

Reference Data and its Role in Operational Risk Management

**Understanding reference data and its impact on the
risk, costs, and capital of financial enterprises**

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1. Highlights

Regulators across global financial markets are now taking operational risk into consideration in the overall risk calculations of financial institutions. In the current regulatory environment, financial firms are required to quantify their operational risk based on historical operational loss analysis and key risk indicators, and keep enough capital aside for covering their overall operational losses. Regulators have advised financial firms to identify and focus risk mitigation strategies on high risk areas.

One of the major contributors to the operational risk of a financial institution is loss due to faulty reference data. Estimated to make up 40% to 70% of the data used in financial transactions, reference data helps identify key supply chain participants and may include: counterparty information; financial product specification; issuer detail; currencies; financial market information; corporate actions; and prices.

Faulty reference data can cause monetary loss to a financial services organization. For example, misidentified products or data mismatching can cause transaction failures. Faulty reference data may also lead to systemic failure. The financial industry has been working to address these data issues by crafting global data standards and numbering conventions. In addition, financial industry-led agencies such as SWIFT are developing data transport and messaging standards.

The key areas of operational risk in the current data management systems are back-office recordkeeping, transaction workflows, payment processing, and technology. Lack of automation and inconsistent business rules across a company also add to the issues with current data and risk management systems. With an increasing number of financial instruments, changing market mechanisms, increasing regulatory pressure and the expanding role of third party data vendors, financial firms will need to invest in upgrading their current data management systems to be in compliance with regulatory guidelines.

However, before initiating new technology implementation projects, firms should develop a deeper understanding of third-party data sources, integration with internal systems, data quality control mechanisms, data distribution, and system maintenance. Financial institutions should also do a cost-benefit analysis of these initiatives as many firms outsource their system and technology upgrade projects to specialized services firms, allowing them to focus on their core competencies.

2. Introduction

“Major problem areas relating to Markets in Financial Instruments Directive (MiFID) and reference data can be grouped into four general areas: instruments, parties, markets/venues, and miscellaneous.”

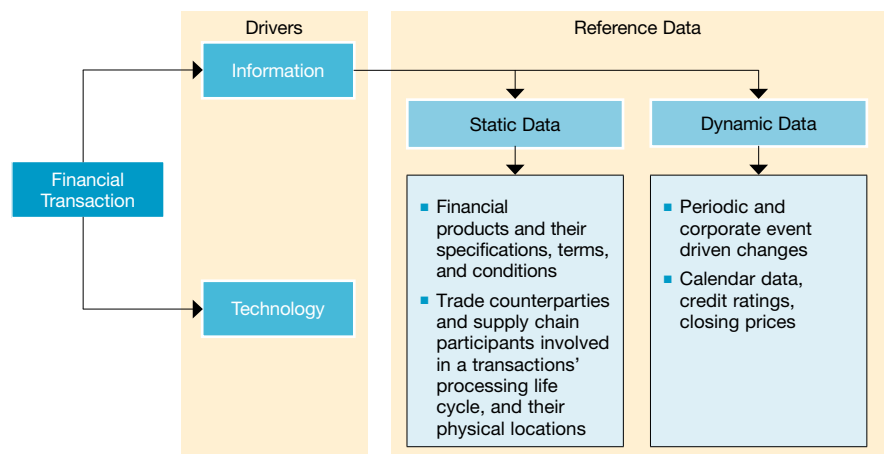
Source: The Reference Data Subject Group, a unit of the MiFID Joint Working Group (JWG), Nov 2011

The Basel Committee on Banking Supervision (BCBS) has formally recognized the importance of considering operational risk along with market and credit risk to adequately manage risk of any financial enterprise. Regulators and financial institutions have realized that in order to mitigate operational risk, data quality and accuracy has to be improved. Since approximately 70% of all data used in capital markets transactions is reference data, faulty reference data is the major component of operational risk.

The key elements for a successful financial transaction are accurate information and reliable communication technology. Information required, i.e. reference data, can be classified as static and dynamic.

- Static data refers to data elements which have unalterable characteristics, such as financial products specifications and expiration dates, and information about counterparties and other supply chain partners.
- Dynamic reference data refers to variable data such as closing and historical prices.

Exhibit 1: Key Elements of a Financial Transaction



Source: Capgemini Analysis, 2012

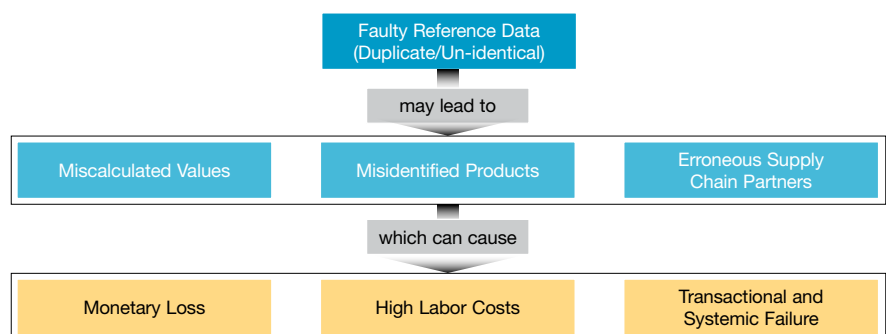
Reference data is stored and used across front, middle, and back office systems of a financial enterprise. In a financial transaction life cycle, reference data is attached incrementally when interacting with various systems and applications. Systems which interact with reference data while performing a financial transaction may be proprietary systems which have their own set of reference data definitions. When these proprietary systems interact, data mismatches can occur as each of these systems may have a different data structure to manage their reference data. In order to detect any error with the reference data and then rectify it, both human and automated system interaction is required.

A business' processing applications also accesses reference data and adds business rules to represent financial transaction as an equity trade, fixed income trade, currency swaps, futures, options, and more. These processing applications also access data from third-party data sources, further integrating reference data within the business application.

When reference data is added, modified, or deleted across the financial transaction lifecycle, it is important to maintain data consistency. However, in the financial services industry, duplication of reference data is common. This problem occurs because firms frequently source data from various third-party vendors and each of these vendors has its own data definitions and data structure. Firms also maintain their own master data bases which may have different data definitions and data structure than outside vendors.

When a financial enterprise's dataset interacts with the databases of external proprietary systems, a data mismatch may occur resulting in a failed or erroneous financial transaction. Faulty reference data may also potentially lead to systemic failure.

Exhibit 2: Repercussions of Inaccurate Reference Data



Source: Capgemini Analysis, 2012

3. Reference Data and its Impact on the Financial Services Industry

“Reference data has always driven investment decisions, transaction processing, back office operations, securities administration, accounting, compliance, and reporting.”

Source: What's New About the Importance of Reference Data? Maryann Houglet, A-Team Group, accessed on 15 December 2011

For decades, the financial services industry has tried to reduce the number of failed transactions, particularly those due to misrepresented reference and transactional data. Transactional failure first came into prominence during the back-office crisis in the 1960s, but over time, this issue has been magnified due to the introduction of electronic trading, product expansion, and the proliferation of new markets. Now, with huge increases in trading volumes, institutionalization of markets, growth in cross-border transactions, and proliferation of cross product trading strategies, the problem of transaction failure may worsen further if not addressed properly.

The issue is complex—technically, as well as operationally—and requires industry-wide collaboration to tackle it effectively. The financial services industry has often overlooked reference data issues as a key cause of failed transactions, but during the last decade some progress has been made. Still, the industry has not yet adopted global reference data standards that can reduce costs and risks.

Since the financial crisis that began in 2007, regulations have forced firms to focus on managing their operational risk more effectively. Companies are now looking to centralize and standardize their reference data systems, and some have already initiated major projects to centralize various reference databases.

3.1. A Deeper Understanding of Reference Data and Reference Data Systems

In his book *Methodologies for Managing and Measuring Operational Risk*, F.C. Harmanantzis defined reference data as “a set of descriptive information about financial instruments and the business partners that trade them.” Reference data includes the data elements carried out through automated financial systems that define the various entities involved in a financial transaction such as customers and securities. It also includes static information such as data on a securities-master file, information on counterparties, data in account-master files, data on clients, and data on dates, currencies, and country codes.

Exhibit 3: Reference Data Definition in the Financial Industry

Reference data is the underlying transaction data defining...

Information Areas	Reference Data Categories
<ul style="list-style-type: none"> ■ Securities and their issuers ■ Accounting prices and corporate actions affecting these securities ■ Corporate customers and/or counterparties and their trading and delivery instructions 	<ul style="list-style-type: none"> ■ Numerical codes for trading instruments such as International Securities Identification Numbers (ISINs), national numbers, proprietary numbers defined by commercial data providers, and cross-reference identifiers ■ Descriptive information on trading instruments including coupon rates, maturities, restrictions and ex dividends ■ Legal entity identifiers for ownership structures and hierarchies ■ Global sector code identifiers ■ Trade-specific information with respect to trading and settlement locations ■ Standing settlement instructions at the level of instruments, funds and markets ■ Client/counterparty identifiers ■ Asset management information ■ Corporate action data such as acquisitions, mergers and stock splits

Source: Capgemini Analysis, 2012; Exploring Costs, Capital Requirements and Risk Mitigation, Allan Grody, 2005

In the financial industry, reference data elements act as unique identifiers for:

- Financial products and their properties including symbol, asset class, market, and maturity date
- Issuers and other participants such as brokers, counterparties, and clearing houses
- Closing and settlement prices, often used by exchanges and clearing houses for calculating margins and portfolio valuations

Exhibit 4: Examples of Financial Reference Data Items

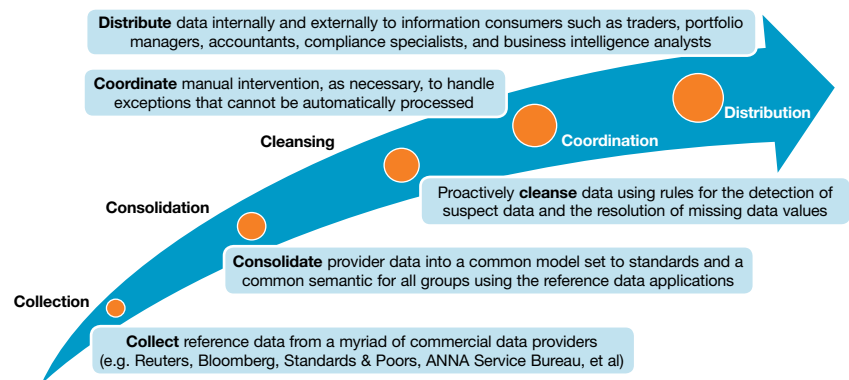
Data Categories	Examples
Issue Identifiers	CUSIP (U.S.), SEDOL (U.K.), ISIN, RIC Code (Reuters), symbol (exchange specific), exchange or market traded on (MIC)
Type of Security	Common or preferred stock, corporate or municipal bond, option, future, commodity, swap
Terms & Conditions	Maturity or expiration date, conversion date and rate, sinking fund provision, deliverable equivalent, reset date
Credit Rating	Credit history and industry categorization such as Moody's rating, S&P identifier and rating, Fitch rating, Basel II operational risk reporting category, SEC identifying data
Customer Identification & Counterparty Data	Department, fund, trading entity, agent, SWIFT BIC code
Accounting, Valuation & Collateral Prices & Formulas	Historical and closing price, time series, volatility, correlation
Regulatory, Tax Jurisdiction & Government Fee Schedules & Rates	SEC, FSA, MOFA, EVA, regulatory fee, tax withholding rate, commission rate
Corporate Actions	Stock split, proxy notification, merger, tender
Calendar Information	Holiday, expiration of contract date

Source: Capgemini Analysis, 2012; Exploring Costs, Capital Requirements and Risk Mitigation, Allan Grody, 2005

Reference data elements are not only used to seamlessly carry out a financial transaction but are also used in price discovery of financial securities such as bonds and over-the-counter (OTC) derivatives. Data elements such as historical prices, calendar data, and ratings are required as inputs in price discovery calculations.

In the center of all transactions are systems which provide essential data elements for successful implementation. Reference data systems provide accurate data to various other applications and trading systems. They process information, beginning with the collection of data from various sources through distributing it internally and externally.

Exhibit 5: Basic Functions of a Reference Data System



Source: Capgemini Analysis, 2012; Software Information Industry Association's World Financial Information Conference, 2009

In the financial industry, reference data systems are still evolving. Some firms utilize a single centralized system supporting multiple business applications, while other firms take a decentralized approach. Currently, most firms have separate business units maintaining their own reference databases which generally lead to data duplication. However, many companies are now moving towards enterprise-wide integrated systems to avoid this duplication issue.

3.2. Reference Data Challenges

Presently, the industry is plagued with many reference data issues such as: poor data quality, lack of global data standards, presence of data silos, multiple data sources, data duplication, and lack of data governing policies. Reference data management systems often also lack standardized definitions of data elements. For example, in some reference databases Hong Kong is excluded from China. Due to these types of issues, financial firms are increasingly focusing on upgrading their data management platforms.

Key drivers that have led to an increased focus on improving reference data management

An increase in the number of financial instruments: Just a few years ago financially engineered securities such as derivatives did not exist, by the end of 2010 there are more than eight million instruments. Exchanges and broker/dealers are coming up with innovative financial instruments in accordance with client demands. With the number of instruments growing, managing instrument-specific data has become increasingly difficult for financial firms.

Changes in market mechanisms: Markets continue to evolve and the composition of market participants is shifting. The emergence of hedge funds and mega buy-side firms over the last couple of decades is one example of shifting market dynamics. This has led to a rapid rise in program/algorithmic trading volumes as a high frequency trading strategy reduces trade size with a corresponding increase in trade volumes. These factors have put lot of pressure on data management systems to store and process high volumes of data with minimal latency.

Increasing regulatory and compliance pressure: As the financial crisis continues, regulatory pressure on financial services firms has increased considerably. The Basel Committee on Banking Supervision has emphasized the importance of managing operational risk and the need for global data standards. Firms, forced by risk and compliance pressures, are now placing a high priority on managing accurate and timely data to feed internal risk management systems.

Expanding role of third-party data vendors: The industry's demand for data, such as security attributes and pricing information, has given rise to an entire sub-industry of vendors that specialize in financial data distribution. These third-party vendors are now playing an increasingly significant role in managing and providing data. However, financial firms are finding it difficult to manage multiple data sources, due to added costs and consistency issues.

Changes in financial market dynamics or business decisions can also cause data issues for financial service firms

Mergers and acquisitions: In a merger, the challenges faced by a firm range from consolidating a varied set of disjointed applications to integrating different data structures, managing different set of data definitions, and minimizing data duplication.

Expansion to new markets: Firms which are present across different markets and are expanding to new markets face issues around their current systems' limited ability to accommodate increasing volumes and decentralized reporting. Their current systems may not have multi-entity or multi-currency capability and have limited interest control and allocation capabilities.

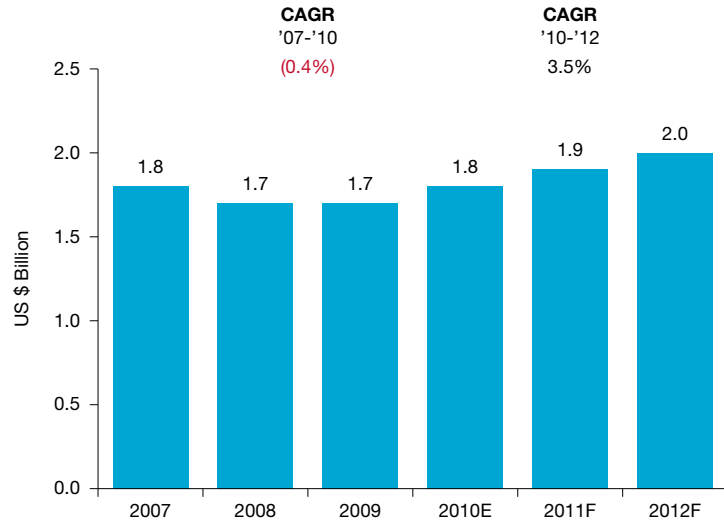
Fund accounting: Hedge funds which invest in many products and across markets also face problems in data management. These may include their current system's inflexible accounting methodology for handling complex securities and products, as well as their current system's inability to handle ever-increasing transactional data volumes—as a huge number of financial products are available and many new products are launched daily.

Investments are being made so financial firms can address the complexity of reference data management issues

Regulatory pressures on the financial industry have provided the impetus to implement the enterprise-wide data management systems needed to resolve reference data issues, and mitigate operational risk. The industry has now realized that their inability to understand and report on risk exposure quickly and correctly is directly linked to a lack of correct data, and not simply a failure of the systems.

Firms are now looking for data management systems that not only ensure quality and accuracy of data, but through data analytics, turn the vast quantities of data into high-quality information. Corporations must understand that the benefits of data management cannot be fully realized without finding effective ways of getting relevant and accurate information as quickly as possible. Data integration enables a financial firm to fully realize the potential of business applications to support key business drivers. It also establishes a solid base for successful application implementations and data management projects in the long term.

Exhibit 6: Global Data Integration Spending (\$ Billion), 2007–2012F



Source: Capgemini Analysis, 2012; Data Silos, Asset Control, 2011

Estimated spending figures for worldwide data management integration projects that include personnel, hardware, and internal and external integration software, as well as broader integration spending figures among business units reached US\$1.8 Bn in 2010 and are forecast to grow at an annual rate of 3.5% to reach US\$2.0 Bn by 2012.

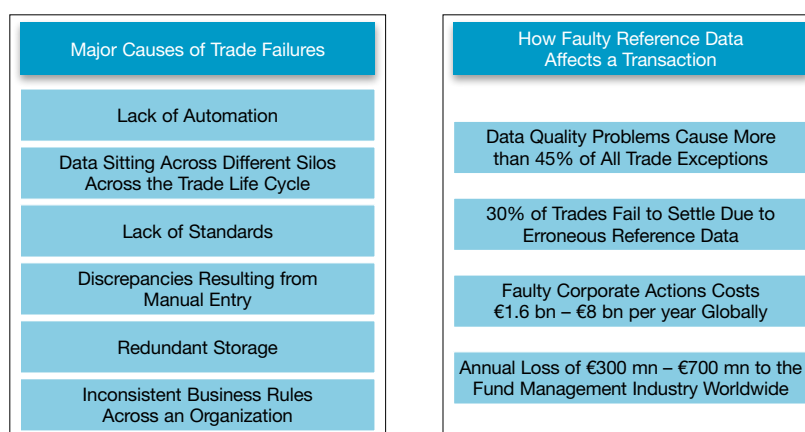
4. Operational Risk Management in the Financial Services Industry

“Operational risk has generally become understood to mean the risk of loss from inadequate or failed internal processes, people, and systems, or from external events.”

Source: Managing Operational Risk: 20 Firmwide Best Practice Strategies, Douglas G. Hoffman, 2002

Operational risk exists throughout the life cycle of a financial transaction and among all its participants in the supply chain. Faulty reference data is a major contributor to the operational risks associated with a financial transaction. Major causes of transaction failure are lack of system automation, lack of data standards, data duplication, and inconsistent business rules across the enterprise. The financial services industry is now realizing the importance of reference data in formulating a firm’s operational strategies.

Exhibit 7: Increased Operational Risk Due to Faulty Reference Data



Source: Capgemini Analysis, 2012; *Exploring Costs, Capital Requirements and Risk Mitigation*, Allan Grody, 2005; *Banks Pushing Reference Data Boundaries*, Finextra, 2011

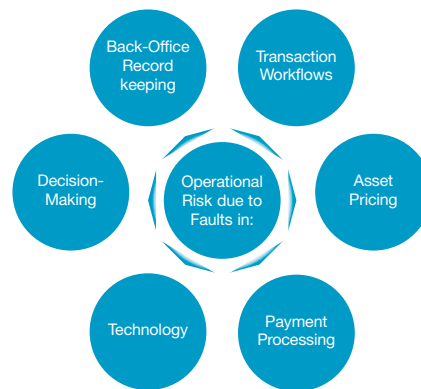
The Securities Industry Association (SIA) has identified reference data as one of the ten building blocks for effective compliance and successfully mitigating operational risk.

4.1. Understanding the Role of Reference Data in Effective Operational Risk Management

For financial firms, controlling operational risk requires accurate decision-making with complete and precise quantification of operational risk exposures over an uncertain period of time. Businesses should also realize that there is no upside to increasing operational risk and reducing this risk should be a key area of focus. In the case of market and credit risk, there is the potential for a greater return by controlling higher risk. As the financial crisis persists, operational risk mitigation has become a priority. To effectively control risk, firms should develop a deep understanding of their sources of operational risk.

In general, the majority of operational losses occur due to errors, both manual and system generated, in transaction processing.

Exhibit 8: Sources of Operational Risk in a Financial Institution



Source: Capgemini Analysis, 2012; *Banks Pushing Reference Data Boundaries*, Finextra, 2011

Regulatory pressures on financial institutions to control operational risk have increased and the Basel Committee on Banking Supervision (BCBS) has come up with eight risk event categories to quantify liabilities related to operational risk. In a survey conducted by the BCBS, *Execution, Delivery and Process Management* was identified as the highest loss event category that contains faulty product related reference data events. Overall, 42% of total operational loss events were accounted for under this category. A second category, *Clients, Products & Business Practices*—which also includes reference data—represented 27.5% of overall operational losses. Global regulators have come to recognize the role reference data plays in mitigating operational risk.

4.2. Effect of Basel Norms on Operational Risk Management

According to BCBS, operational risk is not just confined to internal operations or processes, but also includes exposure to external events such as global macroeconomic conditions. The BCBS, in its third installment, has categorically confirmed the importance of reference data in effective operational risk management. Until recently, the BCBS did not recognize inaccurate reference data as a potential threat. Only in the late 1990s, when Basel II was being negotiated, did operational risk first come into the limelight.

There were two main reasons that operational risk gained prominence in BCBS discussions.

First, the majority of financial losses in recent years were attributed, not to poor credit decisions or misreading market conditions, but to the errors made in operational side of the business such as:

- Unauthorized trading, for example Sumitomo and Barings
- A reckless lack of controls such as in the case of Long-Term Capital Management (LTCM)
- Incompetent strategy such as Metallgesellschaft
- Technological threats, for example the Millennium Bug

Secondly, due to the severity of the financial crisis, regulators pushed for the adoption of a new risk-based approach to credit in Basel II. However, they were also worried that this would reduce the sum of global capital in banks, and therefore added capital for operational risk in order to maintain the desired amount held.

Basel II recommendations related to reference data

In Basel II, which became fully operational in 2008, banks' capital for credit risk started to be calculated using a risk-based approach where lending to an AAA corporation is treated differently than lending to a small business with a lower credit rating. The Basel Committee, under Basel II, defined operational risk as “the risk of loss arising from inadequate or failed internal processes, people or systems, or from external events.”

Basel II defined risk management principles to help institutions improve their existing risk mitigating policies and processes. The Basel II committee recognized that:

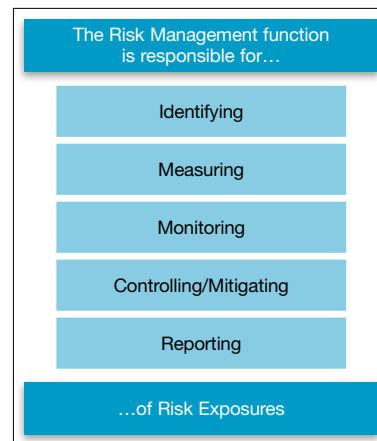
- **Reference data and workflow errors are major risk contributors:** Basel II identified data processing and transaction workflow related errors as contributing the most to the overall risk for a financial institution—more than improper trading and poor credit decisions.
- **Internal risk management systems are most efficient:** Each bank has a different risk profile and risk can be better controlled by having an internal risk management system with firm-specific parameters.
- **Global standards for reference data help mitigate risk:** Global data standards and centralized reference databases should be developed with consistent definitions and categories.
- **Comprehensive reference data maintenance reduces risk:** Proper maintenance and swift error resolving mechanisms should be emphasized to reduce *Execution, Delivery & Process Management* operational risk event type.
- **Improved reporting systems help mitigate risk:** Basel II norms require banks to provide accurate and reliable reporting data and improving its reporting and messaging systems.

The Basel II committee has emphasized the development of an internal and customized risk mitigation approach. Basel II acknowledges that rigid risk management systems using standard risk parameters may not accurately calculate the firm's risk exposure as, over time, institutions may change their structure through mergers, acquisitions, and divestments.

Basel III recommendations related to reference data

The Basel III committee reiterated most of the observations made in Basel II, but with an added emphasis on developing a company-wide risk culture. Basel III also emphasized the importance of a thorough understanding of the business mix of the company—including the various undertakings, the progression of different market segments across different geographies, and the desired state, merger and divestiture strategies—so as to better understand the firm’s risk profile.

Exhibit 9: Basel III on Risk Management



Source: Capgemini Analysis, 2012; Bank for International Settlements, 2011

Financial institutions have been advised to develop an institution-wide risk culture, as it is believed that each member of the organization is responsible for managing risk, not only the risk manager. The Basel III committee has emphasized following a bottom-up approach, where business units, under the purview of the group’s risk policy, procedures, and tolerance level, should be primarily responsible for managing risk on a daily basis.

5. Mitigating Operational Risk by Improving Data Management Systems

“Strategies have to be created and set into motion to accomplish reference data management that is both efficient and effective, and that maintains to the maximum extent possible, the histories of values and meanings as the values were originally implemented.”

Source: The Data Administration Newsletter, Michael M. Gorman, Feb 2010

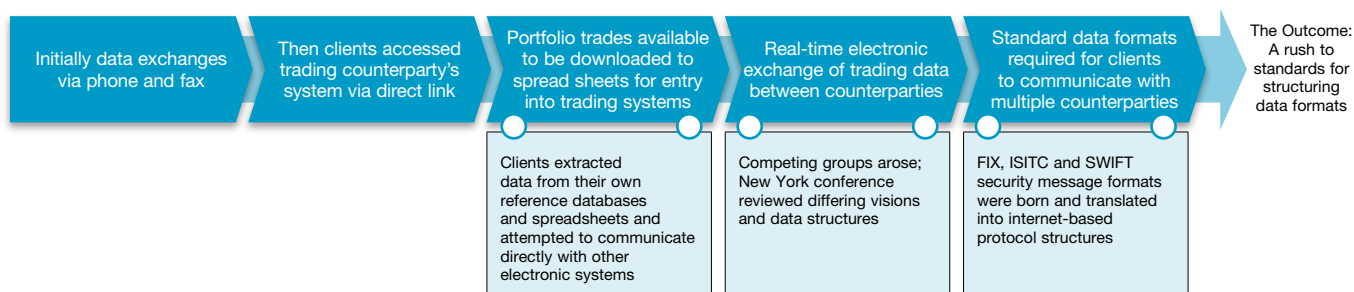
Most of today’s data management systems do not possess all the capabilities required to properly manage the data for the entire firm. Current data management systems have a limited ability to version master data and to model relationships between different data groups; inefficient methods of exporting data to other applications; and an inability to properly store organization hierarchies. In addition, master data is often skewed towards the functions of the system it is in.¹

Financial firms should analyze their current data management system and determine the gaps between the current and the desired system. Operational risk mitigation requires an in-depth cost-benefit analysis to establish the level of efforts required. Financial firms should focus their risk mitigation efforts on high risk areas to maximize operational efficiency. A company’s risk mitigation approach must also have functionalities such as early warnings using key risk indicators, data versioning, and advanced analytics. On the industry level, firms should define and adopt common global data standards to minimize losses due to data mismatching.

5.1. The Importance of Global Reference Data and Messaging Standards

While carrying out a financial transaction, a large volume of data is exchanged between disparate systems. If these systems have different data definitions, order mismatching may occur. In order to rectify this problem, the financial services industry is creating global data standards. The industry’s data exchange mechanism has improved over time. But with exponential increases in data volume and increased regulatory pressures, greater industry-level efforts are required to support global standards for data transport and content.

Exhibit 10: Evolution of Data Exchange Methods



Source: Capgemini Analysis, 2012

Different market regulators believe that global standards for data and messaging formats will facilitate sharing of data across a firm, and potentially on an industry-wide basis.

¹ *Master Data Management from a Business Perspective*, Microsoft, 2010

The International Standards Organization is working on establishing data standards

There are currently two industry wide committees. The first, the Reference Data Users Group and International Securities Association for Institutional Trade Communication (ISITC), was established to develop data standards and market practices to improve efficiency across the financial transactional cycle. The group consists of brokers/dealers, clearing houses/custodians, investment banks, and third party vendors including data aggregators and specialized professional services firms.

The second committee is the Software and Information Industry Association's (SIIA) Financial Information Services Division (FISD). FISD is a trade association with over 150 members including banks, investment firms, dealers, content providers, software developers, and other professional services.

The main objective for these two committees is to minimize settlement risk by creating a seamless process for managing financial transactions. The key goals for both these committees are:

- Standardize the multiple security numbering systems such as CUSIP, Sedol, and ISIN, and establish Unique Instrument Identifier (UII).
- Establish International Business Entity Identifiers such as uniform counterparty and supply chain identifiers, and Standard Settlement Instruction.
- Expand the list of Classification of Financial Instruments such as securities code, and currency denomination code.

Along with developing global data standards, the industry is also working towards establishing global standards for data transport and messaging allowing for seamless transactions.

Two main agencies are working towards establishing global data transport and messaging standards

The Association of National Numbering Agencies (ANNA) is a global agency which acts as a single centralized hub, storing and consolidating International Securities Identification Numbers (ISIN) received from its members and partners. The agency is working towards the improvement of receiving and delivering financial transaction messages, reducing time lags, and accurately identifying financial instruments. In 2002, ANNA authorized Standard and Poor's and Telekurs to manage the ANNA Service Bureau.

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) is an industry-led organization based out of Belgium which introduced its first standard messaging format, ISO 15022, in November 2002. The ISO 15022 system has now become a standard in securities and corporate-actions messaging. SWIFT upgraded its 15022 standard to the 20022 standard in 2010, incorporating FIX Protocol and Market Data Delivery Language (MDDL) into an all encompassing Extensible Markup Language (XML).

In the last few years, XML has gained in prominence and major financial services firms have already adopted this messaging standard. XML enables the communication between programs running on different platforms or even written in different programming languages. XML is an internet-based messaging standard which uses tags to imbed data into the message structure. With the help of middleware messaging software such as MQ Series or Tibco, financial firms can now enter reference data present in standard XML format directly into their portfolio management systems.

5.2. Risk Mitigation through Process Streamlining

The operational risk mitigation approach for financial institutions will vary according to the size, business mix, geographical presence, and the current state of their data management systems.

In a financial firm, process streamlining starts with determining the current state of data management systems and understanding business workflows.

Exhibit 11: Data Management Challenges for Different Size Organizations

Firm Size	Characteristics	Central Challenge
Small	<ul style="list-style-type: none"> Small amounts of master data Data integration is not a top priority 	<ul style="list-style-type: none"> Create a plan that will scale with the business
Mid-side	<ul style="list-style-type: none"> Data integration starts to become difficult for an organization Data stewards can be clearly defined 	<ul style="list-style-type: none"> Implement effective controls and data stewards
Large	<ul style="list-style-type: none"> Huge amounts of master data and system integration Mostly homogeneous data silos with relatively consistent attributes 	<ul style="list-style-type: none"> Build consensus among a large number of stakeholders Manage numerous integration points
Conglomerate	<ul style="list-style-type: none"> Many disparate businesses that may create many groups of data 	<ul style="list-style-type: none"> Determine the level at which master data lives

Source: Capgemini Analysis, 2012; *Master Data Management from a Business Perspective*, Microsoft, 2010

Key focus areas to mitigate operational risk and streamline processes

Focus on high risk areas: Rather than applying mitigation efforts across the board, firms should primarily focus on identifying high risk areas in the organization. After identification and careful analysis of high risk areas, firms should formulate their risk mitigation strategy revolving around these areas.

Use early warning messages: An effective risk mitigation strategy must have the capability of giving early warning messages in case of any imminent breach in any of the key risk indicators. An operational risk mitigation strategy should also involve the development of performance analytics capabilities.

Complete a cost-benefit analysis: Before deciding on a risk mitigation approach, businesses should calculate the total costs involved—including third-party data vendors' costs, maintenance costs, costs of additional facilities required, and technology costs—as well as the benefits gained, specifically a reduction in operational losses.

Perform proper maintenance and training: Data management systems must be maintained and updated regularly. Proper and continuous training of staff may increase cost, but these investments will help in reducing operational risks.

Establish best practices: The final step in process streamlining is to identify best practices and then implement them across the company. This will maximize the benefits of data management systems.

Centralized versus decentralized data administration

In addition to these focus areas, financial industry experts have recommended that firms create an independent department to maintain reference data across the entire enterprise in order to significantly reduce overall costs. The idea behind this concept is to administer data centrally and then distribute the data to other applications and systems. A central data repository will streamline the whole data management process and its flow to other systems. However, in a centralized data repository system, data management may become inflexible as data cleaning can often be handled better by the local teams.

In a decentralized repository system, it is easier to handle data related issues such as quality, accuracy, and exception handling, but data duplication is likely to occur making it difficult to locate data and possibly leading to data transaction failures.

Some financial institutions are implementing a **hub** and **spoke** data management system which combines the benefits of centralized and decentralized methodologies and negates their limitations. In this methodology, business unit specific data is maintained locally in the spoke and rest of the data is stored in a central location, the hub. The methodology solves data duplication problems without sacrificing data quality, and business workflows are also streamlined.

System architecture

After deciding on the data management methodology, financial institutions should focus on finalizing their system architecture. Technology firms have also investigated the pros and cons of centralized and decentralized data repositories. In a conference on reference data management conducted by Financial Insights, a research consultancy, best practices in data architecture were discussed. The group came to conclusion that data architecture should have two layers: **enterprise** and **application data management**. The benefit of this separation is that firms can now deploy any of the three storage techniques:

- Centralized data repository
- Decentralized data storage
- Hub and spoke data storage

Information architecture

The next and final step for institutions will be to finalize the information architecture for their data management systems. Information architecture defines the arrangement of information in the system and the terminology used. Information architecture also assigns the administrative rights and determines how this information can be navigated by the end user. For financial firms, defining the data architecture is one of the most important steps as effectively utilizing the stored information depends on the information architecture used. A poorly conceived information architecture creates a negative experience for end users and can have an adverse affect on the revenue since incomplete or faulty information can affect business decision making.

For effective information architecture the firm must understand the business context in which information will be used, the content, and the end user requirements. In financial services, two types of information architecture are prevalent:

- **Top-down approach:** In this approach, business strategies and end user needs drive the high level structure of the architecture. The structure is finalized first, and then the data is mapped with the business workflows.
- **Bottom-up approach:** Using a bottom-up approach to information architecture, the content is mapped first with specific user requirements and then the high level structure is finalized.

5.3. How Outsourcing Can Help Financial Firms Mitigate Risk

Financial firms are under tremendous pressure from both regulators and shareholders to improve operational risk management systems. Institutions are looking to manage costs without compromising the quality of risk management operations. Outsourcing the development of data management and risk mitigation systems to specialized professional services providers may provide financial firms with the unique value proposition they are seeking.

Outsourcing, in addition to providing a cost benefit, can help financial enterprises focus on strategically important core competencies by letting experienced/efficient service providers develop their systems. The one area where financial firms may not be comfortable with outsourcing is the risk element involved if breaches occur such as identity theft. For example, determining who will bear the responsibility if anything goes wrong.

Before outsourcing the development of their risk and data management systems to professional services firms, financial institutions should analyze their current systems and define key areas for the desired systems. Firms should analyze how many data sources they will be using, how the data is integrated with the system, how the data is organized and distributed to the end users, and what are the key steps in managing data quality.

Exhibit 12: Eight Areas to Focus on Before Starting a Reference Data initiative

Focus Areas	Description
Data Distribution Services	How is the content of a data distribution determined? How do downstream consumers establish their data needs? What is the set of tools by which data distribution requests are handled?
Data Governance	How is new reference data introduced? How are changes administered? How are services provided to new downstream consumers?
Data Quality Management	How do the data owners certify that the data is 'fit for purpose?' To what degree are non-value-added activities like adjustments and reconciliations being performed by downstream consumers to mitigate data quality issues?
Data Repositories	How is data being organized, stored and retained?
Downstream Consumers	How are service level agreements established with regard to content and quality with each of the data consumers? Who is using what in terms of product coverage, data characteristics, etc.?
Integration Layer	How do the upstream sources like vendors introduce their information into the reference data management process?
KPI and Change Management	How are changing business requirements and priorities handled? What is the impact on the Reference Data Management framework?
Upstream Sources	How is reference data being introduced into the production environment? Who are the data owners and what issues exist?

Source: Capgemini Analysis, 2012; *Reference & Market Data Management Solutions*, Capgemini, 2010

Professional services firms usually take a four stage approach to successfully implement risk and data management systems. Using this approach, professional services focus on the following key areas:

- Data sourcing and maintenance
- Workflow management systems
- On-site software for database maintenance
- Data distribution

For a financial firm, the key for successful implementation through outsourcing is to find a technology partner that understands the firm's business and will design a system according to the business and end user needs.

6. Conclusion

Financial firms realize the importance of accurate reference data and are working towards a centralized, industry-wide business model that will provide consistent reference data across an enterprise. Industry-led agencies such as SWIFT and ANNA are developing data and messaging standards, thereby reducing the probability of financial transaction failure due to data mismatch.

Some financial institutions are developing their reference data management systems in-house, but outsourcing system development to professional services providers can help them reduce the costs of acquiring, maintaining, and distributing reference data. Outsourcing should also help these financial firms to focus on their core competencies, thereby positively impacting their top-line and bottom-line growth.

Appendix: XML Based Standards & Regulatory Agencies

One of the clear benefits of XML-based systems is that they enable the same data to be accessible by many different groups, service providers and vendors for both internal as well as external connectivity.

Exhibit 13: XML Based Standards and Regulatory Agencies

	Financial Information eXchange (FIX) Protocol	FIXML	Financial products Markup Language (FpML)
XML STANDARDS	<p>FIX protocol is a messaging standard developed specifically for the real-time electronic exchange of securities transactions.</p> <p>Goal is to improve the global trading process by defining, managing, and promoting an open protocol for real-time, electronic communication between industry participants while complementing industry standards.</p>	<p>FIXML was devised as an XML vocabulary based on the FIX protocol. Essentially, FIXML takes a FIX tag value format and represents it in XML. These FIXML messages are then embedded within the traditional FIX headers and trailers which minimizes the impact on existing implementations of FIX.</p>	<p>FpML is the industry-standard protocol for complex financial products. All categories of privately negotiated derivatives will eventually be incorporated into the standard. FpML has four versions covering interest rate swaps, FRAs, options, FX and equity derivatives, credit derivatives, etc. and defines a messaging framework.</p>
REGULATORY AGENCIES	<p>Working Group 10 (WG10)</p> <p>WG10 was created in September 2000 by the ISO committee to coordinate and standardize the use of XML for securities messages. WG10 has defined a standard approach and guidelines to build a business model of the financial industry and the various supporting message models such as business message scenarios.</p>	<p>SWIFT and ISO 15022 XML</p> <p>SWIFT and FIX Protocol Limited (FPL) believe that ISO 15022 XML will provide the glue between the pre-trade/trade (front office) and post-trade (back office) domains. The effort leverages the experience and expertise of both organizations. FIX in the pre-trade and trade domain and SWIFT in the post-trade domain.</p>	<p>eXtensible Business Reporting Language (XBRL)</p> <p>XBRL brings the publication, exchange and analysis of the complex financial information in corporate business reports into the dynamic and interactive realm of the internet. It provides a common platform for critical business reporting processes and improves the reliability and ease of communicating financial data among internal and external users.</p>

Source: Capgemini Analysis, 2012; WebX Systems, 2011

References

1. *Basel II and Data Management: Telekurs at the Starting Blocks* by Dr Urs Bischof, Telekurs Financial, 2006. http://tkfextern.rolotec.ch/en/dl_tkfich_customers_documentation_realtime_0204_basel.pdf
2. *Basel III for risk management and operational efficiency* by Jamuna Ravi, Finextra, Jun 2010. <http://www.finextra.com/community/fullblog.aspx?blogid=4179>
3. *Crossing the Reference Data Hurdle in Basel II Implementation* by Rhujuta Kene and Anita Stephen, Information Management, Sep 2007.
4. *SIFMA Securities Industry DataBank*. Securities Industry and Financial Markets Association, 2011. <http://www.sifma.org/research/statistics.aspx>
5. *Exploring Costs, Capital Requirements and Risk Mitigation* by Allan D. Grody, Nov 2005, http://www.cetrel-securities.lu/fileadmin/media/downloads/Operational_risk___Reference_data.pdf
6. *Integration: Data Management's Last Mile*. Aite Group, May 2010
7. *Corporate Actions Data: Automate, Process and Synchronize* by Rick Enfield, Asset Control, Sep 2009
8. *G20 Working Group - Enhancing Sound Regulation and Strengthening Transparency*. Bank for International Settlements, 2011. <http://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=549>
9. *Scaling the Hurdles of Data Silos* by Martijn Groot, Asset Control, Sep 2009
10. *Taking the Risk Out of Data* by Martijn Groot, Asset Control, Sep 2009
11. *The Importance of Data Integration on Realizing the Business Value of Enterprise Applications*. Datamonitor, Nov 2008. http://wp.broadstreetdata.com/wp-content/themes/broadstreet/images/pdf/DI-DQ/Data_Integration_Relaising_Business_Value.pdf
12. *Understanding and rationalizing the use of reference and market data within the enterprise*. Capgemini, 2010. <http://www.capgemini.com/insights-and-resources/by-publication/reference--market-data-management-solutions/>

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