

IBM's Information Management Stack

Exploiting Information for Business Value

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► INTRODUCTION

Information overload has become a paradigm for the Internet age, and it will not improve with time; quite the opposite, organisations will need to look at terabytes and petabytes of data storage in the years ahead for common enterprise applications. Particular industries have specialist needs: investment banks trading complex financial instruments will test trade strategies with data going back over many years – creating a heavy demand on infrastructure resources – and aerospace industries rely on electronic design and simulation testing, again using huge quantities of data. However, the typical business enterprise is also facing increasing demands for unstructured data management, including e-mail, voice, video, and electronic document data. E-mail especially has grown not just in size but also in critical importance to the business, carrying intellectual property that needs to be secure and traceable.

Lack of traceability can lead to financial penalties from regulatory bodies, so ensuring easy access to archived information is vital. These problems tend to be manageable for the Small to Medium-sized Enterprise (SME) market, where the volumes and/or number of departments concerned are small. For enterprise-scale businesses, however, the sheer quantity of data and diverse range and needs of departments creates a serious problem in finding and retrieving information. Simply finding sufficient storage space does not solve the problem as new types of scaling problems arise: inefficient searching consumes network bandwidth, retrieval is unsatisfactory, and administration burdens increase in maintaining and archiving large repositories. On top of this, the power bills for running server farms are not negligible. At the root of the problem is getting pertinent information to the right people, at the right time, and the right location. So with volumes increasing and a greater percentage of information stored in electronic format, the problem is getting worse, not better. For large enterprises there are the additional complications of mergers and acquisitions: any plans towards consolidation and standardisation become relative when a new subsidiary appears, and the whole integration cycle needs to be re-started.

Against this background, organisations that are determined to succeed must recognise the vital role of information and its value as an asset. An appropriate Information Management strategy is needed to help organisations cope with today's complex business environment with its mix of demands, opportunities, and risks. The strategy would enable organisations to exploit the inherent value of information in pursuit of their objectives. A broad approach is required for the definition of the strategy to take into account what information is needed to run the business, its units, and for the roles of individuals. To implement the strategy a set of information management capabilities is required, similar to the way in which transaction processing capabilities have been built up over the last three decades. However, the same pitfalls apply, with tactical investment in individual solutions leading to unmanageable chaos. In addition there are new challenges, since the effective use of information must blend human skills and processes with technology, and will be driven by the requirements of individuals and groups, as well as by the objectives of the organisation.

The market for Information Management (IM) comprises a mix of established and new technologies. On the one hand we have software such as Business Intelligence (BI) and Enterprise Content Management (ECM) that are mature technologies. On the other we have the newer Master Data Management (MDM) and data change capture solutions. The factor that most distinguishes the IM market from others is the changing approach towards IM that is bringing established software segments such as BI and ECM closer. IBM has a long history of delivering solutions and services in this market and it arguably delivers the broadest portfolio of IM software. These come under IBM's Information on Demand (IOD) initiative, a cross-IBM effort spearheaded by its Information Management Division. In this White Paper we examine IBM's IOD and map some of the vendor's leading products to Butler Group's Information Architecture.

Purpose and Audience

This White Paper provides senior-level decision makers and CIOs with insight into developing an IM strategy and the types of technologies that are required to support that strategy. It includes an introduction to solutions and services provided by IBM in support of the implementation of an IM strategy. It also draws upon Butler Group research to provide some context around the vendors' wide range of products.

► THE NEED FOR INFORMATION MANAGEMENT

Organisations are generating and collecting data at an unprecedented rate. This data has an inherent value that can be tapped into to gain business insight and competitive advantage. Furthermore, in many organisations a large proportion of enterprise information, in the form of content or unstructured data, is stored in unmanaged repositories and the race is on to try and reverse this potentially business-paralysing trend. Moreover, some enterprise content is still paper based, even in today's Electronic Age. This means that it requires manual processing which is time-consuming, labour intensive and error prone, and makes it difficult to achieve process consistency and efficiency.

Businesses processes often require that content is presented alongside structured data. For example, a customer complaint may involve a customer record stored in an enterprise application, together with correspondence which has been scanned and stored in a content management system. Responding to the customer will require collaboration between several employees, which involves passing the document around the organisation and awaiting feedback, with little or no controls on the timescale. Examples of similar processes include purchase invoice processing, grant applications, digital mailroom processing, claims management, and order fulfilment.

Many business processes involve handling a combination of unstructured information (or content) and structured data, in different formats, located across multiple systems. The problem with making such processes efficient and productive is that few organisations address requirements from a strategy level. Many neither have a fully developed IM strategy nor the technology to support it. This being the case, Butler Group believes that we will see many more organisations making headline news for all the wrong reasons over the coming months, as they fall-foul of industry regulations, compliance directives, and 'digital leakage'. Indeed, failure to act now could also seriously damage the information economies of the world – a worrying thought for any CEO, investor, or citizen.

Looking to a more positive aspect of IM, organisations are now starting to consider the possibilities afforded by Web 2.0 technologies and concepts. As new application runtimes and Web development models enrich the browser experience, so the reach and range of information productivity tools and applications is extended within the enterprise. One side effect of this is that the software for managing structured and unstructured information is starting to overlap and that is bringing new opportunities for improving the quality of information, gaining business insight, and understanding business situations and risks better. In particular the convergence of BI and ECM present new, untapped opportunities as well as technology challenges for the enterprise.

Drivers for Better IM

IM technologies are great levellers, as they enable smaller organisations to compete with much bigger companies and, when used effectively, enable larger enterprises to manage and maintain growth, scale, and agility. While it is undoubtedly an organisation's transactional IT systems that provide the motive force required to compete within a given market, it is the business or institution's IM systems that enable that organisation to perform well by informing judgement, supporting decisions, and actuating strategies.

The business case for IM can therefore be summarised as follows:

- **Making the most of information:** As we collect and generate more information we have to learn to manage it better throughout its lifecycle so that we have access to information when we want and in the format that we want. Furthermore, by exploiting corporate information we can gain insight into how the business is doing, where it is heading, and why.

- **Increasing productivity:** Information work is no longer the sole domain of the white collar worker, and for most businesses and institutions, information work is now an integral aspect of almost every role and function within the organisation. With 'Information Work' accounting for around 70% of salaries, enterprise IM systems together with collaboration technology must now be extended in both reach and range to meet the requirements of the deskless and field-force employee. Moreover, these systems must span ever broader organisational and geographic divides.
- **Converging worlds of structured and unstructured information:** Today's 'new world of work' relies as much upon unstructured information as it does structured information, and so we are now starting to see solution sets that address both of these realms with equal importance. However, weaving together transactional, operational, and management information types is no easy matter, and delivering this in a timely fashion and in a useful format continues to present a real challenge.
- **Regulatory compliance:** To compound the problem, today's decision-makers and information workers in general, must carry out their tasks and duties in an increasingly complex, hostile, and tightly-regulated world, and so CIOs must find new ways to empower the beleaguered workforce without transferring that burden to the already overstretched IT department. In most circumstances this means delivering more with less, and at a time when the 'credit-crunch' is affecting almost every business sector, this means doing it now rather than later.

Operational Considerations

The relationship between uncertainty and information is well established and quite long in the tooth. Claude Shannon wrote a seminal paper in 1948 that outlined this relationship in mathematical terms and communication engineers have used this ever since. His paper stated that information can be measured by the amount of uncertainty it eliminates, and for those who like hard measures he gives a formula for the measure of information. Raw data is often confused with information, but raw data on its own does not convey any information; it is simply a piece of data that has no relevance to us at all. Give the data some context and it can instantly gain relevance and become valuable – it is turned into information and an antidote to uncertainty. Unfortunately, many organisations have masses of data but little information. To put it another way, they are drowning in data, but are starved of information.

The problem is that although a lot of data is collected or generated by organisations today, it is used in a passive way: structured data is often used by transactional systems, and then stored, backed up, and archived; unstructured content is created, distributed, stored, backed up, and eventually archived. These requirements produce massive overheads in terms of disk space and back-up management, but the bulk of the data, after its initial use, goes untapped, stored until needed. Sometimes the data is sought and surfaced from deep storage as part of an urgent action to respond to a business question or to a regulator. This kind of tactical use of data often results in the organisation going into a costly 'fire-fighting' mode of operation, only to find that the valuable context of the data is lost or forgotten. These issues lead to a kind of scenario where organisations are operating despite their data, rather than as a result of good data. This kind of 'Information Friction' comes about as a result of:

- A siloed approach towards structured and unstructured information.
- Poor data quality.
- Information overload without intelligent filtering.
- Disconnected data stores.
- Multiple interfaces.
- Poor corporate memory with lost context, knowledge, and expertise.
- Lack of classification makes information difficult to find.
- Inability to value and prioritise information.

Information Friction causes a number of problems, such as: poor customer service; damage to brand reputation; missed revenue opportunities; cost of rework; and reduced employee productivity. It is undesirable for operations and must be minimised, through an effective IM strategy and architecture, to allow the organisation to operate smoothly.

IM Strategy

Companies and institutions are neither precise nor perfect: they are what we call ‘fuzzy’. They are fuzzy because the information used to run them is usually blurred, indistinct, and incomplete. Reducing this fuzziness often falls on the CIO, and in order to accomplish this he or she must strike the right balance between investments in people, processes, and technologies. This must be achieved in a manner that does not leave one part of the business lacking over that of another. These issues and other requirements can be addressed by defining an IM strategy.

Butler Group believes that organisations need to take a broad approach to their IM strategy, beginning with the standpoint of what information they really need to run their business, their departments, and the roles of individuals. When an information audit is undertaken, there is often a substantial mismatch between the information that the organisation produces, and what its executives, managers, and staff actually find useful. If you have not yet undertaken such an exercise, then we would highly recommend it. One of the acid tests is to ask senior managers in different departments to imagine that they had been called to a board meeting at five minutes notice to report on and explain the performance of their workgroup or individual role: what information would they turn to, to take into that meeting, what formats would it be in, and how easy would it be to lay their hands on it within that timeframe? A useful way to approach the analysis of information requirements is to use a strategy map, associating key information assets and processes with one or more strategic objectives. For example, one of the elements of the strategy map might be effective customer communication, to which one would assign one or more customer databases, customer survey data, and capabilities for customer segmentation, customised mailings, and analysis of customer feedback. The advantage of this approach is that when discussing IM objectives and business cases within the organisation, it is easy to demonstrate the relationships to strategic objectives.

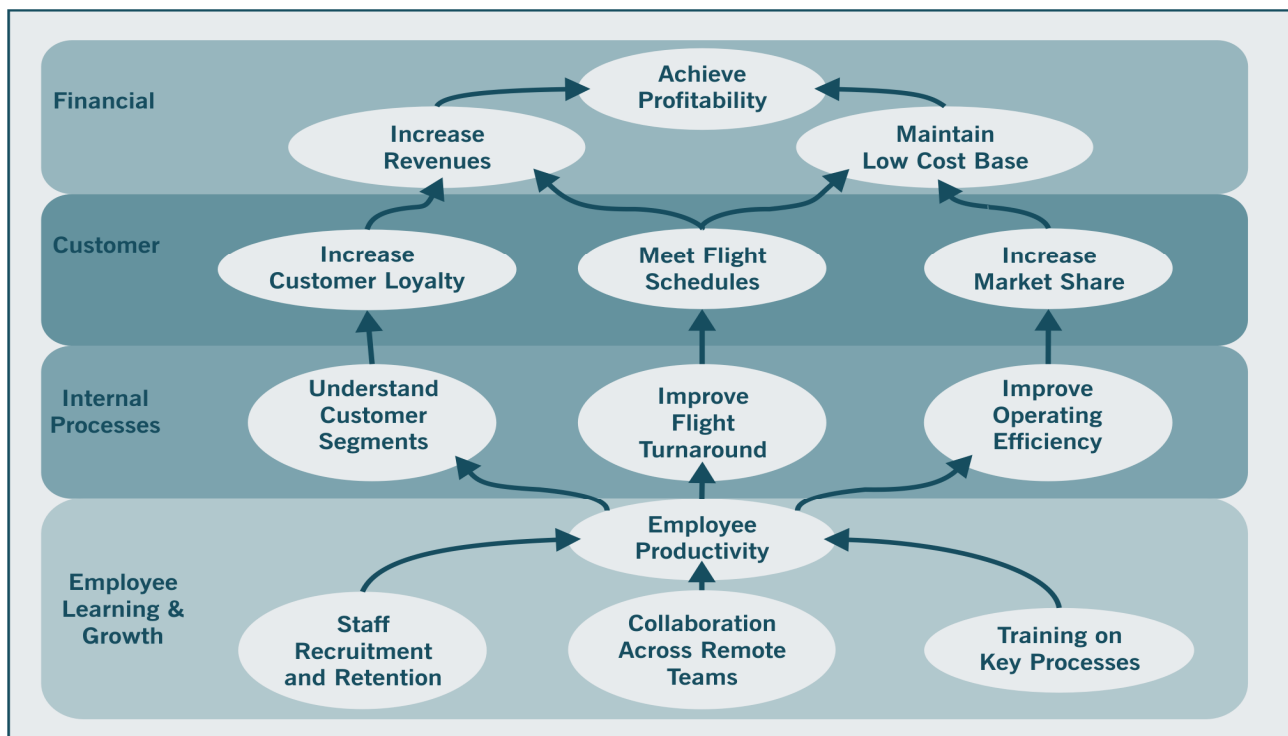


Figure 1: Example of an IM Strategy Map for an Airline (Source: Butler Group)

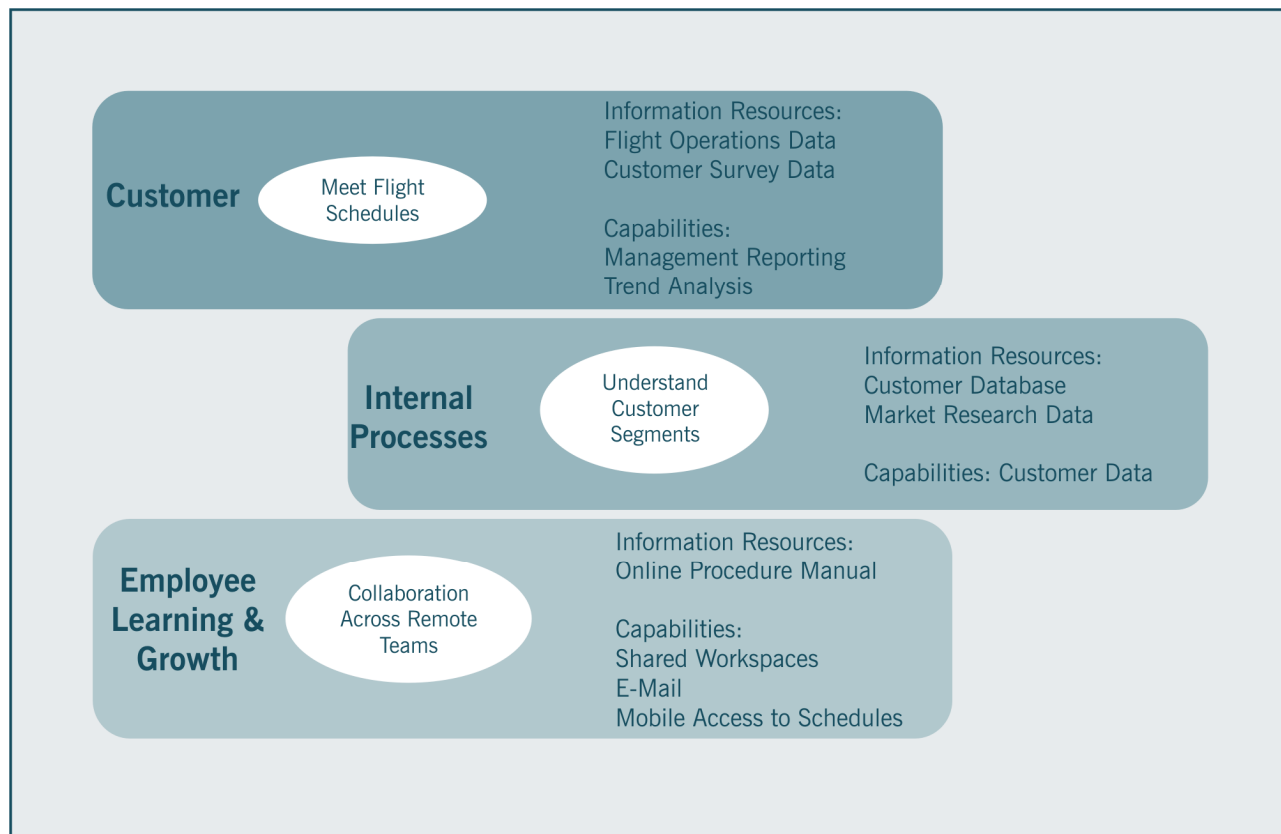


Figure 2: Mapping Information to Strategy (Source: Butler Group)

Figure 1 shows an example of an IM strategy map for an airline company. It sets out the overall objectives and the links between them. Figure 2 shows how the objectives from the strategy map can be linked to specific actions. These together with the information resources shown in Figure 2 form the requirements for implementing the IM strategy.

It is also instructive to consider how different styles of BI are used within the organisation. Much of the traditional use of BI has been tactical and data-centric: focused on analysing the data generated by business applications, and utilising this for business improvement projects in specific areas. Today, we are seeing an increased role for operational BI, which is more process-centric and focuses on the efficiency and performance of current operations, often integrated into those same business applications, rather than being presented as a standalone solution. Finally, there is an emerging role for a more collaborative style of BI used as a strategic tool, both in terms of enterprise-wide performance management and as a stimulus for innovation.

An IM strategy must understand requirements at these different levels, and furthermore, must link them together. This is a strategy that should be led by the business objectives (preferably visualised through a strategy map or similar framework), rather than by technology, although it will of course be informed by the current business and technology architecture. The IM strategy should also cover the organisational aspects of fostering an information culture based on clear IM roles and responsibilities, clearly-defined and communicated policies, and active promotion of collaboration and information sharing. It can then be used to develop a set of key capabilities in the areas of data infrastructure, data management, information services, and information delivery, which then (and only then) should be mapped to the underlying technology requirements.

From a solution perspective, there is certainly increased convergence of different IM disciplines, including BI, ECM, Collaboration, and Enterprise Search and Retrieval, but this is in its early stages, and there is much progress still to be made. It should also be noted that IM lags behind other areas of the software infrastructure in its adoption of open standards – there is still much potential here for lock-in to proprietary solutions, which makes careful technology evaluation and selection even more important.

When employees at all levels of the organisation focus on what information they REALLY need to fulfil their roles, we believe that it leads fairly directly to the conclusion that all types of information (whether structured or unstructured) must be incorporated into this strategy. Taking the “five-minute’s notice board meeting” test usually unearths a mixture of formal reports, documents, unmanaged spreadsheets, and e-mails, and it’s a good illustration of why this broader approach to IM is so important.

Technology Considerations

The technologies required to sustain and enhance the IM strategy should be considered at five levels:

1. Data Infrastructure: There must be a solid underlying infrastructure that provides cost effective storage, security, and business continuity.
2. Data Management: A management layer to handle lifecycle management, classification, metadata management, and data quality.
3. Data Extraction and Integration: Solutions within this layer address requirements for data integration (e.g. data consolidation into data warehouses or data federation), and data synchronisation through MDM.
4. Information Services: A services layer to provide information capture, search, retrieval, query, and analysis.
5. Information Delivery: A delivery layer to enable reporting, publishing, customisation, and collaboration.
6. Security is a requirement across all levels.

These are shown in Butler Group's Information Architecture (IA) (see Figure 3). The IA can be viewed as a layer that sits on top of an Enterprise Architecture (EA) for managing information; for business that would also entail focusing on the needs of users and the business, as contrasted with an IT-centric view of information.

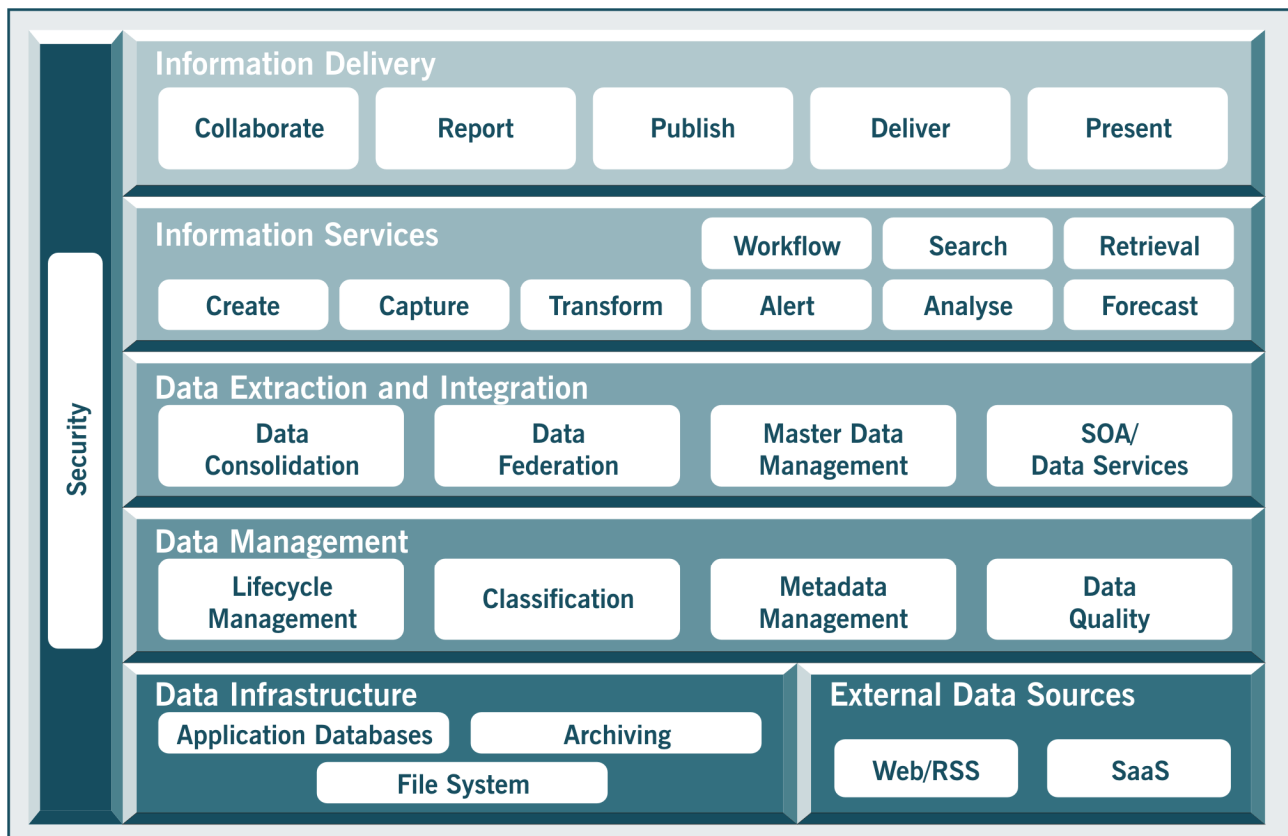


Figure 3: Butler Group's Information Architecture (Source: Butler Group)

These capabilities must span structured and unstructured information, combine both tangible and intangible sources, and be abstracted as far as possible from individual technologies. Leading organisations are using an architectural view to ensure a coherent approach to building business applications on these foundations.

The Building Blocks

The elements in the IA work together, albeit in different layers to enable the end goal. Take the need for a consistent enterprise-wide standard for describing data; this is where a taxonomy, classification, and metadata management become useful (shown in the Data Management layer in Figure 3).

The greater the penetration of taxonomies and metadata within an organisation, the easier it becomes to build an IA. A MDM solution (in the Data Extraction and Integration layer) works towards the same end goal for managing the data explosion. This entails bringing together all sources of data, such as dispersed customer detail files, and particularly those that have likelihood to conflict with each other, put these through a cleansing process and then store the result in a master database. The master data then becomes the subsequent source for all data retrieval and changes. Whilst this concept is simple to describe, it is a major undertaking for a large enterprise. Not least is the synchronisation with legacy systems, and for a diverse range of enterprise applications to integrate with the master system.

Data cleansing is a key step in data management and is also a crucial step in data warehousing, but is not well understood in other contexts, and even within BI it can be a neglected area. Cleansing involves two major phases: data discovery and standardisation. During data discovery metadata is generated which is then used in standardisation.

Another pillar of IM is the concept of Information Lifecycle Management (ILM). In ILM, a data entity is managed from creation to disposal, its lifetime determined by its value to the organisation. Thus, ILM introduces the concept that not all data is the same, and so its management based on value enables the business cost of retrieval to be minimised. In order to decide policy on lifetime, and thereby help reduce the accumulating mountain of data, IBM, for example, is suggesting the appointment of an 'Information Czar', a role ideal for the CIO, who can bridge the gap between IT and the business, and raise the importance of data management within the organisation. Without a top management policy, data management is passed on to the lowest rung within IT, which results in the problems highlighted above. An IA based on ILM and MDM is a good starting point to creating an information-efficient organisation. MDM helps achieve the 'single-version-of-the-truth' Holy Grail that all data managers would like to see. Part of the remit of the Information Czar can also be to ensure that new data generation adheres to the MDM rules, so that, going forward, a streamlined data management regime is in place. Of course, mergers and acquisitions will foil that, but an IA will go a long way to ensuring an easier integration with a new corporate body.

An important aspect of IA is that it prolongs existing IT investment. All too often applications are decommissioned due to the rising costs of maintenance and support, and that includes the costs of data integration. MDM ensures that legacy applications can run alongside new applications so that users no longer have to be concerned with data mismatches – MDM is an essential part of a consolidated enterprise integration solution – thus IA fits well within the Service Oriented Architecture (SOA) paradigm.

SOA provides a loosely-coupled, standardised application environment, based on composite applications using components, objects, and Web services. An IA also removes obstacles to an efficient implementation of SOA – at a stroke a large amount of duplication in pre-processing data for each application is removed as it is done once within the IA.

In order to implement an IA it is worth investigating Darwin Information Typing Architecture (DITA). DITA is governed by the Organization for the Advancement of Structured Information Standards (OASIS) and defines an XML architecture for designing, writing, managing, and publishing information. DITA aims to deliver information as closely as possible to the needs at the point of use, and is therefore a potential blueprint for IA. DITA's pedigree and origins is worth a mention here: initially developed for internal use by IBM in the late 1990s, DITA offered the company an alternative XML-based documentation system that could address many of IBM's topic-based authoring, publishing, and documentation needs.

While the product documentation requirements of IBM might represent more of a challenge than those of the average enterprise, the primary business drivers behind this content management project will be familiar to all: (1) get products to market faster; (2) reduce unnecessary expense and wastage; (3) deliver content in an increasing number of formats and through a variety of mediums; (4) improve business flexibility; and (5) increase the effectiveness of content. In developing DITA, IBM's design goals were as follows: (1) move away from a focus on books to multiple format types and outputs; (2) move away from Standard Generalized Markup Language (SGML); (3) move towards the trend of 'information minimalism', i.e. getting the right information, at the right time, in the right format, to the right person; (4) provide more flexibility in structures, and move away from monolithic Document Type Definitions (DTDs); and (5) support maximum reuse.

Following some early successes at IBM, the company handed over governance of DITA to OASIS in 2004, and the following year the formal DITA standard was published. Since then, we have witnessed a steady stream of tools and technologies entering the market that are capable of authoring, managing, and consuming DITA content, and this in turn has sparked an interest amongst ECM vendors – especially those able to accommodate XML natively within their products. To date, it has been taken up by the technical publishing community and has the potential of application in other areas of business: Product Data Management, Customer Relationship Management, business best practice, e-Learning, and Knowledge Management.

In order for IA to be effective, a number of ideas need to be grasped. First of all, as mentioned, mergers and acquisitions will disrupt the best laid plans, but IA offers a head start in integrating disparate systems. However, a major obstacle is simply the outmoded processes that employees practice; these can easily undo the benefits of IA, so staff training is essential. One of the main issues to address is poor linkage between the upstream and downstream ends of the data chain, which means that data quality and data integration may become the focus, to the neglect of consuming and applying the information to meet business needs. In order to improve the management of information it is necessary to understand the structure, processes, strategy, and control mechanisms of this information within the business. The control element is possibly the weakest, with the cycle of planning, directing, measuring, analysing, and adjusting being ill-defined and practised informally. Embarking on an IA project helps to clarify information needs before creating an appropriate solution for the organisation.

The pervasive use of BI is another area where information can be put to active use, particularly in customer-facing scenarios, with direct benefit to sales. BI works both in the Information Services and Information Delivery layers of the IA, to analyse and forecast, and report on business outcomes and trends. BI systems integrated or embedded in applications provide employees with advanced and sophisticated data processing, automatically and in real-time. The employees may be unaware of the processing being carried out in the background, but the outcome can be dramatic: pop-up windows provide tips and warnings as agents handle customer calls, for example, helping improve customer satisfaction or closing sales. Furthermore, analysis is no longer limited to structured data, but today, more value from unstructured content can be realised thanks to text analytics, and advances in Enterprise Search technology.

Businesses today face many challenges in the area of document, and content management: how to audit a rising tide of information; how to manage enterprise content, store documents and records centrally; how to improve access to information through better search and retrieval capabilities; and also how to deal with thousands of documents and millions of records when they reach the end of their life or retention period. Whilst the volume of information held by businesses is growing at a rapid pace, so is demand for access to it, along with competitive and regulatory pressures. These challenges are fuelling investment in ECM and its components such as Document and Record Management (DRM), as companies seek to improve and optimise internal and customer-facing, information-centric processes. In Butler Group's IA, ECM solutions operate within the top two layers in Figure 3. They help organisations to address an increasing number of business challenges, including auditing, central storage, and administration.

Businesses will need the greater agility that easier access to information achieves, in order to survive in today's tougher markets. As with many such transformation projects, an incremental approach is likely to achieve greater benefits than a big-bang switch over. Starting with major pain points, an IA can be rolled-out to embrace larger parts of the organisation. This experience will also make it easier to evolve IA in an ever-changing organisation structure. Butler Group recommends that to initiate IA, a review of all key internal processes is conducted, a thorough audit of information sources be carried out, and that a dedicated Information Manager be given the responsibility for IA. The data mountain will grow regardless, but with IA business users will find information access improving, despite that growth.

► IBM'S APPROACH TO INFORMATION MANAGEMENT

Sam Palmisano, IBM's CEO, once said "When everything is connected... work flows to the places where it can be done best." Today, we live in a highly competitive and connected world, a 24x7 world, that is always on and always ready for business. Therefore organisations are looking for IM solutions that help them become the place where business flows to. IBM has been building its IM technology stack for several years, and in February 2006 it launched its IOD initiative. The company has since invested billions of dollars in related acquisitions and internal product development. More recently it has enhanced its IOD portfolio with a number of products and services wrapped into what it calls 'the Information Agenda' – a strategic initiative to help customers design and implement IM solutions that address the increasingly complex mix of information requirements.

Many organisations today are attempting to overcome not only technical but conceptual barriers to successful IM. The conceptual barrier comes from a lack of vision and shows itself as the failure of executives to abstract their thinking away from the sources of information, and to focus on the applications of that information. It is all too easy as a manager to see a data warehouse of historic transactions, a repository of unstructured documents, a set of reports, and a customer database, and get bogged down by the separation between them.

The switch needs to be made to seeing a business requirement or business process, and delivering the information that is required to support it, irrespective of underlying structure, location, or channel. The technical barrier is part of the reason for the conceptual barrier – it is the way that organisations have built up these information sources and the technology to manage them.

IBM's Information Agenda is designed to help organisations cross these barriers, to help organisations take a more holistic view of their information assets, and the requirement to apply a common semantic layer at a level above the underlying information sources. From a technology perspective, there is a trend for the integration of point solutions into a more effective platform that can span both structured and unstructured information. IBM's Information Agenda attempts to look beyond the traditional stovepipes and pigeonholes of software. Its primary objective is to facilitate an organisational change of focus – from a software application agenda for business automation to an information agenda for business optimisation. It is to help transform information into a trusted, strategic asset to be presented to, and used by, applications, processes and users/decision-makers for sustained competitive advantage.

The Information Agenda is an extensive part of IBM's IOD initiative supported by IBM's flagship software such as InfoSphere Foundation Tools for data integration and synchronisation, Filenet for Content Management, and IBM Cognos for Business Intelligence and Performance Management. The software elements operate at different levels of the IA to help deliver integrated information and analysis capabilities.

In Butler Group's opinion, there are many advantages to IBM's approach of a 'one-stop-shop' for all IM requirements; e.g. taking a holistic view of information requirement from the start and delivering a supporting structure that accommodates all those requirements. For some organisations with simpler requirements, this approach could be an overkill, for example, for smaller companies that have relatively simple requirements for DRM and Web Content Management. Some might also view the changing approach to IM as adding more complexity to the design and implementation of IM solutions. This would result in expensive professional services being required to help with the deployment. That can certainly be the case, but we believe that the need for professional services, even in the simplest of IM deployments, is often underestimated. For example, many organisations today are having to implement DRM for a second time, having failed to achieve all their objectives the first time around. The lack of DRM knowledge and expertise has certainly contributed to these failures. The same can be true of BI, with expensive deployments that see little take up by users.

The IBM Information Agenda is supported by industry-focused professional services, industry accelerators such as data models and blueprints, roadmaps, industry-specific guides and workshops, and Information Management Competency Centres to help customers build expertise and skills for business transformation.

► MAP OF IBM'S IM SOFTWARE

This Section examines a selection of IBM's flagship IM solutions as mapped against Butler Group's IA in Figure 3, to provide some IM context around each product.

Security

Information security is shown as a requirement across all the layers of the IA. It is generally addressed by IBM's specific applications at each layer of the IA. In addition, IBM has a range of products that provide customers with a full range of other security capabilities. Where access to information is concerned, IBM caters for Identity and Access Management (I&AM) requirements. The details of products are as follows:

- IBM Tivoli Directory Server (TDS) is a scalable, standards-based identity data platform that interoperates with a broad range of operating systems and applications.
- IBM Tivoli Directory Integrator (TDI) can serve as a metadirectory, or data integration tool, synchronising or transforming identity information and other security information in real time, across any relevant organisational sources.
- IBM Tivoli Identity Manager (TIM) provides identity management and provisioning relating to many types of logical assets (e.g. some databases and applications), network infrastructure (e.g. Cisco ACS), and access control systems (including those that are card-operated for building access). In all, it enables integration with a broad range of heterogeneous systems across multiple types of platform. A specialised edition for the SME market, IBM Tivoli Identity Manager Express (TIM Express), is also available – this provides identity management and user provisioning capabilities, optimised for rapid deployment and simplicity of use.

- IBM Tivoli Access Manager (TAM) for e-business (TAMeb) is a versatile solution for handling authentication and authorisation problems, which is primarily focused on Web-based applications, and can be implemented in varying forms, from simple Web Single Sign-On (SSO) to more complex security infrastructure deployments.
- Encentuate, a solution acquired by IBM in 2008 which will be incorporated in, and integrated with, other elements of the TAM product family, and released as TAM for Enterprise SSO. Encentuate provides SSO for applications within the enterprise (normally termed Enterprise SSO), built-in integration with numerous strong authentication form factors and many common applications (as well as extensibility to further applications via a development toolkit), and session management for shared desktops.
- IBM Tivoli Federated Identity Manager (TFIM) provides the necessary framework to support standards-based, federated identity interactions between partners, with capabilities in the areas of Web (SSO), Web services security management, and federated provisioning.
- Tivoli zSecure, a product platform (gained from the acquisition by IBM of Consul) that delivers audit and administrative capabilities for mainframe security, including management of user credentials, and access rights (which it also enforces). It is also a foundation of IBM's Enterprise Security Hub mainframe solution, and integrates with mainframe security schemes such as Resource Access Control Facility (RACF), as well as with the mainframe editions of other IBM security products such as TIM and TFIM.

Data Infrastructure

IBM DB2

IBM DB2 is a Relational Database Management System (RDBMS) that utilises a single code base for its distributed capabilities across multiple platforms (in this case Linux, UNIX, and Windows). IBM DB2 is a hybrid relational database with pureXML features within the solution that enable organisations to leverage XML capabilities in transactional environments. The most notable enhancements in the latest version of DB2 for Linux, UNIX, and Windows are in the areas of security and automation. DB2 version 9.5 features integrated role-based security and auditing capabilities, easing the pressure on organisations that face meeting various regulatory compliance-related issues. On the automation front, the solution is capable of automatically tuning its memory to meet the dynamic memory requirements of workloads and ensuring continued high performance levels of systems. There are currently three editions of DB2 (Express Edition, Workgroup Edition, and Enterprise Edition) that cater to requirements of businesses either at the SME end or the large enterprise end of the market. Butler Group believes that by abstracting the code from the underlying OS, organisations can derive real value when DB2 needs to be branched out to newer platforms.

Optim

Enterprise applications are, by their very nature, mission critical, and so managing the data held within these systems is clearly fundamental to business wellbeing. IBM's Optim, recently acquired from Princeton Softech, is an enterprise data management solution that provides organisations with archiving, test data management, and data masking capabilities. Optim can be used to improve the performance of corporate applications and databases, and can also be used by companies to mitigate risk and control costs. Of interest to organisations running Oracle E-Business Suite, PeopleSoft Enterprise, JD Edwards EnterpriseOne, Siebel, Retek, and a range of custom and bespoke packages, Optim will also appeal to IT managers struggling to bring enterprise databases under control. Architected around a mature and robust data navigation engine, Optim is especially suited to vertical industries such as Financial Services, Retail, Telco, and Utilities, as it is capable of manipulating huge amounts of business-critical data. When used as a 'smart' archiving solution for relational data, Optim is capable of recognising the schema and application logic of even bespoke systems, and is therefore useful in application retirement projects. Optim offers capabilities to mask or de-identify confidential data and thereby supports privacy compliance projects. Optim does not currently support spatial data types and so this might prove limiting in some circumstances. In our view, Optim may well be the answer to data-laden organisations' prayers.

Data Management

IBM has many products with capabilities that work across the Data Management and Data Extraction and Integration layers of the IA. Listed here are two of the products that clearly fit into this layer.

IBM InfoSphere QualityStage

IBM InfoSphere QualityStage is an enterprise-wide data quality software application to support data quality and data governance initiatives. It employs probabilistic technology for data matching and provides a point-and-click interface for the user to set up and run data quality processes. These include data investigation, standardisation, and matching. IBM InfoSphere QualityStage enables data to be audited for quality and then validated. There are also address standardisation verification and enrichment capabilities with Postal Certification modules for the United States, Canada, and Australia. The data cleansing is domain-agnostic, meaning that it can apply to any business domain, for example, product data, customer contact information, events, and other comment and descriptive fields. IBM InfoSphere QualityStage has extensive reporting features that yield intelligence about the data and help tune the application for quality assurance. It also enables organisations to keep track of performance against data quality targets and metrics. IBM InfoSphere QualityStage is SOA-enabled with IBM InfoSphere Information Services Director. It allows data quality logic to be built using the IBM InfoSphere Information Server and to be published as a service for re-use in a SOA.

IBM Metadata Workbench

IBM's Metadata Workbench is a metadata management module for its Information Server platform that provides business and technical users with a control station for accessing and exploring metadata – “information about data”.

It helps to visually depict the inter-relationships that exist between data sources and users, providing data lineage back to source systems – including information such as the type of processing performed on the data along the way – and impact analysis of any changes on the data to reports, databases, or services. Additionally, the software can also be used to create new metadata objects within IBM Information Server and either resolve or clean-up metadata relationships – something that IBM refers to as “metadata stitching,” which is a method of automatically connecting design and operational metadata elements together to form relationships that ensure a complete and consistent view of metadata. The Metadata Workbench can collate metadata across various third-party data modelling and BI tools and applications. It also includes extensive built-in reporting capabilities. While the Workbench might seem like it's brand-new, it is in fact a convergence of three IBM products: IBM Information Server's Metadata Server and browser-based console interface; the successor of the acquired Unicorn semantic metadata product; and the next generation of the MetaStage Explorer, which IBM picked up from its acquisition of Ascential Software a few years ago. In our view, Metadata Workbench fills the gap in IBM's Information Server platform by bringing together the various data integration components (DataStage, QualityStage, ProfileStage) within the platform – i.e. integrating the integration server platform itself.

Data Extraction and Integration

IBM's range of products for this layer include the following:

IBM InfoSphere MDM Server

IBM introduced a multi-entity MDM solution – IBM InfoSphere MDM Server – in January 2008. The solution provides out-of-the-box MDM for multiple data types that fall under the Party, Account, or Product categories. For organisations that just need a Product Information Management (PIM) solution, there is the IBM InfoSphere MDM Server for PIM. Key strengths of the product are Unicode enablement for internationalisation of both data and the solution user interface. The architecture is SOA friendly, with Web services interfaces, and the solution is accessed via a portal. It has full Data Quality capability out-of-the-box, covering data profiling, matching, cleansing, and enrichment. The MDM Server has Information Server components (QualityStage, DataStage, and InfoSphere Information Services Director) as optional components that provide programmable Extract, Transform and Load (ETL) capability. There is also the FastTrack component in Information Server that offers graphical ETL job creation. IBM's approach to integration with Enterprise Applications is through custom integration due to the varieties of implementations existing in the field, hence there are no MDM out-of-the-box connectors to SAP and Oracle for example. The solution supports all the varieties of MDM architecture that the user may require: MDM Server can act as a Registry/Index Hub, Coexistence/Reference Hub, or full Transaction Hub. It has no Business Process Management (BPM) support; however, there is workflow supporting task management for simple human processes. There is a Business Rules Engine in-built through ILOG JRules Execution Server. The in-built BI for MDM capability is limited and would require a separate BI solution for full functionality. Time zone awareness is in the pipeline. In Butler Group's opinion, IBM's MDM go-to-market strategy is on target, being in-line with SOA environments, and supporting MDM for multiple data types – overall an advanced MDM offering.

IBM InfoSphere DataStage

IBM InfoSphere DataStage provides data ETL capabilities for data warehousing. It can deal with integration and transformation of large volumes of data with updates taking place in real-time as well as in batch or on a scheduled-basis. Scalability in DataStage is achieved through its parallel processing capabilities of multiprocessor hardware platforms. DataStage can work with heterogeneous data sources such as text files; complex data structures in XML; data from Enterprise Resource Planning (ERP) systems such as SAP and PeopleSoft; any database (including partitioned databases); Web services; and third-party BI tools (e.g. from SAS). Thus it enables 'Information Agenda' concepts to be turned into reality. The real-time data integration function captures messages from Message Oriented Middleware (MOM) queues using Java Message Service (JMS) or IBM's WebSphere MQ adapters to combine data into conforming operational and historical analysis perspectives. IBM InfoSphere Information Services Director provides a SOA for publishing data integration logic as shared services that can be re-used across the enterprise.

IBM InfoSphere Warehouse

IBM InfoSphere Warehouse is IBM's comprehensive data warehousing platform. It was formerly known as IBM DB2 Warehouse and is still based on IBM's DB2. It is available across a range of server platforms and operating systems. It provides InfoSphere Warehouse Cubing Services Feature, a multidimensional analysis server that enables On-Line Analytical Processing (OLAP) applications to access data. It provides analytical capabilities for large volumes of data, with segmenting and predicting functionality while in the database, to deliver analytics in real-time. Butler Group particularly likes the capability for analysing unstructured content with the embedded InfoSphere Warehouse Unstructured Data Analysis Feature. Analysis of unstructured data is integrated into the Design Studio element of the warehouse (in-line with IBM's Information Agenda). Design Studio enables the creation, manipulation, import, or export cube models, cubes and other metadata objects to be used in OLAP tools. It is Wizard-driven for ease of use. Other features include the Optimization Advisor that analyses metadata and recommends how to build summary tables that store and index aggregated data for OLAP-style SQL queries. The results of an Unstructured Text Data Analysis can be fed into a data mining model. The Data Mining provides capabilities to enable integrated analytics of the data in the enterprise data warehouse. Standard data mining models (clustering, associations, classification, and prediction) are supported and can be developed via drag-and-drop in the Design Studio. These models also may be imported in industry-standard Predictive Model Markup Language (PMML) format from third-party modeling tools. The data mining models can be executed in the production environment to provide real-time scoring of data records. Additionally, rich presentation components are provided to enable visual analysis of data mining results.

Information Services

There are three main components in the Information Services layer: BI, ECM and Enterprise Search and Retrieval. IBM has products in all of these categories. The following are extracts from recent Butler Group Technology Audits of these groups of products:

IBM Cognos

IBM Cognos 8 BI is a single, integrated, enterprise-class, BI and Corporate Performance Management (CPM) product constructed around a SOA. In Butler Group's opinion, the integrated nature of the platform simplifies deployment and increases visibility of key elements of performance management within the application environment and, as a result, within the organisations. IBM Cognos 8 BI delivers functionality at both the Information Services and Information Delivery layers of the Butler Group IA. In the Information Services layer it delivers capabilities such as analysis, alerting, and forecasting. It also has built-in search capabilities that interface with major enterprise search tools. At the top layer, it delivers intelligence through reports and visualisation in dashboards and portals. The acquisition of Cognos has enabled IBM to provide complete BI capabilities in a single product based on a single Web services architecture. However, other acquired products – i.e. Celequest and Applix – remain separate from the main BI platform with only loose integration between them. IBM Cognos 8 BI deploys well into complex enterprise environments, is supported on all popular IT platforms, and is accessed via a well-engineered, browser-based interface. IBM offers extensive CPM functionality for financial performance management and financial consolidation. In addition, the vendor has been extending its solution into other applications and vertical areas.

IBM Content Manager and FileNet P8

IBM's ECM platforms consists of IBM Content Manager (CM8 Family) and IBM FileNet P8. Both products offer a rich set of capabilities to address the needs of organisations to manage their unstructured information more effectively, particularly for compliance and litigation risk purposes. Each has its own strengths – for example, IBM FileNet P8 is strong in enabling and utilising BPM, and IBM Content Manager has a powerful classification capability – but as there is currently no integration between the products, organisations need to decide which solution will best address their requirements although the long-term roadmap will see the products offered as a set of services. IBM FileNet P8 is particularly well suited to Financial Services, Insurance, Government, Telecommunications, Utilities, and Manufacturing, whilst IBM Content Manager has a large customer base in federal government. One weakness is in IBM Records Manager that currently only has limited support for physical records. IBM FileNet provides extensive BPM capabilities and the portfolio includes solutions such as the Compliance Warehouse which combines hardware, software, and services.

IBM WebSphere Information Integrator OmniFind Edition

WebSphere Information Integrator OmniFind Edition is a secure enterprise-search platform that provides organisations with a flexible tool to enable employees to speedily locate the information they require to fulfil their roles efficiently and increase their productivity. As volumes of information, both structured and unstructured, that are stored within organisations continue to grow exponentially, competitive pressures dictate that employees must be able to access this plethora of information speedily. A strength of OmniFind is its ability to search both structured and unstructured repositories for information, whilst at the same time respecting the underlying security imposed by the applications that manage the repositories. For organisations requiring more specialised Web searching capabilities for e-commerce-type applications, IBM has another search product – WebSphere Content Discovery Server – and there are plans to combine the two products into a seamless package. OmniFind is suited to organisations with large volumes of information and multiple repositories to search, from the largest enterprises to medium-sized businesses. The best way to evaluate the product, in Butler Group's opinion, is through a proof of concept, and then to undertake a phased rollout.

Information Delivery

IBM's BI, ECM and Enterprise Search and Retrieval products deliver functionality at this layer through their desktop or browser-based UIs or portals and dashboards. These work as tools for reporting, publishing, delivering and presenting information. In addition IBM has been in the collaboration market for many years, and offers a range of products, technologies, and solutions to meet the many and varied needs of today's information worker. The following Sections provide an overview of some of IBM's Collaboration products.

IBM Notes/Domino, Workplace Collaboration Services, and QuickPlace

Lotus Notes/Domino continues to evolve and adapt to meet the ever-changing requirements of the information professional, and as a result we believe that it is ideally suited to information-heavy organisations. At a practical level, organisations clearly need to have a workforce and a workplace that is amenable to collaboration; moreover, the organisation must also be geared-up to collaborate both internally and externally. Whilst Lotus Notes/Domino is very suited to collaboration within the organisation, its proprietary nature does tend to hamper its use across organisational boundaries. Many of today's licensing models do not accommodate the inter-company use of products such as Notes/Domino, and in many ways this acts as a barrier to IBM's long-established collaboration platform. Workplace Collaboration Services is perhaps IBM's answer to the constraints limiting broader adoption of Domino. Designed with low-cost of ownership in mind, and readily accessible through a standard browser, IBM Workplace is IBM's Web-centric information delivery and interaction platform. A modular offering, Workplace Collaboration Services offers good reach and range, and would suit large organisations in either the public or private sectors.

IBM still lacks a peer-to-peer offering, and should consider adding this valuable facility to both the Notes client and the IBM Workplace Managed Client. QuickPlace fills the gap between Domino and Workplace, and provides information workers with a self-service Web site that is well suited to the task of document collaboration. QuickPlace's off-line facility is an important facet of this product, and is worthy of closer investigation. Organisations interested in IBM's offerings should evaluate them via the free Web downloads, or by contacting one of the company's many partners.

Collaboration Software in IBM Lotus Notes

- IBM Connections is the enterprise social networking software that is a part of IBM's Lotus brand of solutions. Lotus Connections has five discrete components, namely profiles, blogs, Dogear (social bookmarking), Communities, and Activities. These components can be accessed through the browser or other IBM products such as Lotus Notes, Lotus Sametime, IBM WebSphere portal – or Microsoft Office.
- Profiles: This is the directory service of Lotus Notes and helps find people and skills across the enterprise for enhanced co-ordination among teams. The tool displays a list of an individual's colleagues and their blog entries, recent activities, and bookmarks. Entries can be searched by names, phone numbers, job titles, locations, skills, or key work areas. An individual's profile can be used to access his or her shared bookmarks, blog posts, common activities, and communities. The profiles can be populated using data from in-house applications by the IBM TDI.
- Communities: This feature is similar to communities in consumer social networking sites. Users can create or join communities of people with similar work areas or interests. Communities can be searched using specific keywords or browsed through in categories. Community updates can be subscribed through feed readers.
- Blogs: Can be created individually or as part of a group.
- Dogear: Dogear is the bookmark component of Lotus Notes, and allows users to save bookmarks found during browsing to a central server which can then be shared with others.
- Activities: The Activities component of Lotus Notes helps users view or manage information and tasks that need to be completed for a particular project, in a single view. Information can be gathered from files, e-mails, or instant messages, for example. Activities is essentially a project management component, where users can create tasks and set schedules, invite users to newly-created tasks, filter individual or team activities based on keywords or tags, add content such as files, IM transcripts, or e-mails to the activities, notify others of changes, and templates can be used for repetitive activities.

► CONCLUSION

The concept of IM has developed from the need to manage growing volumes of information, and to exploit it for business and competitive advantage. To achieve these objectives organisations have to become more focused on IM and its component parts. Just as systems were deployed in the past to automate business processes and transactions, today we need to implement IM to help us improve our information-based business activities. The development of an IM strategy can get organisations started on a coherent and joined-up IM journey. There are many options available for building the software stack that would support the IM in its entirety, and therefore it is essential that organisations make informed buying decisions. Moreover, the set of skills and knowledge required for implementing the IM strategy should not be underestimated and we recommend that organisations seek help and advice from specialist companies.

IBM is one of the vendors that is most active in this market and provides an extensive and growing range of products and services. IBM's Information Agenda is aimed at delivering a unified approach to managing different information needs. Whilst there are many advantages to a 'one-stop-shop' for all IM requirements (structured and unstructured), the solution should fit the requirements of the organisation. In our view this approach is not necessarily suitable for organisations that have relatively simple document, records, and Web Content Management requirements. On the other hand, some organisations have complex ECM and BI requirements. Others have complex software requirements as well as large and globally-distributed workforces that consume information in different ways. Such organisations would do well to investigate and evaluate the unified approach to IM. IBM has been delivering IM solutions for many years and arguably has the largest selection of IM software. There is an IBM product for every layer and almost every subsection of the layers in the IA, and we have provided an overview of some of these in this White Paper – mapped to the IA. This is to help readers understand and position the software into the IM context within which the products work. The mapping of IBM's products should also help readers with product selection and ease of comparison with rival products that operate at similar IA layers or indeed across them.

We believe that IM can help organisations gain a distinct competitive edge over their rivals and to aid survival in the global economic downturn. We also believe that IM can be exploited to accelerate recovery, but in this climate it must be applied with a clear purpose to specific business challenges to deliver quantifiable returns rather than a distant and general promise of future benefits.

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