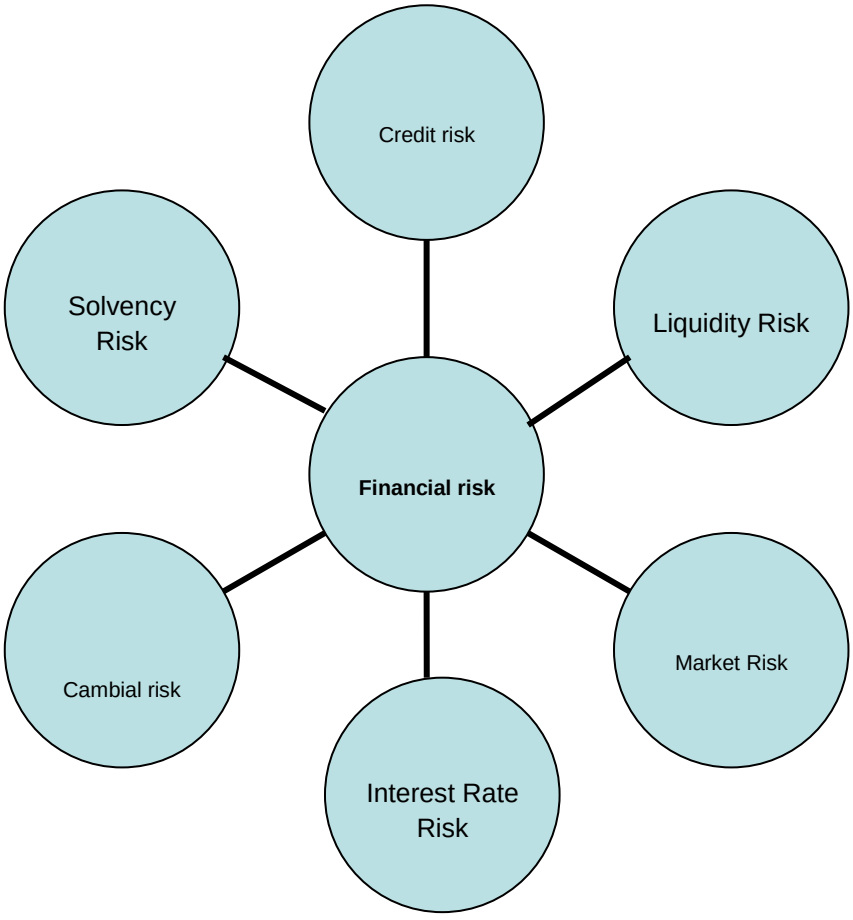
mechanisms. At the technical level when the information systems or the risk measures are insufficient. At the organizational level when the level of reporting and risk monitoring and internal rules and policies related to mitigation and risk control are absent or inadequate.

The financial risk is one that results in losses in asset value in the financial markets due to exposure to variations in interest rates, exchange rates or fluctuations in the prices of financial assets.

It also mentions Ferreira (2004) that the financial risk is underlying uncertainty in future income by the exposure to financial risk should be optimized and should be controlled downside risk[5] their portfolios thus managing actively financial risk.

The financial risk is divided into various risk categories.

Figure 2: Financial Risk Categories



Source: Adapted Ferreira (2004)

[5] Downside risk - this instrument of modern portfolio theory developed by Roy in 1952 states that investors prefer investments with the lowest probability of below the level of disaster or target return.

The credit risk is closely linked to the possibility of customers do not meet the repayment of credit and may lead to total or partial loss of these. Financial markets penalize reducing borrowers' repayment capacity affecting interest rates and any rating changes. Credit risk can be default when the borrower meets certain non contractual clause, country (or sovereign) when the country does not honor the contractual responsibilities, or settlement, when the effective fund return is impossible for some reason. (Smith, 2006)

Liquidity risk, as stated Silva (2006) citing Banco Itaú (2003) is the risk that the reserves and resources of the IC are not sufficient to meet its obligations when they occur, whose imbalance of cash flows generated inability to meet commitments.

Market risk is directly related to the risk of interest rate and exchange rate risk, but also the volatility of the price of financial assets and commodities[6].

The risk of interest rate is associated with the change in the interest rate and consequently the decrease in profits. Thus, according to Ferreira (2004), the main source of interest rate risk is the volatility of the active and passive interest rate and no coincidence the repricing periods of assets and liabilities.

Foreign exchange risk arises from the change in exchange rates for assets and liabilities in currencies other than that in which the bank normally transact and indexing of financial products to these rates.

Finally the solvency risk, or risk of failure, when the institution is unable to make the coverage with available capital losses generated by the risks mentioned above.

On the other hand in 2007 the SEA has defined nine risk categories divided into:

Financial risks:

- Credit risk
- Market risk
- interest rate risk
- Exchange rate risk

and

non-financial risks:

- Compliance risk

[6]Commodities - the English word meaning commodity or raw material. It is usually materials with little processing and in a standardized manner can be traded on the stock exchange.

- operational risk
- Risk of information systems
- Strategy Risk
- Reputation risk

table 2 : Financial Risk and Non-Financial

FINANCIAL RISKS
Credit risk
Likelihood of negative impacts on earnings or capital due to inability of a counterparty to meet its financial commitments to the institution, including possible restrictions on the transfer of payments from abroad. Credit risk exists, mainly on exposures in credit (including the title), lines of credit, guarantees and products.
Market risk
Likelihood of negative impacts on earnings or capital due to movements unfavorable market price of the trading portfolio instruments, caused by fluctuations in equity prices, commodity prices, interest rates, exchange rates. The risk of market is associated mainly to short-term positions detention in debt securities and capital in currencies, commodities and derivatives.
interest rate risk
Likelihood of negative impacts on earnings or capital due to adverse movements in interest rates, by mismatches via maturities or periods of reattachment of interest rates, the lack of perfect correlation between the received and fees paid in different instruments, or the existence of options embedded in financial instruments balance sheet or off-balance.
Exchange rate risk
Likelihood of negative impacts on earnings or capital due to adverse movements in exchange rates, caused by changes in the price of instruments match open positions in foreign currency or by altering the competitive position the institution due to significant variations in exchange rates
NON-FINANCIAL RISKS
C risk *ompliance*
Likelihood of negative impacts on earnings or capital arising from violations or nonconformities in relation to laws, regulations, contracts, codes of conduct, instituted practices or ethical principles. Can be translated into legal sanctions or character regulatory, in limiting business opportunities, reducing the potential for expansion or the inability to enforce contractual obligations.
operational risk
Likelihood of negative impacts on earnings or capital arising from flaws in the analysis, processing and settlement of transactions, internal and external fraud, the activity is affected by the use of system resources of "outsourcing", the existence of insufficient human resources or inadequate or no operation of infrastructure.
Risk of information systems
Likelihood of negative impacts on earnings or capital as a result inadaptability of information systems to new needs, their inability to prevent unauthorized access to ensure data integrity and to ensure business continuity in the event of failure, as well as due to the continuation of a strategy misfit in this area.
Strategy Risk
Likelihood of negative impacts on earnings or capital arising from inadequate strategic decisions, the poor implementation of decisions or inability to response to changes of the environment, as well as changes in the business environment institution.
Reputation risk
Likelihood of negative impacts on earnings or capital arising from a negative perception of the public image of the institution, founded or not, by customers, suppliers, financial analysts, employees, investors, media outlets or the opinion public in general.

Source: Adapted from SEA

For the Risk Assessment Model is in line with that defined by the CEBS *Guidelines on the Application of the Supervisory Review Process under Pillar 2*[7]They were added reputational risk and risk strategy. Also included is-legal risk in the risk of compliance and the risk of information systems in operational risk as well as the independence of the foreign exchange risk arising from activities other than trading in relation to market risk. In SEA were incorporated the risk of concentration, the residual risk and the risk of securitization the credit risk.

The SEA recommends that the assessment of the various risk categories is preceded by identifying all functional areas of the institution, although considered that influence the overall profile of the institution's risk. Considered that the number of categories of risk for functional area does not exceed four, the most relevant being selected which in turn are sorted qualitatively with a high weight, medium or low and is assigned a rating them from 1 to 4.

SEA is thus an instrument that serves as a guide to define the various categories of risk to which the IC's are subject. Besides serving as a driver for the supervision of IC's relation to the practices defined by the regulators also serve as a model to identify, control and mitigate these risks.

The Basel II has introduced an innovation forcing IC's to look not only for the credit, liquidity and market risk but another less talked about and too neglected, operational risk.

[7] Guidelines on the Application of the Supervisory Review Process under Pillar 2 Guidance on Supervisory Process Application under Pillar 2 Prudential created by CEBs to implement a common structure of European supervision.

'In recent years, technological advances, such as banking negotiations via the Internet, the sophistication of products and services offered by banks, the occurrence of financial scandals fraud, among other examples, contributed to the financial institutions and regulatory authorities to begin to give more attention to operational risk as a kind of risk worthy of corporate treatment '. (Alves & Cherubim, 2008: 59)

The Basel I agreement, according to Goncalves (2011), aimed to create the minimum capital requirements, which should be respected by the IC's, as a precaution against the risk of credit. The New Capital Agreement, also known as Basel II, is based on three pillars. The first pillar refers to the requirements and capital requirements. In addition to increased sensitivity of the requirements to credit risk, to validate the ability of institutions use their own methodologies for the determination of capital requirements.

Operational risk was first introduced in the Basel II Accord. As mentioned Silva et al (2011) entities are now required to allocate capital to cover, for example, errors or human errors which fraud is an example.

2.1. Basel I to Basel III

In the 70's with the oil crises of 1973 and 1978, the end of the Bretton Woods system with consequences on banks' exposure to foreign exchange risk, the failure of several banks due to innovation and financial engineering and arbitration practices and unregulated speculation, were created the conditions for financial market regulation in order to avoid some of the adverse effects indicated.

The Banking Supervision Committee of Basel worked for years to finally reach an agreement on supervision rules for international banks' capital requirements pertaining to this forum, which comprises representatives from countries such as South Africa, Germany, Saudi Arabia Argentina, Australia, Belgium, Brazil, Canada, China, Korea, Spain, United States, France, Holland, India, Japan, Mexico, United Kingdom, Russia, Singapore, Switzerland and Turkey.

This Agreement published in 1988 and ratified by more than one hundred countries, known as the Basel I agreement or the Old Agreement establishes minimum capital requirements. These requirements would be conductive lines leaving the Agreement the possibility for each of the central banks adopt more stringent measures for IC's of your country as Silva et al (2011) indicate.

The Agreement seeks to establish banking regulation standards by implementing a set of credit risk measurement mechanisms. Indeed the Committee itself considered that despite these measures, one of IC's robustness analysis implies taking into account other factors than just the credit risk, such as market risk and operational risk, that this Agreement does not contemplate.

This agreement focused on two main objectives strengthen the robustness and stability of the international banking system and ensure that the platform would be fair and consistent in terms of their application to banks in different countries trying to reduce inequalities in terms of competition between banks internationally.

The equity assumes leading role in the analysis of the sustainability of IC's. Before Basel I considered to be a minimum ratio of capital adequacy equal to at least 8% of the bank's assets, considering the total assets. It has established the need for the relationship between equity and assets (now risk-weighted) never fall below 8%. As indicated by Mendes (2013) established the so called 'solvency ratio' or 'ratio Cooke':

Cooke ratio = Capital / RWA

On what:
Capital = Tier I + Tier II

RWA (Risk Weighting Assets) = RWA

The capital shall be divided into two groups depending on the absorbency of the potential losses associated with: core capital (Home Equity) or Tier 1 and Supplementary Capital (Supplementary Capital) or Tier 2.

table 3: Capital Components

capital	Descição
Tier 1	Social -Capital held Reserves -Accumulated profits -Results Net Exercise
Tier 2	Reserves Hidden General -Provisions / provisions for credit risks long-term debt -Instruments -Instruments hybrid capital

Source: Adapted from Silva and Pereira (2011) and Costa (2011)

The agreement came also introduce weights for the assets of IC's based on the associated risk, in order to increase the robustness and consistency of the equity of the IC's.

Table 4: Composition of the categories of weighted assets

weighing	Class of active
0%	Cashier; Elements of the active representative of other claims on central bank and overnos expressed central and funded in local currency; Elements of representative assets other credits on governments of countries OECD members and respective central banks; active elements covered by guarantees constituted by securities of central governments members of OECD countries or guaranteed by central governments OECD;
0%, 10%, 20% or 50%	representative elements of active credits on domestic sector entities public, except for the central government and guaranteed credits by such entities;
20%	Items constituting credits on assets of member countries institutions OECD or guaranteed by these institutions; Values the collection; Items constituting credits assets on public sector entities foreign OECD countries or guaranteed by these entities credits; Elements constituting claims on active credit isntituições countries not menbros OECD with maturity of less maturity or equal to one year which enjoy guarantees these institutions; Items constituting credits active on multilateral banks desemvolvimento and credits covered by guarantees constituted by securities issued by such banks;
50%	Loans secured by real estate mortgages for housing the borrower or leasing;
100%	Homes equipment and other assets; Investment iobiliários; equity securities of other financial institutions; Items constituting credits active on public enterprises; representative active elements of credits on private companies; Items constituting active credits on credit institutions of countri es non-OECD with payment term exceeding one year; Items constituting credits active on central governments of countries not OECD;

Source: Adapted from Silva and Pereira (2011)

In addition to these operations, the Committee also considered transactions not being reflected directly in the financial statements of IC's, are responsibilities of the activity of these institutions, namely:

- Operations character of credit substitutes (eg Stand by Letters of Credit to guarantee financing);

- Certain contingencies related transactions such as bid bonds or performance bonds;

- Commitments with an original maturity of over one year, the purpose of issuance facilities (NIF)[8] and renewable facilities underwritten (RUF)[9] simulators and other instruments and underwriting;

[8] Note Issuance Facilities -Títulos short-term securities issued under long-term underwritten note issuance facilities

- Contingent short-term and self-liquidating associated with the movement of goods.

The first operations are converted to risk assets at their nominal value in accordance with a conversion factor equal to 100%, second and third mentioned are converted using a conversion factor of 50%, while short term contingencies and automatically associated with goods movement liquidation are converted with a conversion factor of 20%.

There is still one last category of off-balance sheet operations and these operations, the Agreement provides that the conversion risk assets has a different approach:

- Operations related to interest rates and exchange rates (eg. Swaps, Options and Futures).

As mentioned by Silva & Pereira (2011) the IC's are not exposed to credit risk for the full value of the contracts but only at the cost of cash flows replacement in the event of counterparty default.

At first glance we can conclude that this Agreement will not consider the credit risk for calculating the minimum capital requirement in relation to the weighting of assets. In fact this is one of the main criticisms of Basel I, criticisms that have widened after several financial scandals ahead listed.

Despite this agreement already contemplating some concern in addition to the risk of credit with the introduction of differences in countries within and outside the OECD, for example, the Agreement does not consider the risk of interest rate risk, liquidity risk, currency risk, operational risk and market risk.

Costa (2011) considers that even in relation to the credit risk weights are too basic and hard, not taking into account for example the temporal structure of the same. A short-term loan, medium term and long term are included in the same risk weighting class necessarily having different exposure depending on their maturity.

As already mentioned, the Agreement's weaknesses became even more evident with events such as the crisis in emerging markets or the failure of Barings Bank who succeeded him. With this in mind the members of the Committee continued to work to improve the agreement and issued in September 1997 a document with 25 principles for effective regulation of banking activity: Basel Core Principles for Banking Supervision efective.

In January 1996 (amended in September 1997) the Committee decided to draw up the document Amendment to the capital accord to incorporate market risks. This addendum, also known as Market Risk Amendment, now includes the market risk in the calculation model of

[9] Revolving Underwriting Facilities

capital requirements of banks and the weighting of asset value. With this addition arose the possibility to measure the risk through internal risk assessment methods, in addition to the standard method. There has also a new concept of equity Tier 3.

The Tier 3 consists of short-term subordinated debt:

- ✓ Held in order to meet the capital requirements to cover the market risk and could only be used for this purpose;
- ✓ maximum of 250% of the total Tier 1 bank;
- ✓ Tier 2 elements may be substituted for these to the 250% limit without running counter to the limits defined in the original agreement;
- ✓ The core capital should represent at least 50% of the total capital base (sum of Tier 2 and Tier 3 may not exceed the toal core capital). optional regulation (regulator powers of each country its application or not).

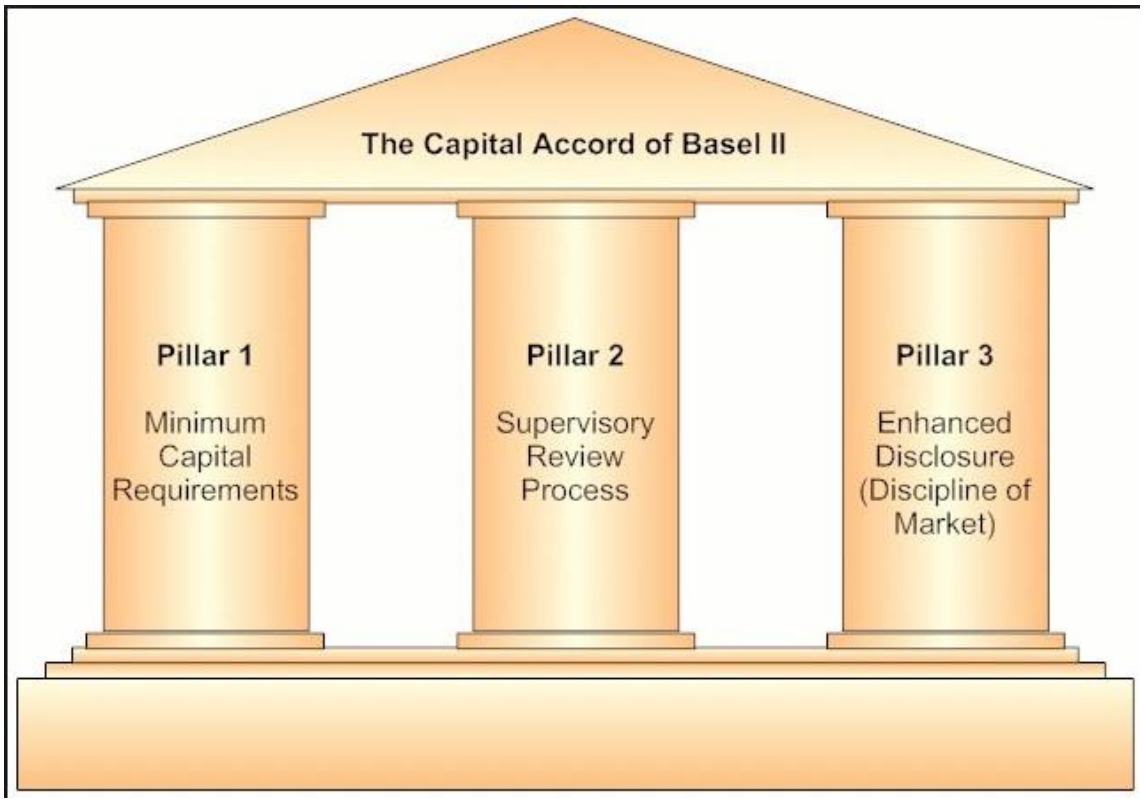
According to Silva and Pereira (2011) innovation of financial and banking systems, computer evolution, more complex financial engineering, measurement techniques and risk management, crisis in emerging markets, combating arbitration, new demands of internationalization of IC's with clear benefits a global system of capital calculation and standardization of solvency indicators, are the key factors for further development of the existing Agreement.

So in 2004 it signed the Basel II, or simply Basel II.

The agreement was intended to contribute to better risk management and the adequacy of capital in the face of specific risks borne by each institution keeping the current capitalization levels seeking to preserve the soundness and solvency of financial systems but increasing the degree of sensitivity to the actual risk profile the IC's and including a more comprehensive approach by introducing risks such as operational risk and more mitigated way the risk of interest rate. Other objectives of this new agreement was the strengthening of the surveillance and greater transparency by harmonizing the information to be made available to the market.

Basel II is based on three pillars: the pillar of minimum capital requirements, the pillar of banking regulation and the pillar of market discipline.

Figure 3: The three pillars of Basel II



Source: Online Newsletter Adapted from 'The Bank' (2004)

As mentioned by Silva and Pereira (2011) the first pillar seeks to increase the sensitivity of the minimum capital requirements to credit risk in order to cover operational risk and market risk.

With respect to credit risk Basel II has introduced innovations to be more correlated with the actual weights counterparty risk through the use of more advanced methodologies, use of external rating agencies or the introduction of new risk weights, among others.

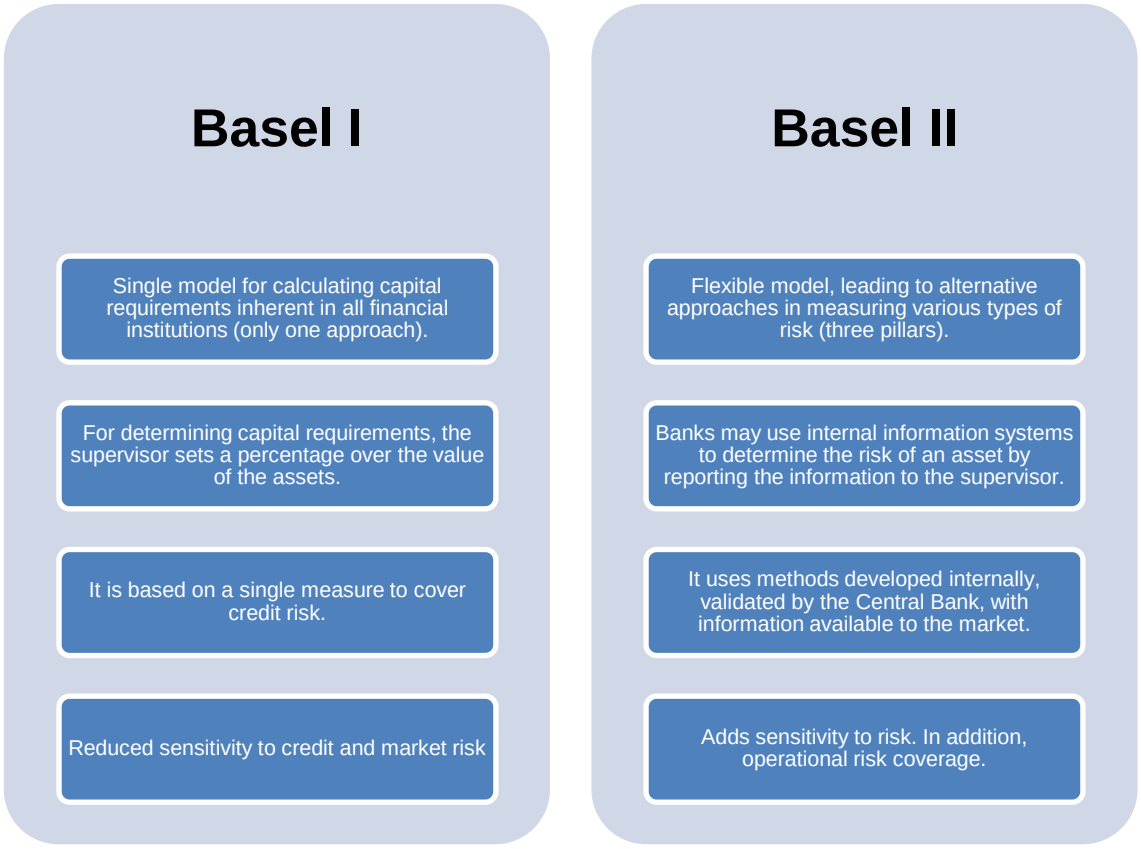
An innovation was the possibility of using internal methodologies of risk measurement. The IC's could now use the Standard Methodology, Methods of Internal Ratings (IRB Foundation and IRB Advanced) to assess credit risk.

To calculate the operational risk may be used Methods of simple indicators or Advanced Method Standard Method.

Already in the calculation of market risk may be used the standard methods or internal models approach.

The following figure shows the main differences between the New and the Old Agreement.

Figure 4: Basel I Basel II vs



Source: Adapted from Gonçalves (2011)

Despite the improvements that have Basel II for the financial system, these were clearly insufficient to guard the crisis of 2008, also known as subprime[10], Which had started with the bankruptcy of Lehman Brothers. This laid bare the shortcomings of such an agreement so that the Basel Committee the need for a new agreement and not just a revision of this. So in September 2010 it approved the Basel III with new measures to be implemented in stages until 2019.

But the measures would be not only the Basel Committee. Since the beginning of the financial crisis that the European Commission adopted a set of regulations to govern the IC's to prevent similar crises and preserve the financial stability of the Union.

"The experience of the financial crisis has exposed important failures in financial supervision, both in particular cases and in relation to the financial system as a whole. The current oversight mechanisms were unable to prevent, manage or resolve the crisis. The national supervisory models have lagged behind the current reality of integration and interconnection between European financial markets, in which many companies develop their cross-border operations.

[10]Subprime mortgage - mortgage loans that were securitized high risk corresponded to the subprime segment. (Paula, M., 2009)

The crisis exposed shortcomings in the cooperation, coordination, consistency and trust between national supervisors. "(European Commission, 2009).

The purpose of this regulation is to revise the principles relating to liquidity, forcing higher capital requirements limiting excessive risk that the IC's assumed in the pre-subprime period.

According to Maia (2013), Basel III can be summarized in 11 indicators, with the temporal application indicated in the following table. To know:

- ✓ **Gearing**: Proceeds to setting limits to the relationship between debt capital and equity of the banking system. (Has a monotorização period 2011-2012);
- ✓ **Minimum ratio of capital** proceeds to establish a relationship between their own and borrowed funds.
- ✓ ***buffer* capital conservation**, Is a "pad" (buffer) prudential capital each bank (the form in periods of expansion to meet contraction periods).
- ✓ **Common shares more "pad",** should represent 3.5% of the capital in 2013 to rise progressively up to 7% in 2019.
- ✓ **Deductions to equity indicator included in Tier 1**.
- ✓ ***ratio*minimum Tier 1 capital,** relationship between the equity shares with risk-weighted assets (fixed by the Central Bank in each country).
- ✓ **minimum total capital**Includes, prior to the increase in the equity, preferred shares (in addition to common) and other similar interests.
- ✓ **minimum total capital more "cushion" of conservation**Assumes the value of 8% 2013-2015 gradually rising up to 10.5% in 2019.
- ✓ **excluded equity instruments of the ratios Tier 1 and 2**, leaves, gradually being considered over a growing period of 10 years since 2013.
- ✓ ***ratio* liquidity coverage**In 2011 opened an observation period which runs until 2014. From 2015 a minimum value is fixed.
- ✓ ***ratio*stable liquidity obtaining funding**, Your observation period knows the start in 2012 and end in 2017 after which, in 2018, introduced a minimum.

Table 5: Implementation phases of Basel III

	Phases	2013	2014	2015	2016	2017	2018	2019
Capital	Leverage Ratio		Parallel run 1 Jan 2013 – 1 Jan 2017 Disclosure starts 1 Jan 2015				Migration to Pillar 1	
	Minimum Common Equity Capital Ratio	3.5%	4.0%	4.5%				4.5%
	Capital Conservation Buffer				0.625%	1.25%	1.875%	2.5%
	Minimum common equity plus capital conservation buffer	3.5%	4.0%	4.5%	5.125%	5.75%	6.375%	7.0%
	Phase-in of deductions from CET1*		20%	40%	60%	80%	100%	100%
	Minimum Tier 1 Capital	4.5%	5.5%	6.0%				6.0%
	Minimum Total Capital		8.0%					8.0%
	Minimum Total Capital plus conservation buffer		8.0%		8.625%	9.25%	9.875%	10.5%
	Capital instruments that no longer qualify as non-core Tier 1 capital or Tier 2 capital		Phased out over 10 year horizon beginning 2013					
Liquidity	Liquidity coverage ratio – minimum requirement			60%	70%	80%	90%	100%
	Net stable funding ratio						Introduce minimum standard	

Source: BIS

The European Union, through the European Parliament, transposes Directive 2013/36 / EU this Agreement.

'The Bank of Portugal in order to ensure a smooth transition to the full implementation of the provisions of Regulation (EU) No 575/2013 and Directive 2013/36 / EU regarding maintenance measures of adequacy levels of funds own to prevent credit institutions efetuem operations in the immediate or short-term, as have certain or foreseeable effect of reducing the nominal value of one or more components of their own funds. Those operations include, among others, the distribution of dividends and the repurchase of own instruments that are eligible for the calculation of own funds'. (Bank of Portugal, 2013)

Briefly, as explained Silva and Pereira (2011), Basel III will strengthen the capital requirements significantly increase the quality of those funds and is to reduce systemic risk with a transition period extended to banks to have temporal room for prepare your application.

Thus, compared to Basel II, Basel III Tier I becomes the main reference shall be greater coverage of RWA increases the ratios of capital adequacy, introduction of simple leverage ratios, introduction of additional capital buffers to minimum capital requirements, greater flexibility in the provision and use of default probabilities adjusted to the credit cycle, the greater importance of liquidity risk with the introduction of two additional ratios and increasing importance of bank regulation.

Source: Mendes (2013)

One of the main points of this new agreement, as mentioned by Costa (2011), is the strengthening of the powers of the supervisory institutions. In Basel III supervisors see strengthened their skills and their intervention in seeing and enforcement of the rules set forth herein. In addition to meeting the capital requirements, banks are now supervised regarding their liquidity. The foundation of this surveillance will increase the detection and timely correction of any liquidity difficulties so that they can avoid similar cases that have occurred in the 2008 crisis.

Some of the tools are presented in the following table:

Table 6: Tools

Tools	features
incompatibility map contractual flows by maturity	Map of inflow and outflow of money, caused by balance sheet items and off-balance sheet, drawn up based on maturity of flows. The structure is defined by the regulator, allowing monitor flows, checking the timing of cash flows.
Concentration of funding	This measure identifies the banks' funding sources, taking into account possible liquidity problems, encouraging diversification of financing.
Map of assets available free charges	Provides information about the characteristics of the available assets of the banks, which They can be used as collateral in financing transactions in the market secondary or from the central bank, can be additional sources of funding.
liquidity coverage ratio expressed in the relevant currency	Can detect problems related to potential gaps in resources different currencies.
Monitoring tools market related	It allows you to monitor the difficulties of potential liquidity, based on information available in the market about the banks.

Source: Costa (2011)

With more rules and control the IC's have more challenges ahead. To deal with ever more regulation could represent more costs but also is more robustness of the accounts of IC's to address the various risks they face. These risks discussed in the previous chapter as Business Risk, Strategic, Financial comprising the Credit Risk, Market, Interest Rate, Foreign Exchange, solvency and liquidity and also the operational risk.

2.2. The Basel II - Operational Risk

One of the innovations of Basel II on the previous agreement was the introduction of operational risk in the calculation of regulatory capital provision, the scope of Pillar I - Minimum Requirements for Capital or Capital.

As mentioned above, the Committee defines operational risk as the risk of loss resulting from a failure or an inadequate internal process control, people or external events.

As regards Mendonca et al. (2008) the term 'operational risk' has a variety of meanings as each bank has its complexity, size, sophistication and diverse nature.

Examples of operational risk surrounding us. Failures in the processes of activities, human error and external events of various kinds arise every day in the news in the newspapers.

The same authors report that the increase in operating losses in recent years has meant that the IC's start to look at the control of operational risk as more than an internal task but as a strategic factor within the organization.

According to the BIS there seven categories of operational risk events.

1. Internal fraud
   Losses arising from acts of a type intended to defraud, diverting assets circumvent national legislation or policy of the IC and involving at least one inside the organization.
   May be:
   - Unauthorized activities such as transactions not intentionally reported, unauthorized transactions or intentional lack of marking position;
   - Or acts of theft or fraud as fraud, credit fraud, worthless deposits, robbery extortion, embezzlement, misappropriation of assets, malicious destruction of assets, forgery, smuggling, account ownership, tax evasion, roulement checks, bribes or insider trading;

2. External fraud
   When someone from outside the organization commits fraud.
   Losses arising from acts intended to defraud or knowingly misappropriate assets or circumvent national rules or even the law and involving at least one party external to the organization.

   They are divided into:
   - Theft and fraud, including theft, forgery and roulement checks;
   - And security systems which includes information theft and hacking;

3. Employment practices and workplace safety:

   And losses from acts inconsistent with employment, the law or collective bargaining agreements, health and safety as well as the payment of personal injury or diversity / discrimination.

   are subdivided into:

   - Labor relations: compensation, benefits, remove portions for termination, organized labor activities;
   - Safety at work: liability, occupational health, events on safety rules and remove portions to workers;
   - Diversity and discrimination that covers all types of discrimination;

4. Clients, Products and Business Practices:

   This is the category of events with greater importance in IC's.

   Losses arising from an unintentional or negligent breach of a professional obligation relating to specific clients (including fiduciary and suitability requirements), or the nature and design of the product itself.

   May be:

   - Suitability, disclosure and reliable including breaches of trust, breach of guidelines, adequacy, transparency issues, violation of transparency, aggressive sales, misuse of information and lender liability;
   - improper business practices or market that encompasses antitrust, of inappropriate market practices, market manipulation, unlicensed activities or money laundering;
   - Failure of the product refers to the product defects and errors in the model;
   - Selection, support and exposure that includes failure on the client framework for guidelines and exceed customer limits;
   - counseling activities referred to disputes over counseling activities;

5. Execution, Delivery and Process Management:

   It is in this category that most events occur.

   processing failures and management of transactions and processes with trade counterparties and vendors.

   In this category we have:

   - Transaction capture, execution and maintenance including communication failure, error in entry, loading and maintenance of data, failure within or liability accounting error, delivery error, other errors such as eg in collateral management or maintenance data of reference;
   - Monotorização and reporting covering failed mandatory reporting and errors in external reporting;

- New clients and documentation: lack of documentation and customer permissions and other legal documents missing;
- Customer Account Management: unauthorized access to accounts, incorrect customer registration, loss or damage negligently client assets;
- commercial counterparts: many trade disputes with non-customers and poor performance;
- Vendors and suppliers include outsourcing and disputes with suppliers;

6. business disruption and system failure
   Losses arising from disruption of business or failure in systems for hardware, software, telecommunications and service interruptions

7. Damage to physical assets
   Losses resulting from loss or damage to physical assets and human derived from natural disasters or other events such as terrorist attacks and vandalism.

It is important to take into account the various categories of operational risk these concepts will be more used to calculate the minimum capital ratio, the IC's that want to use the Advanced Evaluation Model. All IC's must have these notions and present in their day to day if they are to have a model of prevention and management of operational risk, concept ahead discuss.

measurement methodologies were defined operational risk to which they would be exposed to the assets of IC's. This value would be transposed to calculate the Cooke ratio for its inclusion in the denominator of the ratio, added to the weights of the credit risk and market risk. Costa (2011)

2.3. Operational Risk Evaluation Models

Under Pillar I, Basel II offers three capital calculation methods for operational risk: Basic Assessment Model, or BIA, Standard Model and Advanced Model. Whatever the option by the IC's that decision is always pending approval by the supervisor of the country, in the case of Portugal by the Bank of Portugal.

In the European Union the agreement was codified through the banking Directive 2013/36 / EU[11] and transcribed into national law by Decree-Law No. 157/2014 of 24 October.

[11] Capital Requirements Directive

2.3.1. Basic Assessment Model (Basic Indicator Approach - BIA)

The Basic Assessment Model is a simple approach for calculating the capital requirement for operational risk. It can be used both by the banks that are not internationally active as those who are but do not have risk management systems in progress.

In the basic model capital is calculated by applying a percentage, called alpha, defined by the Committee (at this time is set at 15%) in average gross the past three years.

The deemed income amounts include provisions and operating expenses exclude special items.

So we have, according to the BIS:

$$K_{BIA} = [\alpha\ (GI_{1\ \ldots\ n} \times \alpha)] / n$$

At where:

K_{BIA} = Capital requirements according to the Model BIA

GI = gross annual income, if positive, the previous three years

n = number of previous three years for which the gross annual income is positive

α = 15%, defined by the Committee

2.3.2. Standard Model (The Standardized Approach - TSA)

The Standard Model or standardized is an evolution of the Basic Assessment Model and although depend on fixed factors and a percentage of gross income, takes into different lines of business accounts, a total of eight, which have a weighting, called betas ranging from 12% to 18%.

$$K_{TSA} = \{\Sigma_{1\text{-}3\ years}\ \mathbf{max}\ [\Sigma\ (GI_{1\text{-}8} \times \beta_{1\text{-}8}), 0]\} / 3$$

At where:

KTSA = Capital requirements according to the TSA

GI1-8 = gross annual income in a given year as defined in IAB for each of the business lines

β1-8 = fixed percentage set by the Committee in accordance with the following table

In this model are considered eight business lines with different betas. Table 7 shows the description of the activities and the appropriate associated risk factor.

Table 7: Risk factors for each business line (TSA)

Business Lines	*betas*
Corporate governance	18%
Trading and Sales	18%
Retail Banking	12%
Commercial Banking	15%
Payment and Settlement	18%
Agency services	15%
Asset Management	12%
brokers	12%

Source: adapted from the BIS and Mendes (2013)

The TSA is more sensitive to the risk that the basic approach but both approaches are simple and easy to apply, but also simplistic one of the main criticisms of these models.

Within this approach there is still a Model Alternative Standard (Alternative Standardized Approach - ASA) that considers a different value for two lines of business: Retail Banking and Commercial Banking, replacing the gross income by the credit volume (in terms of loans and advances) multiplied by m (set at 0.35).

$$K_{RB} = \beta_{RB} \text{ x m x } LA_{RB}$$

At where:

K_{RB} = Capital requirement for Retail Banking (Retail Banking)

β_{RB}*beta* =for the line of business (Retail Banking / Commercial Banking)

OVER THERE$_{RB}$ = Total outstanding loans and advances (not weighted and gross of provisions, according to the average of the last three years

= 0035 m

The BIS in its Sound Practices for the Management and Supervision of Operational Risk is demanding and it is obligatory to implement a governance model that includes:

- The involvement of top management;
- organizational structure and operational risk processes;
- Policy set to operational risk;
- Definitions and glossary of operational risk;
- Criteria to map the losses by line of business (defined above),
- Incentives for a solid operational risk management system;

This model should also include the definition of identification, evaluation, control and mitigation of operational risk.

According to Carloto (2011) this model will serve as a 'stepping stone' to more advanced models as it will enable the collection of historical data on various categories of risk by business line, using Loss Data Colletion[12] and instruments like Scenario Analysis[13] and Risk Self Assessments[14]. It is thus extremely important that the IC's provide reports on actual losses related to operational risk.

These reports are:

- Be full and complete
- be timely
- be accessible
- Have quality and quantity of information (date, type, amount, exposure rating)

These data are extremely important also to define the institution's risk profile.

2.3.3. Advanced model (Advance Measument Approach - AMA)

[12] Loss Data Colletion - data collection resulting from losses Operational Risk
[13] Scenario Analysis - Analysis Scenarios
[14] Risk Self Assessments - Self-assessment of the risk

In the AMA approach are offered the opportunity to banks to develop their own risk model to calculate the operational risk capital. At the AMA calculation is done by the internal measurement system of operational risk provided they are comprehensive, systematic and have been approved by the regulator.
In Portugal, the regulatory authority is the Bank of Portugal, will monitor IC that want to adopt this model and apply for authorization to do so, deciding after several inspections on the pretense of HF. The selection of this model is not likely to return.

As mentioned by Mendes (2003) this is the most advanced approach and with highest accuracy. Because of their level of sophistication leads, in theory, it has a much reduced level of capital. Here should be attested that expected losses are accrued according to the calculated needs, in which the regulatory capital requirements correspond only to the capital required to cover unexpected losses.

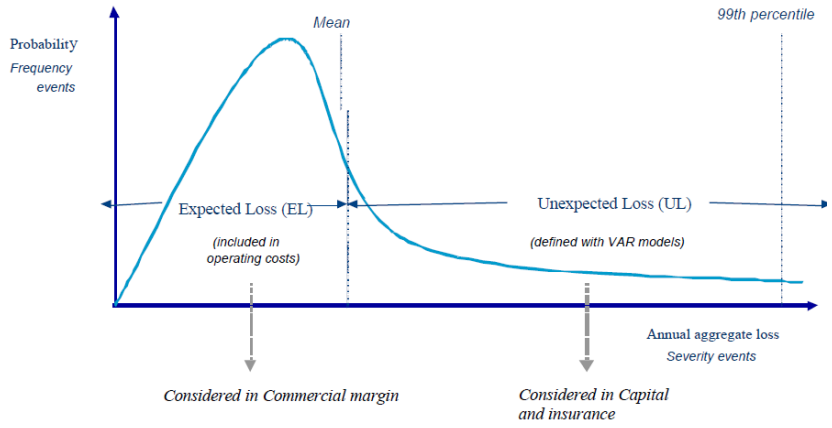
The AMA will be used for IC's internationally active and the requirement of regulatory capital will equal the risk measure given by the internal operating system of the risk measurement database using both quantitative and qualitative criteria criteria.

Most importantly, as mentioned by Carloto (2011), it is that the internal measurement system to estimate reasonably well unexpected loss of operational risk based on the combined use of data on internal losses calibrated with significant external losses and usage analysis adjusted scenarios business information from the environment and internal control factors.

The system should be able to allocate economic capital to each business line, allowing them to seek continuous improvement by each business line individually.

In terms of quantitative standards, the Commission has not made any approach to the measurement system, but the institution must demonstrate to the local supervisor that the internal model captures severe loss events and should be comparable to the one-year holding period with a 99.9 confidence interval % (as of credit risk assessments).

Figure 5: Distribution losses



Source: Carvalho (2007)

The goal is to improve operational risk management framework in a way that is clear to minimize the cost of capital.

The IC's can use safe for risk mitigation. The Committee limited to a maximum of 20% of capital requirements using insurance.

Carloto (2011) and Carvalho (2007) present some of the qualitative and quantitative criteria that may be used in this model:

- **Internal data**

  The AMA model can only be used with internal data for an observation period of 3 to 5 years. the method Loss Distribution Approach (LDA) may be used. With this methodology it is possible to construct two distribution (frequency distribution and distribution of gravity) which then may aggregate using a Monte Carlo simulation resulting in a single distribution Aggregate Loss Distribution (ALD).

  These distributions allow the use of statistical techniques to estimate losses due to operational risk and the calculation of minimum capital level required.

  Use of this type of approach would, in principle, more reliable results under the mathematical point of view. But it can be otherwise, since this process is relatively recent and the IC's still has some difficulty in raising data for the model management process.

- **External data**

  The IC's areuse relevant external data according to a systematic process that incorporates enough information to help IC assess the relevance of the event compared to losses to other IC's. The conditions and use practices should be regularly reviewed, documented and subject to periodic independent review.

- **Scenario Analysis**

  According to the Committee the analysis of scenarios of use is required to validate or incorporate additional data to their previous results, especially for extreme events.

  Ogoal of scenario analysis is to create fictional events with the same characteristics of events that occurred in the past. Sometimes due to lack of information are not included in the statistical analysis. Scenario analysis is an important element for the AMA approach. These scenarios are construindos using empirical knowledge of experts from the institutions.

- **Business environment and internal control factors**

  Capture the key factors of the business environment and internal control that can change operational risk profile and make the evaluation of the IC risk is more focused in the future.

  The factors should be subject to an independent review, documented and justified, as a significant risk factor considered by its impact on the risk assessment of IC and validated over time.

- **Technical integration**

  You can not apply Aggregate Loss Distribution at all times especially in analyzing the data load. The integration of internal and external data can be performed by adding distributions using, among others, qualitative aggregation, integrating linear or Bayesian combination.

- ***Corporate governance***

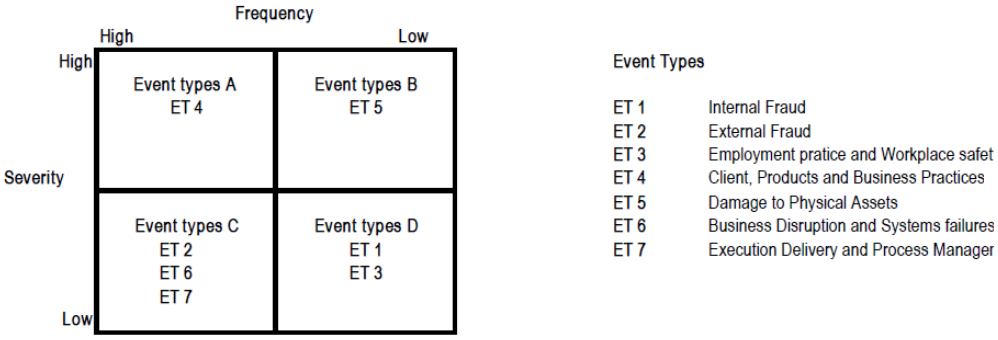
  They must be delivered to senior management and administration loss reporting, exposure to risks, risk indicators and others considered relevant. The internal control environment should be solid. The risk office should be independent and should be accountability for each business line. Tests should be independent internal and external audit. Top management must be involved in the whole process by approving the procedures and related policies, assessing and overseeing the management and control of operational risk.

Carvalho (2007) proposes an approach based on differentiation of the type of event to model operational risk due to the severity and frequency of events.

Taking into account all relevant factors mitigating risk with correlation factors by business lines would be a way to support the combined allocation of calculating the capital requirements for each business line. According to the author the figure, the following exemplify, will allow a more efficient, optimized and effective result of risk in terms of estimated capital under AMA, enabling

banks to leverage capital optimization as opposed to a one size fits all models such as TSA and BIA.

Figure 6: Targeting the type of events by frequency and severity



Source: Carvalho (2007)

So that top management can make decisions duly substantiated these should be supported on reliable information. (Gonçalves, 2011, p.33):

> 'No responsible manager you want your organization has a cost with the top management to the minimum necessary to maintain the level of risk within the established values. The manager needs to have confidence that the material risks are identified, valued and mitigation proposed in the review is the best possible solution, that is, and technically correct, is aligned with the accepted level of risk. '

For a qualitative assessment of operational risk it is necessary to make a quantitative evaluation. Before moving on to the various structures or risk management frameworks that can be used cover some quantitative questions relating to operational risk to better understand the values in question: What does it cost the financial industry operational risk?

Looking at the news of newspapers, mainly of economic newspapers, it seems that every day there are news related to operational risk. Some drew attention by high losses that arose them, as, among others:

'Kweku Adoboli, who cost Swiss bank UBS £ 1.5 bn with secret trades Has Been freed Nearly halfway through his seven-year sentence'

The Guardian, 24 June 2015

'Knight Capital Group Inc.'s $ 400 million trading loss stemmed from old computer software tha was inadvertently reactivated When the new program was installed ...'

Bloomberg Business, August 15, 2012

'Citigroup nears deal to resolve probe mortgage - Bank Could pay about $ 7 billion to settle ...'

The Wall Street Journal, July 8, 2014

These are examples of low frequency and high severity events that can not always fall within the framework presented in the previous figure.

The BIS conducted a study (Results from the 2008 Loss Data Colletion Exercice for Operational Risk) which aimed to collect information from internal data on losses arising from operational risk (Loss Data Colletion). The following tables can analyze events and business lines that contributed in 2008 to losses in this sector.

Table 1: SOman and Loss Annualized Frequency Distribution by Business Line and Event Type

Table ILD 4A

Sum and Distribution of Annualised Loss Frequencies by Business Line and Event Type

	Internal Fraud	External Fraud	Employment Practices & Workplace Safety	Clients, Products & Business Practices	Damage to Physical Assets	Business Disruption & System Failures	Execution, Delivery & Process Management	All	Business Line Losses as Percent of All Losses
Corporate Finance	3.5	11.5	21.6	100.2	2.4	4.6	69.1	212.9	0.7%
	1.7%	5.4%	10.2%	47.0%	1.1%	2.2%	32.5%		
Trading & Sales	32.2	31.7	96.9	398.6	12.2	157.6	2,400.6	3,129.9	9.6%
	1.0%	1.0%	3.1%	12.7%	0.4%	5.0%	76.7%		
Retail Banking	979.4	7,311.9	3,203.4	2,381.0	245.4	293.8	3,743.4	18,158.3	55.8%
	5.4%	40.3%	17.6%	13.1%	1.4%	1.6%	20.6%		
Commercial Banking	69.6	710.4	104.3	504.4	30.1	65.2	1,196.8	2,680.8	8.2%
	2.6%	26.5%	3.9%	18.8%	1.1%	2.4%	44.6%		
Payment & Settlement	20.5	185.3	23.3	50.7	21.7	37.5	386.0	725.1	2.2%
	2.8%	25.6%	3.2%	7.0%	3.0%	5.2%	53.2%		
Agency Services	11.3	94.5	12.8	44.9	5.9	26.8	698.9	895.0	2.7%
	1.3%	10.6%	1.4%	5.0%	0.7%	3.0%	78.1%		
Asset Management	10.7	19.1	30.3	96.5	1.9	22.9	522.8	704.2	2.2%
	1.5%	2.7%	4.3%	13.7%	0.3%	3.2%	74.2%		
Retail Brokerage	196.5	75.9	149.4	2,247.0	2.4	16.1	672.7	3,359.9	10.3%
	5.8%	2.3%	4.4%	66.9%	0.1%	0.5%	20.0%		
Unallocated	50.5	124.7	2,072.4	91.6	61.0	17.8	280.1	2,698.2	8.3%
	1.9%	4.6%	76.8%	3.4%	2.3%	0.7%	10.4%		
All	1,374.3	8,564.9	5,714.5	5,914.9	382.9	642.3	9,970.5	32,564.3	100.0%
	4.2%	26.3%	17.5%	18.2%	1.2%	2.0%	30.6%		

Note 1. Losses of € 20,000 or more in the stable dataset.
Note 2. First row for each business line: Sum of annualised loss frequencies.
Note 3. Second row for each business line: Distribution of losses across event types.

Source: BIS

Most of the events related to operational risk comes from Retail Banking mainly due to external fraud (40.3%) and execution, delivery and process management (20.6%). This risk category is responsible for much of the operational risk events for each of the business lines.

Table 2: SOman and loss of volumes Annualized Distribution by Business Line and Event Type

Table ILD 5A
Sum and Distribution of Annualised Loss Amounts (€Millions) by Business Line and Event Type

	Internal Fraud	External Fraud	Employment Practices & Workplace Safety	Clients, Products & Business Practices	Damage to Physical Assets	Business Disruption & System Failures	Execution, Delivery & Process Management	All	Business Line Loss Amount as Percent of Total
Corporate Finance	6.6	3.2	16.2	2,565.1	0.1	0.6	146.7	2,738.5	28.0%
	0.2%	0.1%	0.6%	93.7%	0.0%	0.0%	5.4%		
Trading & Sales	145.8	4.5	30.3	384.7	2.7	23.8	732.6	1,324.4	13.6%
	11.0%	0.3%	2.3%	29.0%	0.2%	1.8%	55.3%		
Retail Banking	198.5	607.9	305.6	1,263.6	34.0	48.0	670.6	3,128.0	32.0%
	6.3%	19.4%	9.8%	40.4%	1.1%	1.5%	21.4%		
Commercial Banking	84.7	112.8	23.1	262.4	3.3	12.7	241.2	740.2	7.6%
	11.4%	15.2%	3.1%	35.5%	0.4%	1.7%	32.6%		
Payment & Settlement	7.1	18.1	2.3	18.7	8.0	5.8	194.4	254.4	2.6%
	2.8%	7.1%	0.9%	7.3%	3.2%	2.3%	76.4%		
Agency Services	2.5	8.1	1.7	92.3	46.7	15.4	89.8	256.5	2.6%
	1.0%	3.2%	0.7%	36.0%	18.2%	6.0%	35.0%		
Asset Management	27.0	2.3	6.1	74.9	0.6	3.6	128.3	242.9	2.5%
	11.1%	1.0%	2.5%	30.8%	0.3%	1.5%	52.8%		
Retail Brokerage	89.8	6.7	31.1	294.6	0.4	1.0	71.5	495.1	5.1%
	18.1%	1.4%	6.3%	59.5%	0.1%	0.2%	14.4%		
Unallocated	38.5	16.3	167.1	166.8	38.3	7.6	154.0	588.5	6.0%
	6.5%	2.8%	28.4%	28.3%	6.5%	1.3%	26.2%		
All	600.5	780.0	583.4	5,123.1	134.0	118.4	2,429.2	9,768.5	100.0%
	6.1%	8.0%	6.0%	52.4%	1.4%	1.2%	24.9%		

Note 1. Losses of € 20,000 or more in the stable dataset.
Note 2. First row for each business line: Sum of annualised loss amounts.
Note 3. Second row for each business line: Distribution of loss amounts across event types.

Source: BIS

In terms of volume Retail Banking is largely responsible for the losses in this type of risk (32% amounting to EUR 3,128.0 million) followed by the Corporate Governance with total losses of EUR 2,738.5 million accounting for 28% of total losses.

Again the execution, delivery and process management is the category accounted for 24.9% of the losses only surpassed by category Clients, Products and Business Practices, mainly due to the significant volume losses in Corporate Finance.

In the following table we can see that 41 events (over 100 million) account for 41.79% of total losses despite 91.29% of events are small amount.

Table 3: Loss of Gravity Volume Distribution

Table ILD6
Distribution of Loss Amount by Severity of Loss

Severity of Loss	Cross-Bank Median of Distribution Across Severity Brackets			Total	
	Number of Losses	Gross Loss Amount	Gross Loss Amount Net of Non-Insurance Recoveries	Number of Losses	Gross Loss Amount (€Millions)
€0 ≤ X < €20,000	91.29 %	26.26 %	18.86 %	9,897,083	12,164
€20,000 ≤ X < €100,000	6.52 %	12.63 %	15.66 %	121,533	5,178
€100,000 ≤ X < €1 Million	1.83 %	19.37 %	21.35 %	30,598	8,085
€1 Million ≤ X < €2 Million	0.15 %	5.48 %	6.12 %	1,688	2,401
€2 Million ≤ X < €5 Million	0.12 %	9.05 %	9.10 %	1,116	3,570
€5 Million ≤ X < €10 Million	0.04 %	6.87 %	7.90 %	404	2,827
€10 Million ≤ X < €100 Million	0.04 %	15.55 %	17.39 %	333	8,243
€100 Million ≤ X	0.02 %	41.79 %	43.51 %	41	21,752
All				10,052,796	64,221

Note 1. X = severity of loss, based on gross loss net of non-insurance recoveries.
Note 2. All losses in the stable dataset.
Note 3. Results for losses less than €20,000 are not complete as loss data collection thresholds differ across participants.
Note 4. Median calculations include only banks with losses in each particular severity category. If a bank reports no losses in a category, it is not included in the calculation.

Source: BIS

There are databases on the market that compile information on operational risk events, such as IBM that has a service called IBM something FIRST, which according to the company website 'is a database of reference cases of external risk which allows financial institutions to proactively manage operational risk and enterprise. (...) allows making informed more effective risk decision, since it supplements the data of a company and supports complex scenario modeling for advanced analytics risk. '[15].

This database essentially provides an analysis of external events taken from multiple articles. These are a valuable source of information for operational risk managers in terms of events, event types and benchmarking examples. Comparison of internal events with external event patterns can manage the operational ex ante risk. (Girling, 2014)

The ORX consortium allows its 82 members to share more than 15 000 operational risk events per quarter, according to the association, allowing higher data repository and operational risk benchmarking.

These databases are an important tool in building the Risk Management Framework that the IC will have to prepare, whatever it is.

In order to build an operational risk management program, the BCBS has prepared some guidelines in its "Sound Practices for the Management and Supervision of Operational Risk" (BIS, 2003).

An appropriate Risk Management Structure there are several objectives:

[15] Accessed July 15, 2015: www.ibm.com

1. Identify:
   It is necessary to identify the risk
2. To evaluate:
   We need to assess the extent of the risk
3. Control and monitoring:
   As we check to see if this increase or decrease
4. Mitigate
   Depending on the appetite for risk as the organization will mitigate the risk

The main criteria to build a Risk Management Framework are:

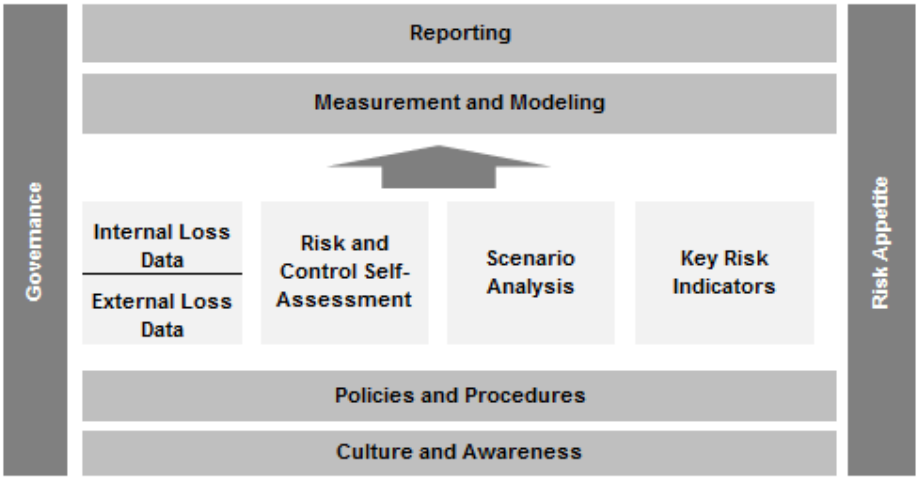
1. Database (Loss Data Collection)
   internal and external risk;
2. Self risk and control assessment (Risk and control self-assessment - RCSA)
   In order to control and mitigate any unacceptable risk;
3. Scenario Analysis (Scenario Analysis)
   Create rare fictional scenarios that could be potentially ruinous;
4. key risk indicators (Key risk indicators)
   Indicators to provide that certain risk is changing and allow intervention;

As mentioned by Gonçalves (2011) these criteria are very similar to those used in other risk management methods as used by ISO 31000 whose processes are: communication and consultation, establishing the context, identifying the risk, risk analysis, risk appreciation , treatment and Monitoring of risk and review.

The Basel Committee on Banking Supervision emphasizes that risk management structure should develop governance, policies and procedures, risk control culture and take account of the appetite for risk of HF. Should provide data for risk analysis model and reports.

The structure includes Girling by the elements present in figure 7 whose structure will depend on the weight institution to institution:

Figure 7: Operational Risk Structure Proposal



Source: Girling (2014)

- The Governance is one of the pillars of the structure because it determines the role and responsibilities of the head of operational risk function and the team that manages the structure, but also the managers of the various business lines and all those who can influence the operational risk. It should also ensure transparency of the whole process as well as periodic reassessment of the same.

- Risk Culture is another pillar of this structure since all employees should be aware of the importance of risk and its consequences and the management and mitigation of operational risk.

- Policies and operational risk procedures must be properly structured and implemented throughout the organization allowing employees the clear knowledge of the action lines.

- **Measurement and modeling**through the implementation of an operational risk analysis model.

- The reports bring together all the information gathered to put into practice.

- The institution should define its appetite for risk which often only happens after a mature structure.

The efficient identification, assessment, monitoring and Monitoring and risk mitigation is critical to the financial health of IC's. It is also possible to establish a direct connection losses with the various events much less overhead, caused for example by reputational risk generated. It is therefore vital that a robust risk management is implemented in IC's.

He began by reviewing the literature, historically contextualizing the risk to better understand the importance of the issue, since until the present day there have been many examples of large losses operational risk or the lack of an adequate control system.

The conceptual framework of risk allowed better understand what events fall into this type of risk and its categorization provides tools to better deal with risk.

The Basel II introduces the concept of operational risk but also the pillar of supervision which created conditions for the IC's took identification, evaluation, control and mitigation of operational risk.

This Agreement creates and defines methods of risk assessment as has happened already to the credit risk. But while the risk of credit advanced method was easier to implement, to the extent that the institution created its risk assessment method based on quantitative data, the operational risk variables are quantitative and qualitative being more difficult to find a formula for application.

You must have more historical data to create a database that would ensure the sustainability of the information to be used in the AMA.

The existence of the database as IBM Something First or ORX consortium are an important step towards the improvement and democratization of the application of more advanced methods.

There is still a long way to go because as mentioned this more complex method requires that there be more historical data so that the internal model is also more solid.

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