A Design for the Enterprise Risk Ecosystem

The lack of a single, holistic view of enterprise risk among financial institutions has been identified as a key factor in the ongoing financial crisis. With data organised along business lines – largely on a silo basis – risk managers have been merely measuring the risk of firms' vertical operations, rather than truly managing it. The result has been a lack of real information on holdings, exposures and counterparties, and an incomplete view of enterprise risk.

Industry practitioners expect regulators to impose a more stringent regime upon the financial services industry in the wake of recent events. Meanwhile, risk managers are struggling to establish a view of group-level risk. It's becoming clear to executives that that a truly enterprise-wide approach to risk management must be underpinned by a consistent, managed approach to data.

The need to establish a standard platform that addresses the data management challenge an enterprise approach to risk requires, is now being recognised by financial institutions as a critical element as they review their risk operations. This Briefing gives some insight into issues surrounding the creation of a standard enterprise-wide data architecture and offers guidance on how a risk ecosystem can be achieved.

An industry briefing prepared for Sybase by A-TeamGroup

A-TEAMGROUP

Executive Summary

In the wake of the turmoil created by the Credit Crunch, many industry practitioners are bracing themselves for increased regulatory scrutiny. The demise of so many banks and investment banks has highlighted the shortcomings of many firms' risk management processes. Senior executives and board members are seeking to rectify the situation, and are moving to establish risk management as a key component of the business model.

Some have suggested that many financial firms have been merely measuring – rather than managing – their exposures to markets and counterparties. The collapse of Lehman Brothers and others demonstrated how many firms were – and remain – unaware of their liabilities to instruments issued by troubled institutions.

The lack of a holistic view of risk has been cited as a contributory factor in the industry's lack of preparedness for the events of 2008. It's become clear to many practitioners, however, that before this can be achieved, a wholesale review of data management processes is required.

Only in this way, can firms hope to underpin their risk management aspirations with a data management infrastructure that can provide the people and applications that need it with the right data at the right time.

- The largely vertical structure firms have used to organise their trading and investment operations, usually along asset-class lines, makes it difficult to generate a broader, holistic view of risk across the enterprise.
- This structural problem has been exacerbated by the volume, update rate and complexity of data inputs into the overall risk view. Each of these measures has been growing rapidly, resulting in a bewildering array of data instances to consider.
- Before they can meet the compelling operational and regulatory need for up-to-the-moment enterprise risk data, financial institutions need to address the underlying data issues.
- Firms need to begin to look at data management on a horizontal plane. By adopting a holistic approach to standardising data – and correctly identifying internal business lines' and functions' requirements – firms can support the enterprise through a single data management design.
- The key aspect is consistency. Enterprise data is not necessarily about having the data in the 'right' format, but is rather about understanding how the data is used through the whole of the workflow, resulting in clearer communication, throughout the organisation, from front- and middle-office function to back-office ones.

Enterprise Risk in the Post-Credit Crunch Environment

The fallout from the credit crunch, and the defaults caused by the failure of Lehman Brothers, is forcing financial institutions to rethink their approach to risk management. At the same time, public outrage at the impact of the credit crisis has led to calls for increased regulation of financial services generally and risk management in particular.

As a result of these two factors, institutions are concluding that the traditional silo-based approach to risk management is no longer sufficient either to protect them from a repetition of the Lehman debacle or to assuage the impending regulatory scrutiny, the first iterations of which are now emerging from the Bank for International Settlements' Basel Committee on Banking Supervision, framers of the Base II capital adequacy rules.

Though they have yet to act formally, most industry practitioners and observers expect regulators to impose a significantly more stringent regime upon the financial services industry in the wake of recent events. The demise of several bulge-bracket investment banks, and nationalisation or part-nationalisation of major banks and other financial institutions in the U.S. and throughout Europe, have highlighted the shortcomings of many firms' risk management processes. Some have suggested that, despite having implemented sophisticated systems to meet regulatory requirements, many financial firms have been merely measuring – rather than managing – their exposures, both to the marketplace and to increasingly shaky counterparties.

The defaults caused by Lehman Brothers' bankruptcy added a cruel twist to the situation. Having underwritten huge quantities of credit default swaps, Lehman left many of its counterparties unclear or unaware of their liabilities with respect to such instruments they were holding. Even where firms were aware of their exposures to this Lehman paper, the lack of liquidity made it difficult to value or price their portfolios, let alone measure the risk associated with them.

Notwithstanding Lehman Brothers and other impacts of the credit crunch, risk managers, CEOs and boards of directors have been struggling for some time to get a timely view of their firms' overall risk positions. One problem has been the largely vertical structure firms have used to organise their trading and investment operations, usually along asset-class lines. This in itself makes it difficult to generate a broader, holistic view of risk across the enterprise.

This structural problem has been exacerbated by the volume, update rate and complexity of data inputs into the overall risk view – and indeed into the individual vertical risk views. Each of these measures has been growing rapidly, resulting in a bewildering array of data instances to consider.

With this rapid growth in the volume and complexity of data, achieving group-level risk management is proving a challenge for managers everywhere. For many firms, getting anything more frequent than a monthly view of consolidated risk across the enterprise is proving difficult. While some may have succeeded in generating a weekly view of enterprise risk, the expectation is that the requirement ultimately will be to migrate to a daily or even intraday view.

While many expect new regulation to set the pace in this respect, existing rules have already begun to drive the shift. For example, the best execution requirement of the EU's

- The impact of the credit crisis has led to calls for increased regulation of financial services generally and risk management in particular.
- Financial institutions are concluding that the traditional silo-based approach to risk management is no longer sufficient either to protect them from a repetition of the Lehman default or to assuage the impending regulatory scrutiny.
- The largely vertical structure firms have used to organise their trading and investment operations makes it difficult to generate a broader, holistic view of risk across the enterprise.

- Before they can hope to get a comprehensive and accurate view of their risk situation, financial institutions need to address the underlying data issues.
- Regulators could start to exert more influence on firms' internal processes by making the granting of investment banking and management licenses conditional on agreed standards of practice.
- Many believe a more prescriptive approach – like that taken in the U.S. – may be needed: the marketplace needs regulatory guidance.

Markets in Financial Instruments Directive (MiFID) dictates how firms should collect, store and access historical data relating to trades and the market conditions in which they were made. MiFID requires trading firms to keep tick data relating to transactions they have made for a period of five years after the event. Further, they must be able to use that historical data to reproduce an accurate view of the market conditions at the time of the trade, in order to prove they acted in the best interests of the client and in accordance with their published best execution policies.

Before they can meet this requirement – and many, more-stringent regulations that may be in the post-Credit Crunch pipeline – and exploit the ongoing and compelling operational need for up-to-the-moment enterprise risk data, financial institutions need to address the underlying data issues. While the solution that will enable them to fully understand and manage their risk positions has yet to be fully prescribed, what's clear is that firms no longer can manage risk on a siloed basis. Executives are beginning to realise that a truly enterprise-wide approach to risk management must be underpinned by a consistent, managed approach to data.

It's no surprise that many in the industry believe regulators will seize the opportunity to impose more transparency and better practices on investment banks and asset management firms. Regulators could exert more influence on firms' internal processes, for example, by making the granting of investment banking and management licenses conditional on agreed standards of practice.

As they grapple with the issues raised by the Credit Crunch, regulators may insist that firms implement some kind of pre-trade risk analytics capability. This would give CEOs and chief risk officers a holistic view of the entire enterprise they're responsible for. For example, a capital markets head may want to explore or, conversely, restrict opportunities for arbitraging between his or her firm's equities business and its associated derivatives desk. The challenge is in collecting the appropriate information on these businesses and presenting it in a dashboard for senior managers, providing them with true business intelligence on how to direct the business.

Historically, pulling together the broad array of data required on a timely basis has proved too much of a challenge for many financial institutions. The chief risk officer needs to be looking at market risk, credit risk, liquidity risk and operational risk. He or she needs to understand the cost implications of settlement before venturing into new markets. And this data needs to be pulled together in a timely way. End of month reporting is no longer sufficient and in many cases neither is end of day.

But what is acceptable? And what is operationally optimal?

Many firms see the gathering of this data as a cost centre rather than as a potential profit centre. Europe's principles-based approach to financial services regulation is well understood by the marketplace, but many believe a more prescriptive approach – like that taken in the U.S. – may be needed: the marketplace needs regulatory guidance.

Things may be beginning to move, though. As they move to respond to recent market turmoil, regulators might consider encouraging exchanges to allow trading in non-regulated, over-the-counter instruments, in order to make use of the exchanges' reporting mechanisms, thereby boosting transparency. Exchanges – under threat everywhere from the entry of nimble, electronic alternative trading systems or

multilateral trading facilities (MTFs), as they are designated under MiFID – are needless to say interested in any potential new sources of revenue as they see market share dwindle. In the face of expectations of significant exchange consolidation – in Eastern Europe, Germany, Spain, Italy – operators are keen to offer new services that leverage existing capabilities, and the addition of OTC instruments would fit the bill.

Certainly, by improving transparency – both in real-time quotes and reported trades – adding OTC instruments to exchanges could boost liquidity in these often-illiquid securities, by providing some level of benchmark pricing to the marketplace. This could be seen as a step toward building confidence among financial institutions and allowing them more accurately to value these instruments and their constituent parts, a problem that has exacerbated the current credit crisis, according to many observers.

Whatever the regulatory response to the current crisis, two things are clear: first, order volumes in Europe will continue to mushroom, exponentially increasing the number and frequency of data points institutions will need to monitor; and second, firms will need to understand what it is they need to know about, rather than continue to collect and collate data in a piecemeal, silo-based way, if they are to develop a strategic, holistic view of their business.

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- If they are to develop a strategic view of their business, holistic view of their business, firms will need to understand what it is they need to know about, rather than continue to collect and collate data in a piecemeal, silo-based way.

- The ongoing data explosion is challenging financial institutions to handle more data than ever before.
- Data management is set to become a major challenge for firms of all sizes in all locations, as they struggle to cope with more complex regulations, faster update rates and harder-to-source information.
- In many cases of losses, managers don't have sufficient data to understand whether to blame poor data or poor decision-making, as systems operate in solos that are disconnected and fail to give a true, holistic picture of what is happening.

The Data Management Challenge

To effect the kind of change needed to satisfy this emerging enterprise risk requirement, firms will need to meet a significant, multi-threaded data management challenge. First, they need to develop standard access to data across the board. But the ongoing and growing data explosion – combining more data points with ever-faster update rates – is challenging financial institutions to handle more data than ever before. At the same time, applications across the board are trending toward real-time updating, and audit trails increasingly are required – due to both regulatory and operational considerations – to capture tick-by-tick data.

Data centres are at capacity, and the data needs of various silos within the firm – from quants to risk managers, and from servers running algorithmic trading engines and databases containing five-year audit trails – continue to be highly specialised, even when analysing the same basic instruments and measures. Data management is set to become a major challenge for firms of all sizes in all locations, as they struggle to cope with more complex regulations, faster update rates and harder-to-source information.

Indeed, since the late 1970s, when portfolio reporting switched from a monthly to a daily net asset value (NAV) update, there has been an explosion in the volumes of data. The pace of update for pricing positions is accelerating, with many firms shifting from end of day pricing to intraday or even streaming tick data updates.

At the same time, faster electronic markets require participants to respond more frequently to more data points in increasingly volatile environments. With prices oscillating wildly, making the right decision quickly is essential; indeed, the danger of racking up significant losses doubles up quickly in volatile markets, which can magnify the impact of losses due to bad data or misinterpretation of good data. Worse, in many cases of losses, managers don't have sufficient data to understand whether to blame poor data or poor decision-making, as systems operate in silos that are disconnected and fail to give a true, holistic picture of what is happening.

In these instances, managers aren't able to ascertain which areas of their business are working efficiently. Because there is no flow of information between business lines, it's difficult for common data elements to be transferred from one area to another. And rather than taking a holistic view of the business, staff are preoccupied with fighting fires due to local inefficiencies, or responding to the latest regulatory decree or change in tactics.

In order to change this picture, it's essential that financial institutions begin to look at data management on a horizontal plane. The first constraint on any trade cycle is the power of the infrastructure upon which it is reliant. The gradual implementation of specialised systems often results in the creation of data silos within a financial institutions, even though these lines of business often have similar data needs.

For example, traders and automated trading operations need real-time market data, while quantitative analysts and model development staff need historical (time series) data and research (scenarios, post-trade analysis). P&L and risk management, meanwhile, need trade and risk data, and management and compliance reporting need corporate data.

By adopting a holistic approach to standardizing data, and correctly and comprehensively identifying the groups' requirements at the time of implementation, all of these functions can be catered to through a single data management design.

The Enterprise Risk Ecosystem

With the Basel II capital adequacy regulations under review at the time of writing, it's increasingly likely that regulators will begin to require financial institutions to tighten their risk management processes. A single data model for all areas of investment operations, underpinned with standard use of external data sources, internal database and metadata, can meet the needs of users across the board all through a single infrastructure, and provide the fuel for an enterprise view of risk. And by working with legacy platforms, applications and databases, the cost of implementation can be contained, while the benefits allow the institution to quickly demonstrate return on investment according to a broad range of parameters.

Firms need a kind of ecosystem that allows interaction between a wide variety of data sources, both internal and external, and that uses a single data model to satisfy the needs of all users. From the same set of sources, for example, the firm should be able to meet the broadly disparate needs of risk managers, who need highly cleansed, verified and validated 'for-the-record' data, and algorithmic or quantitative trading applications whose need for speed means they are built to receive 'raw', uncleansed low-latency data.

The key aspect here is consistency. Enterprise data is not necessarily about having the data in the 'right' format. It's about understanding how the data is used through the whole of the workflow, resulting in clearer communication, throughout the organisation, from front- and middle-office function to back-office ones.

But many organisations are already overburdened. Their data centres are reaching capacity. Their middle offices represent an unfortunate buffer between front and back office data communications, presenting an obstacle to achieving straight-through-processing. Data is organised by business silo, hampering horizontal data communications between business lines. Under these circumstances, the prospect of creating the data ecosystem required to support holistic risk practices appear bleak.

What's needed is a new approach. When Formula 1 modifies the rules surrounding car design in order to keep things interesting, the race teams' designers don't merely replace components on their respective cars, in essence retrofitting to meet the new requirements. Rather, they go back to the drawing board and rebuild based on previous experience. They assess every working part, retaining those that perform and replacing those that don't with new ones that can provide better value.

To apply that kind of process to their data infrastructures, already-overburdened financial institutions need to focus sharply. They need to break down their existing architectures into core elements, keeping those that work and discarding those that don't. They need to take a 'Jeep' approach (just enough essential parts), keeping things as simple as possible and focusing solely on the components that are needed to fulfill business needs and deliver on business strategy.

Within the data ecosystem, that translates into a scalable, multifrequency data platform capable of taking inputs from low-latency direct exchange feeds, real-time consolidated feeds, intra-day and end-of-day pricing services, order and execution management systems, risk and portfolio management systems, and other internal and external sources of event-based data.

- A single data model for all areas of investment operations, underpinned with standard use of external data sources, internal databases and metadata, can meet the needs of users across the board.
- From the same set of sources, firms should be able to meet the widely disparate needs of risk managers and algorithmic or quantitative trading applications.
- Enterprise data is not necessarily about having the data in the 'right' format; it's about understanding how the data is used through the whole of the workflow.

- The introduction of 30+ assorted broker and independent dark pools and alternative trading systems (multilateral trading facilities), lifts the opportunity for firms to demonstrate increased scope for investment performance.
- The Bank for International Settlements' Basel Committee on Banking Supervision has outlined plans to promote stronger risk management and governance practices to limit risk concentrations at banks.

Making the Case for Change

Regulation may be driving the market to turn to thoughts of an enterprise-wide risk ecosystem, but there is a compelling business case for adopting one. Europe's generally principles-based approach to regulation means that there may be opportunity for active institutions to differentiate themselves from their competitors. Unlike in the U.S., where a prescriptive approach to regulation can often mean the industry's response to compliance is uniform across participants, Europe's stance of leaving it to the marketplace to find its own solutions means that operators are able to gain competitive advantage through operational efficiencies even as they move to achieve compliance.

As such, as others decide that they'd best take heed of regulators' calls for a holistic view of risk, the benefits they accrue as a result will place detractors at a severe disadvantage. In other words, there are significant costs for firms that elect not to adopt an enterprise data ecosystem.

What's more, as MiFID takes hold in Europe, the addition of new trading venues is proving a double-edged sword. While the introduction of 30+ assorted broker and independent dark pools, and alternative trading systems (multilateral trading facilities) increases the opportunity for firms to demonstrate increased scope for investment performance, it also adds to the overall complexity of the marketplace, and in turn to the challenge of measuring the institution's overall market exposure.

Regulation is also increasing transparency across asset classes. Again, MiFID in particular is raising the bar. It has already introduced more onerous pre- and post-trade reporting of equities transactions, and requires firms to maintain a five-year audit trail of order and trade data, and related market data. And MiFID will go further as it moves into other asset classes, replicating the requirement. This threatens to yield significantly more data points as inputs into firms' risk positions, even as this additional data makes for improved decision-making and pre- and post-trade analytics.

Thus, these additional data sets could help firms in improving their trading and investment capabilities, provided the data is able to flow throughout the enterprise as needed and at the appropriate velocity.

But MiFID isn't the only regulatory game in town. The widely anticipated modification of Basel II this autumn by the Bank for International Settlements' Basel Committee on Banking Supervision has outlined plans to promote stronger risk management and governance practices to limit risk concentrations at banks.

One of the key elements of the committee's strategy is the strengthening the risk capture of the Basel II framework, in particular for trading book and off balance sheet exposures. The committee has also suggested that there needs to be an evaluation of the requirement to supplement risk-based measures with simple gross measures of exposure in risk management frameworks. In particular, the committee identify the strengthening of counterparty credit risk capital, risk management and disclosure at banks as key building blocks.

The committee expects to issue proposals on a number of these topics for public consultation in early 2009. In the mean time, firms are assessing their processes to prepare for the possibility of more specific and prescriptive language from the committee.
Firms are expected to focus on areas like balance sheet management, where access to

real-time data within the treasury function to support the generation of reports on an *ad hoc* basis will be key to establishing a validated liquidity management process.

Financial institutions are also expected to place more emphasis on the future valuation of holdings. In particular, with a liquidity management process in place, firms may be able to factor liquidity into their valuations of the assets they hold. Certain instruments, such as corporate bonds, may be more liquid than others, generating a 'liquidity premium' in their valuations.

An Ecosystem Approach

As onerous as these requirements sound, coming as the marketplace enters what may be its deepest and longest recession for generations, help is at hand. It is possible to build the infrastructure required in order to compete effectively in the new environment. But it's clear that there is no generic requirement. What's needed is an understanding of the specific nuances of the marketplace and the ability to apply those nuances to key operational functions and processes.

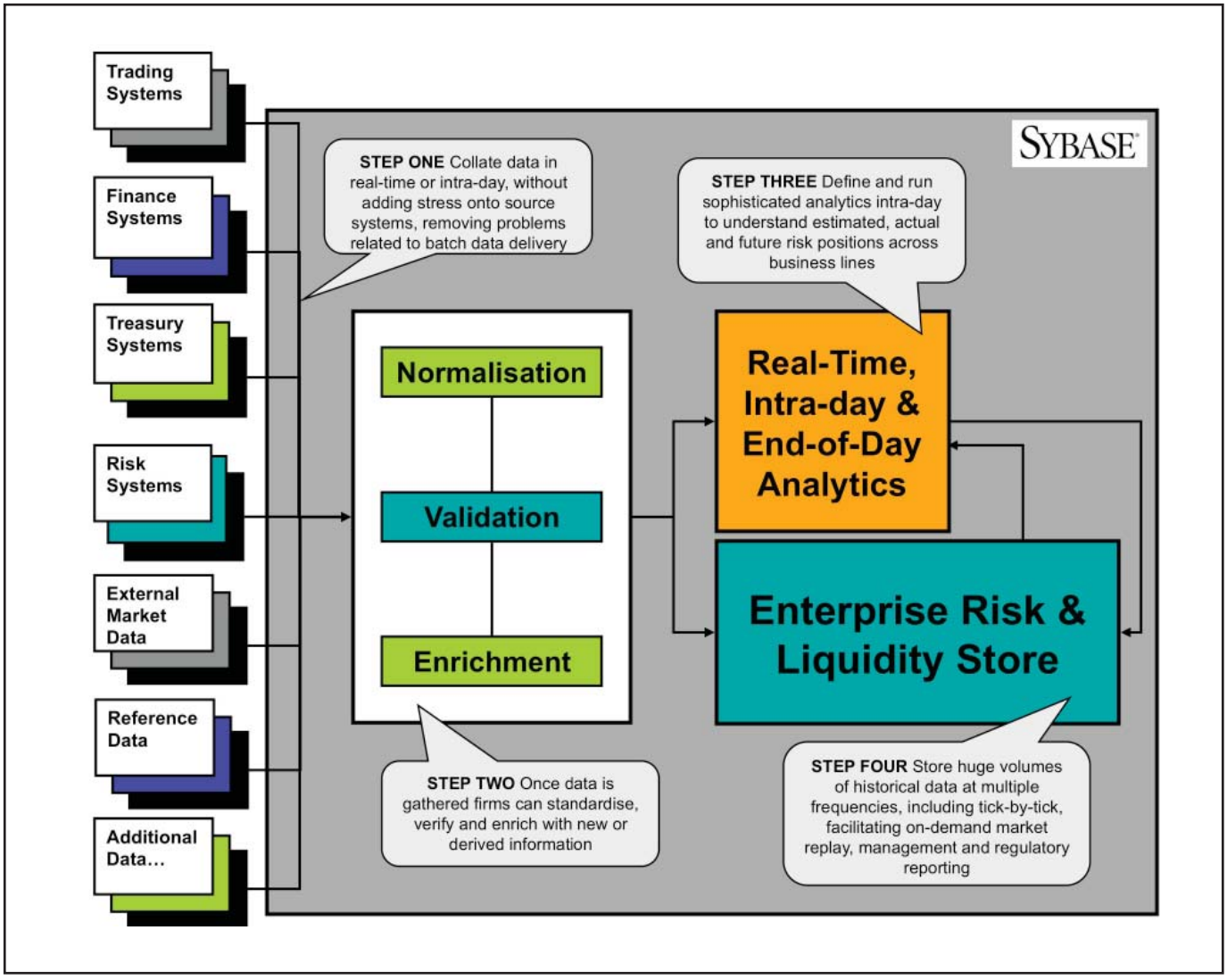

Figure 1: Four Data Management Steps Toward an Enterprise View of Risk

- What's needed is an understanding of the specific nuances of the marketplace and the ability to apply those nuances to key operational functions and processes.
- While traditionally considered a one-size-fits-all solution to data standardisation, EDM today is about broader application of a managed data environment, which pulls data from disparate platforms across the enterprise.
- As the market moves toward a real-time environment, the business models focus on developing a more holistic framework for group-level risk, there is a need to review the underlying technology that is supposed to support these changes.

Sybase believes it has a solution that meets the infrastructure challenges surrounding the enterprise risk ecosystem, which at the same time can be applied to key application areas such as development of algorithmic and quantitative trading models and the creation of real-time risk management analytics.

Given history, and the level of complexity, Sybase acknowledges that firms will need to work with legacy systems, and has set out a programme for partnering with entrenched suppliers like Oracle and Microsoft, which often play a role in managing major internal databases for clients.

This approach embraces the ecosystem concept. Sybase is now working with clients to achieve this change in the way of moving toward achieving a holistic view of the enterprise. In this way, Sybase believes, the specific requirements of individual business functions can be satisfied, while drawing upon a single, standard data management infrastructure.

Sybase believes the approach represents a change in definition of the term Enterprise Data Management. While traditionally considered a one-size-fits-all solution to data standardisation, EDM today is about broader application of a managed data environment, which pulls data from disparate platforms across the enterprise.

Taking the Steps to an Enterprise Risk System

Most organisations are able to meet both their regulatory and function-specific requirements for desk-level or even entity-level risk management and reporting using specialist systems that have evolved since their original inception perhaps tens of years ago.

As the market moves toward a real-time environment, and business models focus on developing a more holistic framework for group-level risk, there is a need to review the underlying technology that is supposed to support these changes. In addition, firms have to adhere to stringent changes to the increased regulatory pressure, such as the U.K. Financial Services Authority's recent moves aimed at reducing liquidity risk.

The development needed to fulfil these business and regulatory obligations quickly start to show the level of granularity and intra-day availability of data firms require in order to power the enhanced modelling and reporting processes defined by the business.

To achieve this, firms have two key problems to solve. Firstly, how to collect the right data, and secondly, how to build a single data warehouse that facilitates the data validation, analysis and reporting needs in a way that will scale to the future.

Technologies currently in place to manage market or credit risk, product control or even treasury functions are not privy to the data required to meet either a stable liquidity risk framework, let alone a sufficient enterprise risk system. The highly granular data required at a product or deal level will need to be collected from the multitude of cross-asset trading systems and sub-ledgers or – under a worst-case scenario – created from scratch, particularly for more complex assets with complicated term sheets.

The challenge for firms collecting this data is to do so in a non-invasive way that does not impose additional stress on systems that may already be running close to maximum capacity. Once the data is collected, the next stage is to provide an environment to validate and 'shape' the data into the right format to be analysed. Whether an organisation is trying

to calculate product-level cash flows, volatility surfaces, credit curves or VAR, doing so at an enterprise level, on a daily basis requires the right technology, offering high-speed analytics with a proven track record in reliability.

From here the data, a lot of which is static reference data, needs to be made available in a scalable storage environment or data warehouse. Here, product, deal, customer and derived data can be stored in confidence for use in further analytical and reporting functions for monitoring and governance of the policies put in place by the business.

Sybase Financial Services delivers 'fit for purpose' technologies to meet these requirements backed by more than 20 years as a leading provider of data management services to the Financial Services Industry.

To enable organisations to operate intra-day, enterprise-level risk management, Sybase provides data management solutions that enable:

- Data aggregation from multiple systems of any type from databases to file based applications without adding additional load on to the existing infrastructure
- Data modelling to ensure accurate data integration and to create adequate meta data for improved granularity and understanding
- Automated data validation without adding latency to the storage process removing the need for timely manual validation and reduced chance of analysis on inaccurate data
- High speed scenario testing and complex analytics on combined historical and real-time data on an intra-day basis
- A single data warehouse for all content allowing data to be re-used more efficiently and facilitating intra-day and ad-hoc reporting and model development
- Ability to efficiently execute and develop new business strategies quickly
- Progress towards a group level, multi-entity risk management platform without disrupting existing business as usual or placing undue stress on internal sources of data.

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